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Study No. 8, Chinese Amphibious Warfare: Prospects for a Cross-Strait Invasion

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CHINESE AMPHIBIOUS WARFARE

Prospects for a Cross-Strait Invasion

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Chinese Amphibious Warfare

Studies in Chinese Maritime Development
Andrew S. Erickson, Series Editor

Powered by the world's second-largest economy and defense budget, China is going to sea on a scale and with a sophistication that no continental power ever before has sustained in the modern era. Its three sea forces are all leaders in their own right: the world's largest navy, coast guard, and maritime militia, by number of ships. They are supplied by the world's largest shipyard infrastructure, which has achieved the largest, fastest postwar production-capacity expansion. On the civilian side, Chinese sea power is supplemented by the world's largest fishing fleet, including in number of fishers; aquaculture and pisciculture industries; merchant marine; and marine sector overall. It has a large, nationally flagged tanker fleet and expansive global port-infrastructure networks.

Paramount leader Xi Jinping is guiding China's transformation into a "great maritime power." At a minimum, today's Middle Kingdom is already a hybrid land-sea power. Amid European decline and American fiscal and strategic challenges, this historic transformation has the potential to end six centuries of largely Western dominance of the world's oceans. The U.S. Navy and nation must understand this momentous sea change to inform strategy and policy properly. Worryingly, Beijing has the world's most numerous and extensive disputed island/feature claims, with the largest number of other parties. Of these, no flash point looms larger than Taiwan.

Since the Chinese Maritime Studies Institute was established in 2006, it has been conducting research and holding conferences covering the broad waterfront of Chinese oceanic efforts to advise USN leadership and to support the Naval War College in its core missions of helping to define the future Navy and to support the Navy during an era of great-power competition. The Studies in Chinese Maritime Development series assembles the resulting proceedings into edited volumes focusing on specific topics of importance, to elucidate further both China's progress and its challenges at sea.

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Chinese Amphibious Warfare across the Strait

In August 2022, the People's Republic of China (PRC) encircled and overshot Taiwan with a battery of military exercises. The People's Liberation Army (PLA) conducted live-fire drills, air sorties, naval deployments, and ballistic-missile launches in six zones encompassing the busiest international sea-lanes and air corridors surrounding Taiwan. Subsequent PLA activities suggest an effort to impose heightened, more-comprehensive pressure on Taiwan moving forward.

This is merely the latest in the continuing series of PRC military threats and provocations that have increased over the past several years. These have included continued fortification of atolls and islands in the South China Sea, almost nonstop PLA Air Force incursions into Taiwan's air-defense identification zone, and continued challenges to U.S. Navy vessels operating in the South China Sea and Taiwan Strait.

Beijing's provocations will continue for the foreseeable future as PRC president, general secretary, and commander in chief Xi Jinping continues to send the clear message to Taiwan, the United States, and its allies that China has both the ability and the willingness to use an increasingly capable and technologically advanced PLA to unify Taiwan with the mainland by force. Make no mistake, this is not a PRC bluff—the threat to Taiwan is real and grave.

That said, China would have to execute successfully a military operation that history shows is among the most difficult: an opposed amphibious landing. This feat has not been accomplished since the U.S. attack on Inchon, South Korea, in September 1950. The PLA must transport thousands of troops and tons of equipment one hundred miles across the Taiwan Strait—one of the most militarized waterways on Earth. The few natural landing beaches on Taiwan are crisscrossed with streams, marshes, and canals, and they lie at the base of buildings, cliffs, or hills. The center of this island of nearly twenty-four million people is dominated by a north–south mountain range that would be a nightmare for even the best, most experienced army to assault. Finally, a motivated Taiwan military, supplied and supported by the United States, has been preparing for this defensive battle for over seventy years.

There is no question that a PRC invasion of Taiwan would be one of the defining events of the twenty-first century. However, most contemporary literature analyzing China–Taiwan military scenarios focuses on the political, diplomatic, and informational factors leading to a PRC decision to invade. Far less published analysis concentrates on the actual ability of the PLA to execute a large-scale amphibious invasion successfully.

This is not surprising. Analysis of political decision-making—especially within the Chinese Communist Party and PLA—is more art than science, subject to hypothesis and much speculation. As a result, everyone from learned scholars and government officials to the novice strategist can attempt a reasonable assessment. Analysis of China's comprehensive war-fighting capability is the exact opposite. It requires an objective understanding and careful consideration of information warfare, cyber and space technology, weapons capabilities, maritime and aerospace operations, logistics supply chains, geography, and even tides and currents. More science than art, it requires of scholars and analysts expertise that may take years of study and practical experience to develop.

From 4 to 6 May 2021, the Naval War College's China Maritime Studies Institute (CMSI) assembled just such a collection of specialists for its "Conference on Large-Scale Amphibious Warfare in Chinese Military Strategy." The final product of that conference is this edited volume. The contributing authors are the leading U.S. military, intelligence, and academic experts on PLA capabilities. I was honored to call most of them colleagues and friends during my over thirty years of China-focused assignments in Hong Kong and Beijing, in the Indo-Pacific Command, in the Pentagon on the Army Staff, and in the Office of the Secretary of Defense.

The authors deconstruct the key elements necessary for any PRC attack to succeed—weapons, technology, geography, operational doctrine, amphibious lift, logistics and matériel readiness, to name but a few. They then offer a balanced assessment of PLA strengths and weaknesses. Notably, they explore whether the inexperienced soldiers and commanders of the PLA—who have not mounted a large-scale military operation of any type since 1979 (border clashes with India excepted)—would be able to employ their advanced military technology effectively in maximum-intensity, high-stakes combat.

The publication of this volume is particularly timely as we contemplate the potential PLA "lessons learned" from the current Russia-Ukraine conflict. As Moscow learned at its cost in the initial stages of the conflict in Ukraine, military technology by itself does not translate into military capability. Operational doctrine and tactics matter; logistics and geography matter; and finally, education, training, leadership, and soldier morale—yours and your adversaries'—matter. The enemy gets to vote on your success. The evolution of the Russia-Ukraine conflict has surprised many students of war, and it no doubt has gained the full attention of the PLA leadership. At the very least, this volume will provide a solid baseline of current PLA offensive capabilities from which we can analyze the lessons that China learns from Russia and Taiwan learns from Ukraine.

I congratulate the Naval War College, CMSI, and the contributors to and editors of this volume. It has my strongest recommendation for serious students of the China-Taiwan military scenario, and I believe it will become the seminal reference, not only for those who study China's ability to invade Taiwan, but for those who study its political willingness to go to war.

Lt. Gen. Charles W. Hooper, USA (Ret.)
Washington, DC
October 2022

Acknowledgments

On behalf of the China Maritime Studies Institute (CMSI), the editors thank everyone who contributed to this volume and the conference on which it is based. As with all CMSI events and publications, countless people made vital contributions. While it is not possible to list them individually, we express sincere appreciation to all concerned.

We extend special thanks to Cdr. Dan Caldwell, USN (Ret.), both for his management, as CMSI director, of the event that generated this volume, and for the guidance and insights he has provided throughout, based on his cutting-edge knowledge of the history, theory, and practice of joint military operations. Commander Caldwell's amphibious-warfare experience includes tours as the operations officer on USS *Duluth* (LPD 6) during Operation Iraqi Freedom, the executive officer on USS *Pearl Harbor* (LSD 52), and the operations officer on USS *Makin Island* (LHD 8). We also deeply appreciate the years of leadership and support for CMSI provided by Lt. Gen. Charles Hooper, USA (Ret.), as well as his insights and generosity in helping to frame this work and to explain its significance.

Readers of this book will be oriented by a set of illuminating maps at the front, provided by leading China scholar and cartographer Pete McPhail, and at the back they will be deeply informed by an appendix, provided by order-of-battle experts Manfred Meyer, Larry Bond, and Chris Carlson, that depicts and details PLA amphibious vessels relevant to cross-strait scenarios.

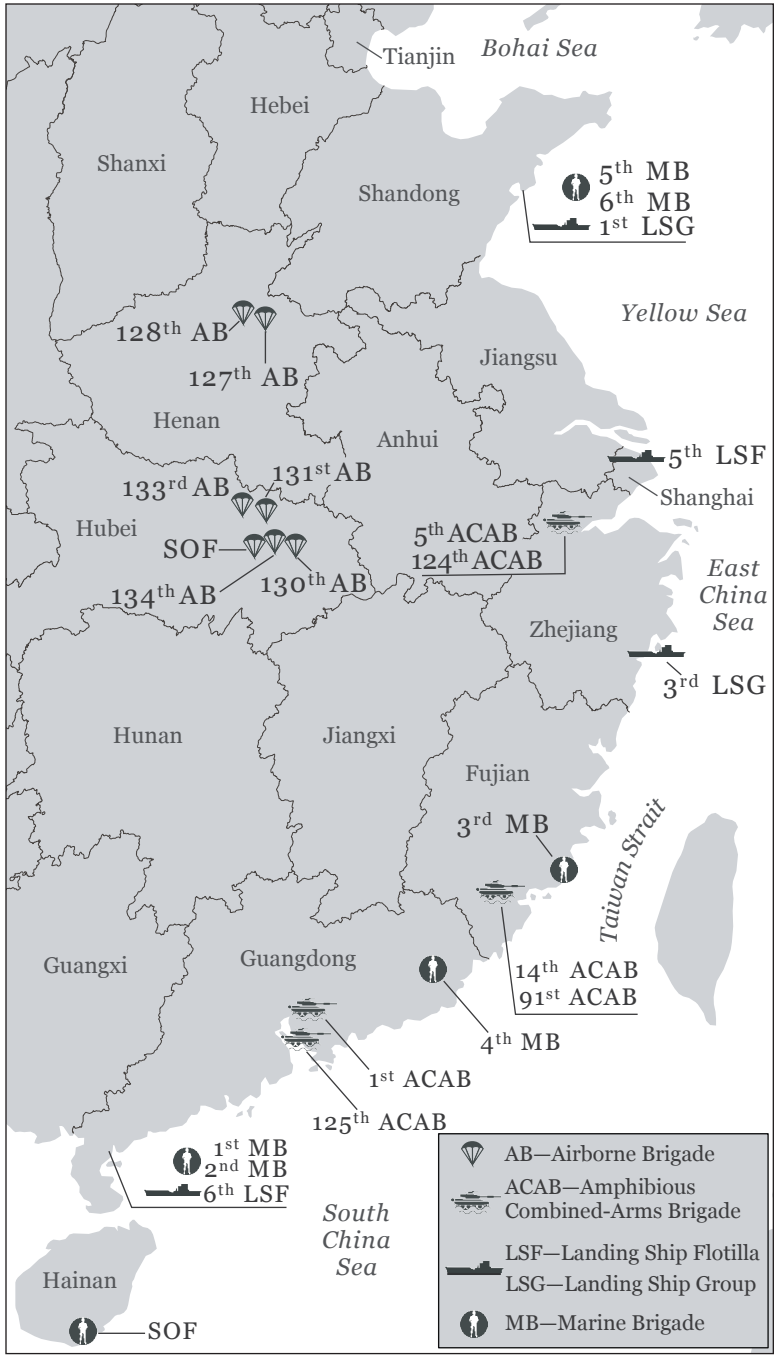
The support of the leadership of the Naval War College, and of the U.S. Navy more broadly, has been essential. Particular gratitude is due to Dr. Colin Jackson, Chairman, Strategic and Operational Research

Department (SORD), in which CMSI resides, and to Dr. Peter Dutton, then interim dean of the Center for Naval Warfare Studies, the Naval War College's research arm and home to SORD. Finally, we thank the entire Naval War College Press team, under the leadership of Director Dr. Carnes Lord, for its professionalism and dedication to this volume.

The book's production was supported further by a generous contribution from the Leidos Chair of Future Warfare Studies, under the leadership of Dr. Sam J. Tangredi, for which we are grateful. The resulting volume is the eighth in CMSI's Studies in Chinese Maritime Development series of edited conference proceedings, published since 2007.

Andrew S. Erickson
Conor M. Kennedy
Ryan D. Martinson
Newport, Rhode Island
October 2022

Map 1. PRC Mainland & Taiwan



Source: Pete McPhail

Map 2. Taiwan Strait Closeup

Source: Pete McPhail

Andrew S. Erickson, Conor M. Kennedy, and Ryan D. Martinson

Introduction: Taking Taiwan by Force?

Chinese Amphibious Warfare in the New Era

For over seventy years, the Taiwan Strait has separated the People's Republic of China (PRC) and the Republic of China (ROC). Just eighty-one miles across at its narrowest point, this sea barrier also has helped to maintain peace across the strait, preventing an armed resolution to the Chinese Civil War. Over the past several decades, the rapid development and modernization of the People's Liberation Army (PLA) has strengthened its overall combat power significantly, including a greater ability to project force over water. This threatens to upend the basic calculus for peaceful cross-strait relations and presents a major threat to Taiwanese security. PLA amphibious warfare thus merits special attention and careful study in all its aspects.

From 4 to 6 May 2021 the Naval War College's China Maritime Studies Institute (CMSI) held an academic conference (virtually, under pandemic protocols) to address this issue. The roughly 160 attendees—leading American experts from government, academia, and U.S.-based think tanks—considered the topic of large-scale PLA amphibious warfare (i.e., a Taiwan invasion scenario). A by-product of those presentations and discussions was this volume. As with all other CMSI volumes, this introduction reflects the editors' effort to synthesize the most important findings from the conference. The chapters themselves reflect the authors' personal views alone

and not those of any institution with which they are affiliated, including the U.S. government. No author is responsible in any way for content outside his or her chapter.

Conference participants sought to answer key questions about PLA amphibious doctrine and capabilities. How well prepared is the PLA to execute a joint island landing campaign against Taiwan? What capabilities is the PLA developing to ensure success? What weaknesses could restrain it? How have military reforms affected the joint amphibious force? In what ways does historical experience, both foreign and Chinese, inform PLA thinking on amphibious warfare? Conference participants also proposed solutions to deter the PRC from attempting an assault on the island—and to frustrate any amphibious operation should deterrence fail.

The answers to these questions have tremendous real-world significance for the fate of Taiwan and any countries that would come to its aid. There is no more urgent, high-stakes scenario with implications for American security and power on the global stage than a large-scale invasion across the Taiwan Strait. Seizing control of Taiwan looms as the most ardent geopolitical goal of the Chinese Communist Party (CCP), and its current general secretary, Xi Jinping, appears determined to achieve "unification" with Taiwan during his time in power. With the cross-strait military balance shifting perilously in Beijing's favor, an emboldened Xi may have confidence in the PLA's ability to risk an attempt in the near term, as conditions become maximally favorable to the PRC. Senior U.S. military officials warn that China might attempt to invade by the mid-to-late 2020s.[1]

Like the conference on which it is based, this volume comprises five parts: (1) "Doctrinal Foundations of Chinese Amphibious Warfare," (2) "The Joint Amphibious Force," (3) "Enablers of Amphibious Warfare," (4) "Scenario Factors," and (5) "Implications."

Doctrinal Foundations of Chinese Amphibious Warfare

Part 1 examines the historical experience, both Chinese and foreign, informing PLA amphibious doctrine. In chapter 1, Grant Rhode chronicles Shi Lang's successful campaign to subdue Taiwan during the early period of the Qing dynasty. In 1661–62, famed naval commander—and Ming loyalist—Koxinga (Zheng Chenggong) evicted Dutch colonists from Taiwan. For over twenty years he and his descendants ruled the island, until Shi, leading a force of three hundred junks and 21,000 men, defeated the Zheng navy near the Penghu Islands (Pescadores), just west of Taiwan. This paved the way

for Shi's largely uncontested landing on Taiwan. Although Shi's successful military campaign offers few practical lessons for today's PLA, it does hold symbolic and political value. It serves as "proof" that Taiwan belongs to China. It also reminds Chinese patriots that China has invaded Taiwan before, and potentially can do so again. Indeed, the PLA's first aircraft carrier was informally named *Shi Lang* during the years before its 2012 commissioning as *Liaoning*.

In chapter 2, Xiaobing Li examines early PLA experience in amphibious warfare, looking specifically at the failed campaign to seize Kinmen (Jinmen) Island and the successful campaigns to take the islands of Hainan and Yijiangshan. In October 1949, PLA forces failed to reinforce the first wave of their amphibious assault on Kinmen, resulting in the loss of over nine thousand landing troops (including over three thousand taken prisoner). The PLA applied lessons learned from this failure in its successful invasion of Hainan (April 1950) and Yijiangshan (January 1955), both occupied by Nationalist forces. As the last major island landings conducted by the Chinese military, these campaigns continue to inform PLA thinking on amphibious doctrine.

Chapter 3, written by Christopher Yung and Zoe Haver, analyzes the influence of Western amphibious thinking among PLA strategists. From their reading of PLA sources, Yung and Haver distill six key pillars of PLA amphibious doctrine: (1) dominance of the three domains (air, sea, and information), (2) key-point strikes, (3) concentration of "elite strengths," (4) rapid and continuous assaults, (5) integrated and flexible support operations, and (6) psychological attacks. All have echoes of doctrinal principles developed by the Allies during World War II. The authors also discuss recent efforts by PLA analysts to advance and update these concepts for a cross-strait invasion scenario.

The Joint Amphibious Force

Part 2 discusses the four main components of the joint amphibious force: (1) the amphibious units of the PLA ground forces (PLAGF), (2) the PLA Navy Marine Corps (PLANMC), (3) the PLA Navy (PLAN) amphibious fleet, and (4) the civilian support fleet. In chapter 4, Dennis Blasko outlines the missions, organization, capabilities, and training of the PLAGF's amphibious forces. As a result of the 2017 PLA reform, the PLAGF now possesses six amphibious combined-arms brigades (ACABs): the 5th ACAB (Hangzhou, Zhejiang Province), 124th ACAB (Hangzhou), 14th ACAB

(Zhangzhou, Fujian Province), 91st ACAB (Zhangzhou), 1st ACAB (Boluo, Guangdong Province), and 125th ACAB (Bao'an, Guangdong Province). Despite efforts to modernize the amphibious force, readiness limitations in conscript-heavy units and lack of training above the battalion level continue to constrain PLAGF ACABs. These units account for a small fraction (about 7 percent) of the total number of army combined-arms brigades. Nonetheless, reforms have strengthened army capabilities to support a joint island landing campaign through stronger aviation, special operations, long-range artillery, and incorporation of new technologies such as unmanned aerial vehicles and robots. The author concludes that, at present, the PLAGF amphibious force may be capable of seizing ROC-controlled offshore islands but could not lead a major assault directed against the main island of Taiwan.

In chapter 5, Conor Kennedy examines the PLANMC's likely contributions to a cross-strait invasion. Since 2017, the PLANMC has tripled in size. While the PLA likely regards the new PLANMC as an expeditionary force tasked with protecting China's "overseas interests," the PLANMC's eight brigades also would be expected to participate in any large-scale assault on Taiwan. During the preliminary phase of the amphibious assault, PLANMC forces likely would conduct advance operations to create favorable conditions for landing operations. PLANMC forces also likely would focus on smaller-scale landing operations throughout the depth of amphibious objective areas in support of the larger campaign, as well as in support of the army's main assault over the beaches, working in conjunction with the PLAGF's combined-arms brigades. The inclusion of mechanized ground- and air-assault battalions in PLANMC brigades means they also could be charged with follow-on operations beyond the beachhead, including urban combat.

Chapter 6, written by Lonnie Henley, looks at the role of civilian shipping and the maritime militia in a cross-strait assault. Foreign observers long have assumed that the PLA would need to requisition large numbers of civilian ships, especially roll-on/roll-off vessels, to compensate for inadequate naval lift. Henley argues that this approach is not a "stopgap" measure but a key component of the PLA's preferred approach. Civilian ships likely would be operated by China's maritime militia, which is made up of members of the armed forces with day jobs in civilian industries. PLA sources describe the overall functions that the maritime militia could fulfill in a cross-strait invasion, including force delivery, at-sea support, over-the-shore logistical support, medical support, obstacle emplacement and clearing, engineering support, reconnaissance, surveillance, early warning, deception and concealment, and helicopter relay support. The PLA also openly acknowledges

the major challenges entailed in using the maritime militia in a large-scale military operation: incomplete laws and regulations, inadequate data management, uneven training, and widespread use of flags of convenience. Nevertheless, the capabilities of civilian shipping and the maritime militia could be sufficient to enable a cross-strait invasion.

In chapter 7, Jennifer Rice introduces the PLAN amphibious fleet, which comprises ten amphibious assault combatants, including eight amphibious transport docks (i.e., LPDs) and two landing helicopter assault (i.e., LHA) ships (with a third soon joining the fleet); thirty tank landing ships (LSTs); twenty medium landing ships (LSMs); and dozens of smaller landing craft. In recent years, the PLAN has prioritized production of larger amphibious vessels better suited for overseas operations, not a Taiwan invasion. This reflects a balanced approach to amphibious-force modernization, balancing the pursuit of global deployment capabilities against the maintenance of modest traditional naval lift. However, China's tremendous shipbuilding capacity could enable the PLAN to surge production of amphibious vessels quickly to meet its needs for a cross-strait invasion.

Enablers of Amphibious Warfare

Part 3 considers other forces that would be vital to a cross-strait campaign but would not participate in the main invasion force. In chapter 8, Cristina Garafola examines the roles and missions of the PLA Airborne Corps, a component of the PLA Air Force (PLAAF). Chiefly comprising six combined-arms brigades and one special-operations brigade, the Airborne Corps operates from light, medium, and heavy aircraft, including the PLAAF's Y-20. PLA writings suggest that Chinese paratroopers would support an invasion by operating behind enemy lines, seizing and holding important terrain and relieving pressure on the main invasion force. Despite improvements in recent years, questions remain about the Airborne Corps's ability to operate effectively with other invasion forces, especially in complex and degraded environments.

In chapter 9, Tom Fox looks at helicopter units of the PLAGF, a force that has grown considerably in recent years, with some speculating that it could provide the main thrust in a campaign to subdue Taiwan. Fox considers two possible scenarios involving a helicopter-led invasion. In the first scenario, the PLAGF would use nearly all its available helicopters to overwhelm Taiwan's defenses and convince the ROC leadership to capitulate. In a second, "unconventional" scenario, the PLA would launch a sudden attack

using its older helicopters, saving its more modern platforms for follow-on operations. Drawing from his own experience as a helicopter pilot and analysis of Chinese media coverage of PLA training, Fox concludes that neither approach is plausible in the short term. In sum, the PLAGF helicopter force offers no "easy button" for a cross-strait invasion.

Chapter 10, written by John Chen and Joel Wuthnow, focuses on PLA and People's Armed Police special-operations forces (SOFs) and their likely contributions to a large-scale amphibious assault. Chen and Wuthnow reckon that Chinese SOFs would play important roles in the preparatory and main-assault phases of the landing. SOFs from the PLAGF, PLAN, and PLAAF could infiltrate the island via special-mission craft and helicopters. Once on the island, they would provide reconnaissance and targeting, clear obstacles, conduct strikes and raids, and perform extraction missions. As with other supporting forces, questions remain about the ability of PLA SOFs to coordinate their activities effectively with non-SOF forces, especially those of other services. Moreover, the authors raise doubts about SOF proficiency with the newer, more-advanced equipment required for the type of operations that would be conducted in a Taiwan invasion campaign.

In chapter 11, Thomas Shugart examines a vital but often neglected aspect of modern amphibious operations: mine warfare. Prior to the attempted invasion, the PLA likely would use its massive inventory of sea mines to blockade Taiwan, isolating it from international trade and the support of its allies and partners. The PLA is capable of deploying mines from submarines, aircraft, and surface ships, including craft operated by members of the maritime militia. Its offensive mining operations could extend to the Japanese islands, to instill caution in U.S. forces operating from bases there, and perhaps even to compel Japanese neutrality. During the cross-strait-assault phase of the campaign, the focus would shift, with the PLAN's mine-countermeasure (MCM) forces being tasked to clear the way for the invasion fleet. PLAN MCM forces will play a crucial role in a cross-strait invasion, but little is known about their true capabilities, except the recent procurement of new minesweeping vessels and mine-hunting robots.

Scenario Factors

In part 4, the volume focuses on specific factors vital to the success of an invasion. In chapter 12, John Culver looks at the potential conflict from Beijing's perspective, arguing that China would see the invasion as the last chapter in an "unfinished civil war." This has important implications for campaign

timelines and objectives. Culver reviews the PRC's "all of regime" approach to pursuing its territorial claims in the South China Sea, regarding it as a useful template for what it might do to pursue its preferred resolution of Taiwan's status. This includes using domestic law to legitimize its actions, placing law-enforcement forces out front and backing them up with preponderant military forces, using economic coercion to pressure other territorial claimants, shaping Chinese public opinion to support Beijing's actions, starting slowly and moving forward when no resistance is encountered, dividing and isolating opponents, and taking steps to create a "new normal." China's past, present, and future preparation of the battle space for eventual victory could span years, perhaps decades, as part of its long-term political strategy for "national unification."

In chapter 13, William Fox and Roderick Lee discuss the all-important topic of air and sea supremacy, which Chinese strategists recognize is a precondition for a successful island landing campaign. The PLA rarely shares its own assessments of its ability to meet these requirements, so Fox and Lee painstakingly inventory the shooters and sensors that would be available to Beijing in a near-term Taiwan conflict to gauge the Chinese military's likely confidence of its operational capabilities in zones extending to and beyond Taiwan (i.e., within the first island chain, within the second island chain, and beyond the second island chain). They conclude that the PLA likely has moderate confidence in its ability to seize and maintain control of the air in the context of a joint island landing campaign, but high confidence in its ability to achieve localized sea control for the invasion.

Chapter 14, written by Kevin McCauley, is the first of three chapters examining PLA logistics support for an invasion. In his comprehensive treatment of the topic, McCauley draws heavily from an authoritative PLA volume entitled *Operational Logistics Support* (作战后勤保障), produced by the All-Army Logistics Academic Research Center. He discusses the challenges and considerations associated with logistics command and control; transportation and delivery (air, sea, and ground); matériel and petroleum, oil, and lubricants supply; combat medical treatment; infrastructure support; and war reserves during different campaign phases. At the time the volume was published (2017), the authors cited weaknesses across the whole range of logistics functions, with particular emphasis on inadequate transportation capabilities and war reserves. McCauley concludes that at present the PLA remains logistically unprepared for a large-scale invasion of Taiwan.

Many analysts assume that the PLA would assault Taiwan over the beach, in a limited number of suitable locations along the coasts. However,

in chapter 15 Ian Easton argues that China's military instead could seek to leverage Taiwan's major ports to disembark the bulk of the invasion force. This could enable the PLA to avoid the potential bottlenecks and dangers of moving large numbers of troops and quantities of equipment over the beach. The PLA may favor operations to seize the ports from Taiwan defenders, by amphibious attack, sea-skimming raids, air assault, secondary assaults after a successful beach landing, or special-forces infiltration. With insights gleaned from PLA sources on port-landing operations, Easton assesses the suitability of specific Taiwanese ports in relation to PLA requirements.

As Lonnie Henley shows in chapter 6, the PLA intends to rely on commercial vessels to support logistics over the shore in a cross-strait invasion. In chapter 16, J. Michael Dahm examines recent training activities by the PLAN to develop the technologies and hone the skills needed to achieve seamless civil-military integration in a major landing operation. On the basis of his careful reconstruction of Eastern Transportation-Projection 2020A (summer 2020) and training and exercises conducted in 2021, Dahm argues that China's commercial fleet is currently unable to provide the logistics capabilities needed to support an amphibious landing operation on Taiwan effectively, despite clear signs of progress toward this goal.

Implications

The volume concludes with a discussion of implications for the U.S. military in part 5. In chapter 17, Sam Tangredi compares trends in PLA and U.S. Marine Corps amphibious-warfare doctrines. He observes that the two appear to be moving in opposite directions—in other words, "trading places." For example, prior to its 2017 reform, the PLANMC largely was focused on defense of PRC-occupied islands in the South China Sea. But with the Chinese navy's construction of big-deck amphibious assault ships, the PLANMC appears to have embraced an assault doctrine reminiscent of that of the U.S. Marine Corps prior to, during, and following World War II. For its part, largely in response to the China challenge in the western Pacific, the U.S. Marine Corps is developing a doctrine favoring defense of advanced bases, akin to coastal defense—a significant departure from its long-standing global-expeditionary-warfare mission.

In chapter 18, Michael McDevitt offers recommendations for how the U.S. Navy should respond if tasked by civilian leadership to help Taiwan frustrate a Chinese invasion attempt. McDevitt assumes that China will begin its campaign to subdue Taiwan with coercive measures, including imposing a maritime exclusion zone around the island. If that fails to compel

Taipei to meet Beijing's demands, China could conduct an air and missile bombardment of Taiwan to destroy its airpower and degrade its command-and-control and surveillance capabilities. It next might seize ROC islands near the mainland coast and in the South China Sea.

McDevitt highlights the importance of the U.S.-Japan alliance in the event of a Chinese attack on Taiwan; coordination between the two militaries would be vital. For example, McDevitt recommends that the two navies develop a space-management plan for their respective submarine forces in waters adjacent to Japan and Taiwan. Once fighting breaks out between China and the United States, the zone of conflict will shift to the Philippine Sea, where the PLA will seek to push U.S. forces as far east as possible. Space-based support likely will be degraded for both sides; to prevail, the U.S. Navy must be better than the PLA at operating in this "space-deprived" environment. To enable itself to halt the Taiwan invasion, the U.S. Navy should develop capabilities that can defeat the Chinese surveillance system, learn to operate without space-based support, field organic air-wing tanking so Navy fighters can conduct long-range sorties, and introduce long-range antiship and land-attack cruise missiles that can be launched by Navy aircraft.

In chapter 19, Andrew Erickson and Gabriel Collins consider Taiwan's options for better deterring and defeating a PRC invasion attempt. Vladimir V. Putin's invasion of Ukraine offers both a wake-up call regarding the risk of great-power irredentism and lessons in how the target of such aggression can defend itself best. With the PLA studying its Russian counterpart's experiences in Ukraine, Taiwan must learn and implement its own lessons to keep ahead of the mounting threat. Taiwan, with support from the United States, must make the island tougher to invade, even harder to subdue, and harder still to occupy and govern. It can do this by turning the antiaccess/area-denial (A2/AD) issue on its head and presenting PLA forces with multiple, numerous, hard-to-counter defenses that specifically target key Chinese military weaknesses. Erickson and Collins accordingly outline seven concrete areas for immediate, concerted investment: (1) air defense, (2) sea-denial fires, (3) shore-denial fires, (4) mine warfare, (5) information warfare (including jammers and decoys), (6) civil defense, and (7) the resilience of critical infrastructure.

Overall Findings

The contributors' findings, distilled here, will shock even optimists with how little margin is left in this perilous situation, yet hearten even the most

hardened pessimists with reasons to believe that deterring an invasion of Taiwan is still completely feasible. The deep historical background and rich, realistic details offer as gripping a reading as may be found in serious scholarship. Accompanying the hard-hitting text are numerous supporting graphics and data tables, as well as an appendix laying out the PLA's amphibious order of battle of major amphibious ships and landing craft, with detailed ship silhouettes and specifications.

Among this book's key findings is that Beijing keeps strengthening its relevant capabilities, particularly missiles—an area in which it long has lacked the geographic and policy constraints that Washington faces and in which it already boasts, in some respects, world-leading capabilities. The PLA is developing both the sensors and shooters (surface-to-air missiles, advanced fighter aircraft, etc.) needed to vie for air and sea superiority over the Taiwan Strait. With probably the world's most potent at-scale mine-delivery capability, China's capabilities appear to exceed those of the United States, Japan, and Taiwan by far. China also has invested heavily in MCM capabilities, and the PLA is developing technical solutions (e.g., unmanned and logistics systems) to support a potential invasion force.

Yet China also retains many weaknesses. Despite sweeping reforms, PLA jointness—essential to success in a Taiwan invasion—suffers persistent limitations, including apparent lack of joint training among special-operations communities. Most forces within the PLA lack any actual combat experience that could prepare them for what would be a tough fight to take Taiwan. Despite dramatic expansion since 2017, the PLANMC does not seem to be optimizing itself for a traditional amphibious landing against Taiwan; instead, the PLAGF retains the lead amphibious invasion role, but it still faces hurdles in its own training and readiness. Notwithstanding significant effort to bolster logistic-support capabilities, the postreform PLA remains incapable of effectively sustaining invasion forces. PLA helicopter forces suffer enduring limitations, particularly in overall readiness, and in operational capacity under combat conditions, including air-ground integration. Add to this the magnitude of the operation that China would face, on the scale of Operation Overlord, and success is anything but assured. A major saving grace for Taiwan is that its natural geographic defenses (e.g., the strait itself, weather, tides, currents, mudflats, coastal terrain) offer formidable protection and a firm foundation for fortification. It is unsurprising that numerous PLA writings describe amphibious warfare as one of the most complex and difficult forms of military operations.[2]

Our contributors reach major areas of consensus. Lacking in major modern-era successes of its own (beyond its seizure of Hainan and

Yijiangshan Islands, etc.), the PLA has studied carefully foreign experiences with amphibious operations and has incorporated relevant lessons. A cross-strait invasion remains tremendously difficult and risky for the PLA, despite a growing military imbalance across the strait. The PLA clearly has attempted to emulate and incorporate major "gold standards" of U.S. doctrine, terminology, and forces. The PLA is attempting to boost the realism of its amphibious training and exercises and recognizes sea and air control as prerequisites for a successful invasion. The PLAN is building large amphibious vessels, but these appear to be designed to support overseas operations, not a cross-strait invasion per se. The PLAN has not yet built the large numbers of LSTs and LSMs that would support a conventional invasion of Taiwan; indeed, its inventory of those single-mission vessels arguably is smaller than it was a decade ago. The PLA currently lacks the required amphibious lift, logistics, and matériel for a robust cross-strait invasion. Thus, a major invasion today would require heavy reliance on civilian assets; China is pursuing comprehensive capabilities through incorporation of all possible forces, including a major emphasis on maritime militias and civilian logistics. Accordingly, the PRC is unlikely to achieve a major element of surprise.

In keeping with CMSI's scholarly standards, our contributors debate key points, including the following: Might the PLA preemptively threaten strikes against—or seizure of—offshore islands (Kinmen, Matsu, Pratas, Penghu Islands) as a means of coercion short of attempting to invade Taiwan's main island? How effective might the PLAAF Airborne Corps be in supporting the campaign, and how well will it integrate operations with other arms and services? To what extent would the PRC have to exploit a limited number of predictable landing points on Taiwan's main island, where Taiwan could prepare to conduct a defense prior to conflict? Does the PLA seek to prioritize large-scale beach landings or seizure of Taiwanese ports to facilitate invasion? Citing PLA textbooks, Easton argues that major ports are the key priority. Several other authors contend strongly that the PLA likely will be unable to conduct a large-scale cross-strait invasion successfully until it masters what the U.S. military terms "joint logistics over the shore." And perhaps most significantly at this time: Could Beijing use civilian assets effectively to support a cross-strait invasion? Most contributors conclude that current abilities are inadequate, but Henley argues strongly that maritime militia forces might operate mobilized civilian shipping as a "just good enough" logistical backbone.

Our book leaves readers, from U.S. and allied decision makers to members of the naval-interest community, with several significant takeaways. Overall, the PLA has achieved tremendous progress in developing many

of the capabilities needed for a cross-strait invasion—the threat posed to Taiwan is grave. Nevertheless, the inherent challenges and risks remain sufficiently high for Xi and the CCP that Taipei, Washington, and Tokyo can continue to deter—or, in a worst case, frustrate—an invasion. Even if sea and air control over Taiwan and the strait no longer is guaranteed, credible capability to achieve sea and air denial can be good enough to prevail against the PLA. Key PRC sensors are far less numerous than key PRC shooters, and hence a better single-point-failure target for limited U.S. and allied fires. Taiwan must redouble its efforts to build A2/AD "porcupine" capabilities grounded in its natural defenses. U.S. planners must consider the possibility of the PRC improvising in just-good-enough-for-long-enough fashion to attempt to pursue basic political objectives, particularly if events or trend lines "force" Xi's hand. Preparing to address this ultimate possibility has become a pressing mission for the Taiwan and U.S. militaries. All make it essential to read the ensuing chapters without delay.

Notes

1. Andrew S. Erickson, comp., "Testimony by Admiral Philip S. Davidson, USN, Commander U.S. Indo-Pacific Command: 'U.S. Indo-Pacific Command Posture,'" *China Analysis from Original Sources,* 14 March 2021, www.andrewerickson.com/2021/03/testimony-by-admiral-philip-s-davidson-usn-commander-u-s-indo-pacific-command-u-s-indo-pacific-command-posture/; "Advance Policy Questions for Admiral John C. Aquilino, USN, Nominee for Commander, U.S. Indo-Pacific Command," www.armed-services.senate.gov/imo/media/doc/Aquilino_APQs_03-23-21.pdf; Hearing on the Nomination of Admiral John C. Aquilino, USN for the Reappointment to the Grade of Admiral and to Be Commander, U.S. Indo-Pacific Command," *United States Senate Committee on Armed Services,* 23 March 2021, video, 2:44:32, www.armed-services.senate.gov/hearings/21-03-23-nomination_aquilino.
2. 肖天亮 [Xiao Tianliang], ed., 战略学 [*Science of Military Strategy*] (Beijing: National Defense Univ. Press, 2020), p. 364; 王果 [Wang Guo] and 王翔 [Wang Xiang], 登陆作战到底难在何处 ["What Makes Landing Operations So Difficult"], 人民海军 [*People's Navy*], 29 December 2020, p. 4.

PART I

Doctrinal Foundations of Chinese Amphibious Warfare

Grant F. Rhode

1. Shi Lang's Amphibious Conquest of Taiwan in 1683

Over three centuries ago, Qing admiral Shi Lang successfully conquered Taiwan, dismantled Ming rule, and brought the island into the Qing empire under mainland governance. What can today's strategists learn from Shi Lang's amphibious conquest of Taiwan in 1683, and how does it relate to current concerns about China's increasingly assertive posture toward Taiwan as an autonomous polity? In the twenty-first century, Taiwan is faced with the possibility of an amphibious invasion by forces of the Chinese government in Beijing. Taiwan faced that same possibility during the seventeenth century, when the naval forces of the Qing dynasty commanded by Admiral Shi spent two decades attempting to defeat residual forces on Taiwan loyal to the deposed Ming dynasty under the leadership of powerful members of the Zheng clan. Shi Lang finally defeated the Ming naval forces led by the Zhengs in 1683, eradicated the Ming government on Taiwan, and oversaw the incorporation of Taiwan into the Qing state.[1]

The parallels between the seventeenth and the twenty-first centuries are striking. Both periods involve civil war, as well as struggle with foreign powers external to China. This chapter examines the similarities and differences between these two situations three centuries apart, especially with regard to amphibious operations, changing power dynamics, problems of leadership, and possible alliances in the struggle for Taiwan.

Shi Lang in Brief

Shi Lang was born into a prominent Fujian family a quarter of a century after the Imjin War (1592–98). He studied military strategy as a youth and became a senior captain in the fleet of the Zheng clan, which was affiliated with the Ming and commanded by Koxinga (Zheng Chenggong).[2] Following the Qing capture of Beijing in 1644, Koxinga fought against the Qing south of the Yangzi River. Known as a competent naval commander, Shi Lang gave Koxinga advice regarding the defense of Xiamen on the southeast coast of China facing the Strait of Taiwan. Koxinga ignored the advice and was defeated there. Having a haughty temper and known to be both blunt and rude, Shi snubbed Koxinga for not taking his advice. Koxinga imprisoned Shi Lang, but he escaped and defected to the Qing in 1651, bringing along with him deep knowledge of the Zheng forces' plans and organization. Koxinga responded by killing Shi's father, brother, and son.

The feud between Shi Lang and Koxinga played out over the next four decades, during which Koxinga initially was successful in establishing a Ming successor state on Taiwan. This Ming rebel state was extinguished finally by Shi Lang with his invasion of Taiwan in 1683. As an adviser to the great Qing emperor Kangxi, Shi was successful in lobbying to have Taiwan made a prefecture of the Qing province of Fujian in 1684, despite fierce opposition at court. He became governor of Fujian Province, but his ambition to revive the great Zheng trading operation as his own private business domain ultimately failed.

Shi Lang died in 1696, leaving a legacy that continues to be reinterpreted. Over the centuries, Chinese literature at different times and locations has emphasized the various and sometimes opposing views regarding Shi's naval competency, his unification of Taiwan with the mainland, and his traitorous act of defection. During the first years of this century, a "Shi Lang fever" gripped the historical discourse in China, including in 2006 public presentation of a thirty-seven-episode China Central Television drama on Shi Lang that took three years to produce.[3] The rumored naming of the first Chinese aircraft carrier as *Shi Lang* as it was being prepared to join the People's Liberation Army Navy (PLAN) fit well within the context of "Shi Lang fever" and its focus on Shi's unification of Taiwan with the mainland.[4]

Chinese Ming-Qing Civil War and European Arrivals in East Asia

During the early seventeenth century, turmoil and dynastic change engulfed China. After three centuries of flowering under the Ming dynasty emperors from the Zhu family, northern Jurchen tribes, later called Manchu,

increasingly pressured Beijing. As the Ming dynasty's power collapsed, the Manchu occupied Beijing in 1644 and established the Qing dynasty. The seventeenth Ming emperor, Chongzhen, committed suicide in a park lying just outside Beijing's Forbidden City. Ming partisans retreated to Nanjing in southern China to consolidate their resistance. Although the Manchu occupied Nanjing in 1645, just a year after their occupation of Beijing, Ming partisans continued to hold out farther south. In 1662, the Manchu killed the last Ming claimant to the throne.

It took twenty-two more years, until 1684, for the last portion of Ming-controlled territory, Taiwan, to be incorporated into the Qing state. Support for the Ming emperors in exile hinged on the powerful Zheng clan on the Fujian coast. Although many members of the clan were involved from the 1620s to the 1680s, the primary military support for the Ming emperors came from Koxinga. During the late 1650s, Koxinga led two major offensives against the Qing in Nanjing, which failed. These expeditions were followed by Koxinga's attack on the Dutch in Taiwan in the early 1660s, which succeeded in driving the Dutch off the island; the military victory surprised Europeans at the time. The Dutch retreated from Taiwan to their base in Batavia (modern-day Jakarta) on Java, in the East Indies. However, after ruling on Taiwan for two decades, the last Zheng family Ming loyalists were defeated in a naval battle at the Penghu Islands in the Taiwan Strait in 1683. Following this defeat, the last holdout Ming loyalists on Taiwan were subjugated to Qing rule. It was a defector from the Zheng family navy, Shi Lang, who ultimately succeeded in defeating the Zheng navy at Penghu.

During these seventeenth-century decades of convulsive civil war within China, Europeans arriving in East Asia struggled among themselves to gain and control access to the commercial possibilities in the East Indies, on the China coast, and in Japan. They established key trading ports in the China seas. The chief Portuguese stronghold was Macao, while the Dutch operated from Batavia and the Spanish from Manila.

Profits in the spice trade ran as high as 400 percent. During the 1590s, Dutch merchants sent exploratory expeditions to the East Indies—notably, to Banten, the pepper port of west Java, and to the Moluccas, the source of pepper, thereby cutting out the Javanese middlemen. The English threatened Dutch competitors by establishing the English East India Company in 1600. Not to be outdone, Dutch merchants of the republic founded the Vereenigde Oostindische Compagnie in 1602. English speakers referred to it as the VOC or Dutch East India Company to distinguish it from the English East India Company (EIC).[5]

The VOC issued shares of stock to the general public, making it the forerunner of the modern multinational corporation and the world's first

publicly traded company. The VOC promoted Dutch interests outside Europe, and in addition to having the power to trade, it possessed quasi-governmental powers to negotiate treaties, maintain armies and forts, wage war, imprison and execute convicts, establish colonies, and issue coins. The VOC established trading posts at Banten in 1603 and at Ambon in 1610 before setting up an adequate permanent trading center in 1619 in what had been known as Jayakarta, renamed Batavia when it came under Dutch control that year.

From their Batavia base, the Dutch worked to build their Asian empire. During the 1620s, through clearing that they conducted for plantation development, the Dutch decimated the indigenous population of the Banda Islands. Unable to force the Portuguese out of Macao in an attack in 1622, the VOC nevertheless followed the Portuguese string-of-pearls strategy by establishing a trading center on the Penghu Islands in 1622, before the Chinese forced them to move to Taiwan in 1624. From this mid–China coast location, from which they had access to Chinese silk and porcelain, the Dutch moved north to force the Portuguese out of Nagasaki, establishing in 1641 the only Japanese-sanctioned European trading post in the country, on the artificial island of Dejima in Nagasaki Bay.[6] The Dutch also replaced the Portuguese in Malacca on the Malay Peninsula in 1641. Thus, by the 1640s the Dutch had replaced the Portuguese as the predominant trading entity in the China seas. The Spanish contested Dutch control of Taiwan by establishing the forts of San Salvador at Jilong (Keelung) in 1626 and San Domingo at Danshui (Tamshui) in 1628, thereby challenging the establishment of the Dutch forts at Zeelandia and Provintia in 1624. However, the Dutch forced the Spanish to abandon Taiwan by 1642.[7] Elsewhere, the Portuguese presence in East Asia was reduced to Macao and the Spanish to Manila. By the middle and latter half of the seventeenth century, the Dutch clearly dominated East and Southeast Asia in terms of European influence. By the late 1660s, the VOC was the richest private company in the West, with deep pockets that during the 1680s nearly bankrupted England's EIC via the two companies' head-to-head Asian competition.

However, the Dutch loss of Zeelandia during the Sino-Dutch war of 1661–62 marked the beginning of the demise of the lucrative Dutch China trade, especially in silk. Although the VOC was flush with other successes at the time, the Sino-Dutch war of the early 1660s foreshadowed the company's eighteenth-century decline, ultimately resulting in its dissolution in 1799.

The Zheng Clan and Koxinga

The powerful Zheng clan of the Fujian coast ran a successful maritime trading empire between Java and Japan. Zheng Zhilong and his son Zheng Chenggong (Koxinga) were the heads of the Zheng clan from the 1620s until 1662.

Despite the general decline in power of the Ming dynasty in the early seventeenth century, southeastern China had developed successful maritime-oriented commercial capabilities. The wealthiest of the Fujian merchants, Zheng Zhilong, had a trading fleet based in Fujian Province that consisted of hundreds of trading junks that plied the China seas from Batavia to Nagasaki. Recent scholarship has shown that the revenues of the Zheng clan were considerably more than those of the Dutch VOC, which at the time dwarfed those of the English EIC.[8] On a trip to Japan, Zheng Zhilong took a Japanese wife near Hirado in Kyushu, where the couple had a son, who later became known as Koxinga.

The apocryphal story of Koxinga's birth is that his mother, Tagawa Matsu, the daughter of a samurai, was collecting oysters on a Kyushu beach and, while resting by leaning against a rock, gave birth to Koxinga. This was in 1624, the year in which his father, who formerly had served as a translator for the Dutch, helped drive the Dutch from the Penghu Islands to Taiwan. Zheng Zhilong introduced his son—first trained in samurai arts as a youngster, and then trained in the Chinese classics—to Longwu, the Ming emperor in exile. The emperor bestowed on the boy the name Guoxingye, "he of the royal surname," romanized as Koxinga. However, the Zhengs, father and son, became estranged and never reconciled after Zheng Zhilong defected to the Qing in 1646, two years after they had defeated the Ming in north China. Koxinga, the son, held out to fight for the Ming until his death in 1662. Before he died, he suffered a great maritime loss to the Qing in 1659 and achieved a great maritime victory against the Dutch in 1662.

Koxinga's Naval Expeditions against the Qing and the Dutch

Although he successfully had resisted Qing forces in southern Fujian during the early and mid-1650s, Ming loyalist Koxinga determined that he would challenge the Qing by engaging in a northward expedition to push them out of south China. Beginning in 1655, he conducted a series of halting yet successful campaigns to control the coast in northern Fujian and Zhejiang Provinces. As part of his fighting forces, he created units of "Iron Men," who could fight in iron-plated tunics. In 1658 and 1659, Koxinga led

successive massive but ultimately unsuccessful expeditions to retake Nanjing from the Qing. The first expedition, of one hundred thousand soldiers and one thousand ships, failed owing to storms. The second seems to have failed because Koxinga delayed in pressing his advantage, which allowed Qing reinforcement troops to expel Koxinga's forces from their camp at the base of the walls of Nanjing. As Qing forces chased Koxinga's Ming forces south, Koxinga decided to relocate his headquarters from Jinmen and Xiamen (also known as Quemoy and Amoy) on the Fujian coast to the island of Taiwan.[9]

Koxinga's commanders objected that Taiwan was too wild and disease ridden, but Koxinga overruled them and moved his base of operations there for multiple interrelated reasons. Fujian remained constrained by the coastal prohibitions instituted by the Qing, and it was lacking in space and security. Koxinga believed that all these problems could be solved by moving to the larger, more-defensible territory on Taiwan. Given his seafaring prowess, Koxinga favored the position because it was accessible only by sea.

From 1661 to 1662, Koxinga successfully drove the Dutch from Taiwan back to Batavia, using a fleet of three hundred junks and thirty thousand men. His fleet left from Jinmen, and for a week it used the Penghu Islands as a staging ground. His forces overcame the Dutch forts of Provintia and Zeelandia during an eight-month siege.[10] Koxinga established a new Ming vassal state on Taiwan in early 1662.

However, Koxinga died suddenly less than five months after the Dutch surrender in what appears to have been a state of abrupt, violent dementia caused by both physical and psychological illness. His son, Zheng Jing, held off repeated attempts to reclaim Taiwan by the Dutch and by the Qing, led by Adm. Shi Lang. After Zheng Jing died in 1681, the young heir, Zheng Keshuang, was unable to withstand Shi's final attack on Taiwan in 1683.

Shi Lang's Amphibious Operations against the Ming on Taiwan

After Koxinga captured Taiwan from the Dutch in 1662, the Dutch, in an ultimately unsuccessful alliance attempt with the Qing, engaged Shi Lang to take back the island from Zheng Jing, Koxinga's son, in 1663. Shi scheduled two invasion dates, but the threat of typhoons curtailed the operations. The following year, the Qing appointed Shi Lang chief of the Fujian navy and commanded him to capture Taiwan. However, this mission too was impeded when a typhoon destroyed his fleet.

In 1667, Zheng Jing requested that the Qing recognize his Taiwan regime as an equal and separate state. He also sought an alliance, to include

military assistance, from the Japanese, who were sympathetic to the Ming cause, especially because Koxinga had been half-Japanese. However, the Japanese declined because they had entered their long period of *sakoku* (isolation).

Countering the entreaty from Zheng Jing to the Qing, Shi Lang lobbied to attack Taiwan, but the suspicious Qing treated him like other defectors, such as Koxinga's father, Zheng Zhilong, and placed Shi under house arrest, moving him to Beijing in 1668. At the time of the succession transition following Zheng Jing's death in 1681, Shi Lang was released from house arrest and reinstated to his post as chief of the Fujian navy. After Shi disagreed with the governor of Fujian Province over how to attack the Zhengs on Taiwan, the Qing emperor Kangxi granted Shi Lang total control over military decisions. In spite of opposition from within the Beijing court, which argued that Taiwan was too remote, too unproductive, and too expensive to maintain, the emperor eventually authorized Shi Lang to conquer Taiwan for the Qing.

On 7 July 1683, Shi Lang sailed from Fujian to the Penghu Islands, seventy miles from the Fujian coast, to attack the Zheng navy stationed there.[11] His fleet included three hundred junks and 21,000 men—a force two-thirds the number that Koxinga had brought to Taiwan to evict the Dutch twenty-two years earlier. Initially Shi Lang's fleet was deflected south by a storm; however, the Zheng navy, under the command of Liu Guoxuan, remained unprepared because it believed that an attack during typhoon season was unlikely. After the delay caused by hurricane-force winds, the Qing forces made a devastating naval attack on the Ming naval forces in the Penghu Islands. Bolstered by superior guns the Dutch had provided, the Qing navy sank 169 Zheng junks with a loss of twelve thousand Ming naval men, thereby shattering the Zheng clan's naval superiority, while Shi Lang's forces suffered little harm. A Qing landing cohort completed the takeover of the islands. Shi treated captives with leniency and fed them well, in contrast with the famine that Zheng defenders faced on Taiwan.

From the Penghu Islands, Shi Lang's navy sailed almost unopposed into Tai Bay. He took control of Taiwan against only sporadic opposition; Zheng morale crumbled amid divided military leadership, half of which wanted to move the Ming resistance to Manila. At the proclamation of surrender on 26 August 1683, thirteen-year-old Zheng Keshuang handed over the Ming emperor Yongli's seals that were in his family's possession and subsequently shaved his head Manchu-style as a sign of submission. In October, Shi Lang proclaimed a general amnesty for all who recognized Qing rule. When Shi visited Koxinga's shrine a few months later, a few Zheng sympathizers

committed suicide, but most agreed to the generous terms that Shi Lang offered.

Meanwhile, debate in Beijing raged about whether to incorporate Taiwan into the state. Many advocated abandoning the island and moving its population to the mainland. Desiring to replace the Zheng commercial enterprise on Taiwan with his own monopoly, Shi Lang counseled Emperor Kangxi to incorporate Taiwan into China to prevent any further possibility of its use as a base for any ongoing Ming insurgency. In February 1684, Shi petitioned the throne to annex Taiwan. In March 1684, Emperor Kangxi decided to incorporate Taiwan as a prefecture of Fujian Province. The new Taiwan Prefecture consisted of three counties, with a total garrison of eleven thousand men.[12] As pleased as Shi Lang must have been by the incorporation of Taiwan into the Qing state, he was frustrated when Kangxi lifted the maritime trading ban on the coast in November 1684, thereby opening it to competition and ending Shi's dream of a trade monopoly. Subsequently, Shi's influence declined until his death in 1696.

The geographical facts surrounding the Penghu Islands, Jinmen, and Xiamen have implicated these islands in larger geopolitical struggles over Taiwan historically and to the present day. All three invasions of Taiwan during the seventeenth century used the Penghu Islands as a staging ground for amphibious operations. The Dutch had established a fort in the Penghus in 1622 before being forced to Taiwan by the Chinese in 1624. Koxinga, representing the Ming, came through the Penghus in 1662 to defeat the Dutch on Taiwan. Shi Lang, representing the Qing, came through the Penghus in 1683 to defeat the Ming-loyalist Zheng clan on Taiwan. In the 1880s, the French navy attacked Taiwan by way of the Penghus. In March 1895, the Japanese took the Penghus in the last battle of the Sino-Japanese War, paving the way for Taiwan to become a Japanese colony pursuant to the Treaty of Shimonoseki, a situation that lasted for the next fifty years. With a large, deep, natural harbor thirty miles from Taiwan and a position seventy miles from the coast of China, the islands have provided a significant logistical shortening of the final attack distance to Taiwan.

The importance of the twin islands of Xiamen and Jinmen just off the coast of Fujian to control of both the southeast Fujian coast of China and the Taiwan Strait was demonstrated clearly by the struggle between the Ming and the Qing to control these islands. Although close together near the coast, Xiamen is currently a Chinese island, while Jinmen belongs to Taiwan.[13] In the October 1949 battle of Guningtou on the northern beaches of Jinmen five miles from the Chinese mainland, the Nationalist army decisively defeated the Communist attempt to drive the Nationalists from Jinmen.[14] The role that Jinmen played during the Taiwan Strait crisis of 1958

brought China and the United States to the brink of nuclear war.[15] Thus, the struggles of the nineteenth and twentieth centuries mirror those of the seventeenth century, pointing to the continuing importance of these islands in the twenty-first century.

Parallels between Seventeenth-Century and Twenty-First-Century Taiwan

There is a remarkable historical parallel between the Ming-Qing and the Nationalist-Communist civil wars and transitions of power. Both conflicts moved from north to south within China, and in each struggle Taiwan became the geographic refuge of last resort for the defeated party.

On the mainland, Koxinga is remembered best today as the hero liberator of Taiwan from the Dutch; however, on Taiwan he is considered the heroic civil war Ming holdout on Taiwan opposing the mainland Qing. Although Koxinga was loyal to the Ming, he ultimately failed to reinstitute the Ming dynasty on the mainland. Nevertheless, he successfully added Taiwan to the realm of Chinese geography—an important point in the development of Chinese historical narratives. Without Koxinga's program to drive out the Dutch, the chances are good that Taiwan never would have become a part of the territory of the Chinese empire.[16] As a result of Koxinga's efforts, Taiwan did not become a European-ruled island similar to the Philippines, which was ruled by the Spanish. Thus, the results of Koxinga's Sino-Dutch war substantially changed the path of East Asian politics.

Whereas Koxinga opposed the Dutch as a foreign power in the seventeenth century, Chiang Kai-shek opposed the Japanese as a foreign power in the twentieth century. To the extent that Chiang assisted in the defeat of Japan, he increasingly is being given credit in both Western and Chinese scholarship. Then Taiwan became the refuge of last resort for Chiang Kai-shek, as it had for Koxinga. Parallels between Koxinga and Chiang Kai-shek have been drawn in both Chinese and Western scholarship, and the two figures are linked inextricably in popular memory in Taiwan.[17] Parallels between Taiwan's seventeenth-century liberation by Shi Lang and its situation today likewise remain embedded in Chinese historical imagination.

This chapter has examined changing power dynamics, problems of leadership, and failed attempts at alliances in the struggle for Taiwan during the seventeenth century.

Regarding changing power dynamics, rising Qing power eclipsed declining Ming power in land-based operations, allowing the Qing to consolidate China north of the Yangzi River within a year of their occupation

of Beijing in 1644. Through the Zheng clan, the Ming retained power at sea from their Fujian coastal base on Xiamen and Jinmen, which enabled Koxinga's Ming navy to attack Nanjing in 1659 and to defeat the Dutch on Taiwan in 1661. Following Koxinga's death in 1662, the relative power of the Ming Zheng clan's navy gradually declined in relation to that of the Qing. Today, China's military power, especially at sea and in the air, is expanding rapidly in relation to that of Taiwan, a capable but much smaller polity.

Regarding problems of leadership, the capability of seventeenth-century Qing leadership had a significant impact on Taiwan at both the national and operational levels. Taiwan's independent Ming governance survived separately from the mainland from 1662 until 1683—in all, twenty-one years. Qing emperor Kangxi's reign from 1661 until 1722 became increasingly powerful over time and was the longest in Chinese history, at sixty-one years. He took the throne at age seven, with regents and the empress wielding power for seven years. His de facto power was in place by the end of the 1660s, putting him in position to command more authoritatively and to direct Shi Lang's naval attacks on Taiwan. Today, Taiwan has survived separately from the mainland for over seventy years, from 1949 until today. Chinese president Xi Jinping has emerged as an increasingly powerful leader in China, with a mission to incorporate Taiwan into the mainland People's Republic of China polity. Strong leadership at the top matters, and it will impact future developments.

Operational leadership in the field also matters. Koxinga's maritime knowledge and skills, a product of his Zheng family legacy, contributed to his strong personal leadership in wresting Taiwan from the Dutch. He appears to have been chastened by his earlier failure to strike decisively against the Qing in Nanjing, and he subsequently maintained a sustained aggressive action against the Dutch on Taiwan. Later, Shi Lang used his detailed knowledge of Zheng naval practices—he had served as a Zheng commander—to defeat the Zheng navy in the Penghu Islands.[18] In China today, the question remains whether there will be a latter-day commander similar to Shi Lang who will succeed in attaching Taiwan to the mainland as Shi did in 1683, albeit after several earlier failed attempts and during a moment of weak leadership on Taiwan.[19]

Regarding alliances, although the Zheng clan pleaded with the sympathetic Japanese to assist the Zhengs in their struggle against the Qing, the Japanese had committed themselves to *sakoku,* the "closed country" isolationist policy.[20] While the Ming sought but failed to obtain a Japanese alliance to help defend themselves, on the other side the Qing flirted with a Dutch alliance, especially in the aborted Shi Lang–led Dutch/Qing invasion

attempt of 1663. Differences of opinion about the impact of bad weather led to a breakdown such that the potential alliance never was finalized. Taiwan has been described as a latter-day Melos, which during the Peloponnesian War of the fifth century BC tragically relied on an unresponsive ally, Sparta.[21] As a result, powerful Athens did what it could, violently subjugating Melos and inflicting great suffering on the people of that island. Today, the United States is more committed to Taiwan than Sparta was to Melos. Although this may provide hope to Taiwan, the questions remain whether the United States will stay involved, and, if it does, whether an entangling alliance will be the proximate cause of a great-power "Thucydides's Trap" war between China and the United States today, as proximate causes Corinth and Megara were for Athens and Sparta.[22]

This review of the case of Shi Lang, with its many strong parallels to the context of Taiwan today, suggests that relative military power matters, leadership matters, and alliances—existing or not—matter. History also matters, as a way to understand these dynamics and the way that the rhymes of history can play out. Parallels between the seventeenth-century liberation of Taiwan by Shi Lang and the place of Taiwan today are embedded in Chinese historical imagination.

Notes

1. Key studies focused on late Ming–early Qing maritime history, with detailed accounts of Koxinga, Shi Lang, and Taiwan, include Tonio Andrade, *Lost Colony: The Untold Story of China's First Great Victory over the West* (Princeton, NJ: Princeton Univ. Press, 2011); Xing Hang, *Conflict and Commerce in Maritime East Asia: The Zheng Family and the Shaping of the Modern World, c. 1620–1720* (Cambridge, U.K.: Cambridge Univ. Press, 2016); and Ronald C. Po, *The Blue Frontier: Maritime Vision and Power in the Qing Empire* (Cambridge, U.K.: Cambridge Univ. Press, 2018).
2. Ralph C. Croizier, *Koxinga and Chinese Nationalism: History, Myth, and the Hero* (Cambridge, MA: East Asian Research Center, Harvard Univ., 1977); Jonathan Clements, *Coxinga and the Fall of the Ming Dynasty* (Stroud, U.K.: Sutton, 2004).
3. Ronald C. Po, "Hero or Villain? The Evolving Legacy of Shi Lang in China and Taiwan," *Modern Asian Studies* 53, no. 5 (September 2019), p. 1505.
4. Prior to its commissioning into the PLAN, China's first aircraft carrier was called *Shi Lang* in some unofficial press reports. See, for instance, Peter W. Singer, "Who's Afraid of the Big, Bad Chinese Aircraft Carrier?," *Brookings,* 28 July 2009, www.brookings.edu/, and Wang Jyh-perng, "Is There Significance in a Name?," *Taipei Times,* 13 June 2011. The story that China's first aircraft carrier would be named *Shi Lang* was called a groundless rumor by Yang Yi, director of China's Taiwan Affairs Office of the State Council. Although *Shi Lang* was the most discussed name

before the ship was commissioned formally in September 2012, other names were the subject of public speculation, including *Mazu,* for the Chinese goddess of the sea. Koxinga credited Mazu for his success in his amphibious capture of Taiwan from the Dutch. The figure of Mazu that he hand carried from Fujian to Taiwan still is worshipped in a Mazu temple in Luermen, Tainan. The ship was formally named *Liaoning* when it was commissioned on 25 September 2012.

5. François Gipouloux, *The Asian Mediterranean: Port Cities and Trading Networks in China, Japan and Southeast Asia, 13th–21st Century,* trans. Jonathan Hall and Dianna Martin (Cheltenham, U.K.: Edward Elgar, 2011), pp. 126–37.
6. Warren I. Cohen, *East Asia at the Center: Four Thousand Years of Engagement with the World* (New York: Columbia Univ. Press, 2000), pp. 194–200.
7. Substantial remains of Forts Zeelandia and Provintia are in Tainan. For those interested in the European-Ming saga, they are worth visiting, as are the fort in Danshui and the fort remains in Jilong.
8. Hang, *Conflict and Commerce in Maritime East Asia*. The appendices are valuable for their comparison of the revenues of the Zheng regime on Taiwan with those of the VOC. See the analysis of Zheng market share, pp. 263–94.
9. Kinmen is the adapted Wade-Giles romanization used on Taiwan for Jinmen. Herbert Allen Giles, after whom the Wade-Giles romanization is partly named, served as British consul in Tamsui in the 1880s.
10. The history is told admirably in Andrade, *Lost Colony.*
11. More details of the 1683 battle of Penghu are in Hang, *Conflict and Commerce in Maritime East Asia,* pp. 230–34.
12. In reality, Qing administration covered only the western plains of Taiwan, where most of the Chinese settlers lived. The mountainous central and eastern sections of the island remained underadministered, such that indigenous people continued to control much of these areas. The Qing did not deem Taiwan worthy of being designated a province with its own governor until 1885, when fears of Japanese invasion of the island took hold in Beijing. Indeed, the Japanese took control of Taiwan in 1895 in accordance with the terms of the Treaty of Shimonoseki.
13. The mid-twentieth-century struggle for Jinmen is documented in Michael Szonyi, *Cold War Island: Quemoy on the Front Line* (Cambridge, U.K.: Cambridge Univ. Press, 2008).
14. Still-existing defensive fortifications on the beach are reminders of this successful defense against amphibious invasion, now well documented in the Guningtou Battle Museum adjacent to the beaches.
15. Szonyi, *Cold War Island,* pp. 64–78
16. Croizier, *Koxinga and Chinese Nationalism,* p. 19. Croizier points out that it is an irony of history that Koxinga's last campaign was forced on him by his failure to oust the Ming from Nanjing, yet this campaign became "his only lasting historical achievement."
17. Grant F. Rhode, "Tasting Gall: Chiang Kai-shek and China's War with Japan," in *The Road to Pearl Harbor: Great Power War in Asia and the Pacific,* ed. John H. Maurer and Erik Goldstein (Annapolis, MD: Naval Institute Press, 2022), pp. 63–92. Paul Cohen has illuminated the popular uses of Chinese history in his *History and*

Popular Memory: The Power of Story in Moments of Crisis (New York: Columbia Univ. Press, 2014).

18. A leadership what-if question is: What might have happened if Koxinga, three years younger than Shi Lang, had lived as long as Shi Lang? It is likely that Koxinga would have been a wilier and better-prepared commander in 1683 than the youngster Zheng Keshuang.
19. Bad blood remains between the Zhengs and the Shis owing to the 1651 defection of Shi Lang from the Ming to the Qing. At the present time, a Zheng will not marry a Shi and vice versa. In another family development, descendants of Koxinga's half brother Shichizeamon changed their name from Tagawa to Zheng and served as Meiji diplomats who oversaw Japanese control of China. See Po, "Hero or Villain?," p. 1508.
20. Donald Keene, *The Battles of Coxinga: Chikamatsu's Puppet Play, Its Background and Importance* (London: Taylor's Foreign Press, 1951) provides careful scholarship about an early eighteenth-century Japanese play telling the story of Koxinga's expedition to attack Nanjing. Keene subtly examines the complex interplay of Japanese and Chinese influences on Koxinga, indicating the special relationship that Koxinga had with Japan.
21. James R. Holmes and Toshi Yoshihara, "Taiwan: Melos or Pylos?," *Naval War College Review* 58, no. 3 (Summer 2005), pp. 43–61.
22. Graham Allison, *Destined for War: Can America and China Escape Thucydides's Trap?* (Boston: Houghton Mifflin Harcourt, 2017), pp. 34–39.

Xiaobing Li

2. What Did the PLA Learn from Its Jinmen, Hainan, and Yijiangshan Landing Campaigns?

Since the Chinese Civil War (1945–1949) was primarily a contest for control of the Chinese mainland, the People's Liberation Army did not gain extensive experience in amphibious operations. In the period after the founding of the People's Republic of China (PRC), the PLA did conduct several landing operations intended to assert control over offshore islands. These operations, both successes and failures, informed the early development of PLA amphibious doctrine.

This chapter chronicles the PLA's early amphibious campaigns and examines the lessons that Chinese military leaders learned from them. It comprises three main parts. Section 1 highlights the 1949 assault on Jinmen (Quemoy or Kinmen) and the lessons learned from this failed landing operation. Section 2 discusses how these lessons were applied to the successful invasion of Hainan in 1950. Section 3 analyzes the PLA's invasion of Yijiangshan, which both further validated PLA amphibious doctrine and offered new lessons of its own. It was also the PLA's only joint operation during the Cold War. The chapter concludes by summarizing key findings and discussing their implications for a future large-scale landing campaign across the Taiwan Strait.

Jinmen: A Failed Landing

When Mao Zedong founded the PRC on 1 October 1949, Chinese leaders still were confronting over one million Nationalist (Kuomintang, KMT) fighters on Taiwan and in southwestern China. Mao's first priority was to consolidate the new state by eliminating all remnants of the KMT forces of Chiang Kai-shek on Taiwan and other offshore islands.[1] In late 1949, Chiang moved the seat of his government to Taiwan. At Taipei, the new capital city of the Republic of China (ROC), Chiang prepared for the final showdown with Mao in the last battle of the civil war. He concentrated his troops on four major islands: 200,000 men on Taiwan, 100,000 on Hainan, 120,000 on the Zhoushan island group, and 60,000 on Jinmen.[2]

Jinmen is a small island group lying less than two miles off the mainland, covering a total of sixty square miles and having a population of forty thousand at that time. It is not in the open ocean, but instead lies just off the coast from Xiamen, the largest seaport on the southeast mainland. After taking over Xiamen on 17 October 1949, the Tenth Army Group ordered its 28th Army to prepare a landing campaign against Jinmen. However, poor intelligence caused the army command to pay insufficient attention to battle readiness. On the evening of 24 October, the 28th Army attacked Jinmen. As the first wave landed, its ten thousand troops found themselves tightly encircled by the KMT garrison at Guningtou, a small village near the landing site, and suffered heavy casualties. Most of their familiar tactics that had been successful in the civil war—such as achieving surprise to avoid superior enemy firepower, outnumbering the enemy whenever possible, and engaging the enemy in mobile operations—did not work in the landing.[3]

Next morning, KMT air and naval forces destroyed two hundred small fishing junks concentrated around Xiamen before they could land PLA reinforcements.[4] With no boats, the Tenth Army Group, 150,000 strong, could not reinforce the Jinmen landings; its members could only listen helplessly as their comrades pleaded for aid on the radio; and three days later, transmissions ceased. The 28th Army lost 9,086 landing troops, including more than three thousand taken prisoner, while the KMT lost only about a thousand defenders.[5]

No Chinese record exists revealing serious discussions at the high command concerning the Jinmen operation until 28 October, when the bad news reached Beijing: one of the best army groups in the Third Field Army had lost three regiments on the Jinmen beaches. Shocked, Mao drafted a circular with a warning to all PLA commanders, "especially those high-level commanders at army level and above," that they "must learn a good lesson from the Jinmen failure."[6] The PLA high command learned four lessons from the

failed Jinmen landing: (1) cross-strait transportation was the key factor, (2) coordination and communication were crucial for landing operations, (3) landing forces must outnumber the enemy defense, and (4) naval and air forces were necessary for large-scale amphibious campaigns. Su Yu, deputy commander of the Third Field Army, warned his generals that amphibious operations were "a new warfare" or "modern warfare, different from all the wars we have fought before."[7]

The KMT had different explanations for the PLA's failure at Jinmen. First, the PLA troops had become arrogant and conceited after they took over Xiamen, and they underestimated the challenges of landing on Jinmen. They thought they were successful as soon as they landed and did not have a plan in case of setbacks. Second, the PLA did not have accurate information on the KMT defense forces, which had received reinforcements from the 18th and 19th Armies. Third, the PLA had only one landing point, and the 28th Army timed its landing wrong; it chose the early morning for its attack. This provided the KMT a chance to concentrate its defensive forces and firepower through the first day—a task that would have been more difficult at night. The PLA should have chosen two or more landing sites, with landings at different times. Fourth, the landing troops did not have supporting firepower and antitank guns. Last, the PLA did not have boats for its second wave or any major reinforcements after it transported the first wave of three regiments to Jinmen. KMT general Chiang Wei-kuo recalled during an interview that the battle of Jinmen not only boosted the troops' morale but also convinced his father, Chiang Kai-shek, that the KMT government could survive on these islands by building up a strong defense.[8]

Thereafter, the PLA developed a new strategy for offshore campaigns in 1949–50. It included (1) a centralized national command, (2) a large landing force, (3) proper training, and (4) necessary naval and air support. Obviously, the high command still considered landings to be army-led operations.

First, the PLA high command realized that any major landing operation was not a local campaign; it needed a centralized and integrated high command for planning, coordination, and mobilization of all available sources at large scale. On 31 October, Mao telegraphed Lin Biao, Fourth Field Army commander, to halt all amphibious operations on the South China Sea coast.[9] In early November, Mao instructed Su Yu to postpone the attacks on the islands in the East China Sea.[10] Su issued orders to the Seventh, Ninth, and Tenth Army Groups on 14 November, instructing them that army group commands no longer would order any offshore attack; only the field army headquarters (HQs) could authorize such an operation.[11]

Second, Mao believed that a major amphibious attack must concentrate a large force capable of landing, defending the beachheads, and continuing deeper attacks. On 18 December, on his way to Moscow, Mao drafted a lengthy telegram to Lin Biao. This message was the first systematic consideration of PLA amphibious operations by the top Chinese leaders.[12] Mao warned Lin, "The cross-strait operation is totally different from all of our army's experience in the ground operations in the past. . . . [You] must concentrate and transport at least an entire army (forty to fifty thousand men) with supplies for at least three days before landing at the enemy beach. . . . You must study the lesson [of Jinmen]."[13] The principle that any major landing campaign must concentrate a large force continued to impact Chinese strategy. In 1961, the Chinese Communist Party (CCP) Central Military Commission (CMC) organized the CMC War Strategy Research Group, with Gen. Su Yu as chair, to study past landing campaigns and prepare for another showdown against Chiang Kai-shek. The group invited the field generals with landing experience on Jinmen to Beijing to provide more details. Their research and reports emphasized the concentration of a force numerically superior to the defensive garrison.[14]

Third, Mao suggested to Su Yu that all concerned armies needed to be better prepared, with time taken to conduct amphibious operation training. From this point forward, Mao showed extra caution. He telegraphed the field army commanders again in November that the "[c]ross-strait campaign is totally different from all experience our army had in the past." Mao asked his commanders to "guard against arrogance, avoid underestimating the enemy, and be well prepared."[15] Su carried out the training order in the Third Field Army, while warning the high command that it would be "extremely difficult to operate a large-scale cross-ocean amphibious landing operation without air and sea control."[16]

Last, Mao indicated that the PLA needed naval and air forces to support any major amphibious landing. For the PLA on the mainland, the offshore operations became an important and difficult issue in late 1949 because of the lack of amphibious experience and lack of naval and air forces. On 11 November 1949, the PLA high command proclaimed the establishment of the PLA Air Force (PLAAF). Xiaoming Zhang points out, "Chinese Communist concepts for the development of airpower derived primarily from Mao Zedong's plan for the invasion of Taiwan in 1949."[17] In December, the high command reorganized the HQ of the Twelfth Army Group, Fourth Field Army, into the HQ of the PLA Navy (PLAN). Xiao Jinguang, commander of the Twelfth Army Group, was the first commander of the PLAN.[18]

Mao paid a state visit to the Soviet Union on 16 December, hoping to get what he desperately needed through a treaty of alliance. This would include

equipment for his new air and naval forces. The Soviet Union agreed to arm the Chinese naval force with ships and equipment worth $150 million (1950 value), constituting half the total loan package that Joseph Stalin granted during Mao's two-month stay.[19] Mao then placed a huge military order (1.2 billion rubles, about $220 million) with Stalin, including to purchase 340 warplanes.[20] On 11 February, Mao wrote to Stalin ordering an additional 628 airplanes from the Soviets, and on 25 February he asked for 217 more Russian air force advisers.[21] Since the Russian planes and warships arrived later, the PLAAF and PLAN did not participate in the April 1950 Hainan landing.

The Hainan Landing and the Taiwan Invasion Plan

The army applied the lessons from the battle of Jinmen to its invasion of Hainan in April 1950. First, from the very beginning the high command worked closely with the field army and army group commands. On 10 January 1950, Mao instructed the CMC and the party center "to make an effort to solve the problem of Hainan Island in the spring and summer seasons."[22] On 1 February, the CCP Central China Bureau held a Hainan campaign conference and decided on an amphibious strategy that would combine small-scale crossings with large-scale crossings; this was intended to cope with the KMT naval and air superiority in the twenty-mile-wide Qiongzhou Strait separating Hainan from the mainland. After his return from Moscow, Mao approved the Fourth Field Army's Hainan landing plan.[23]

Having learned the lessons of Jinmen, the PLA concentrated a large landing force for the invasion. On 18 December 1949, Mao instructed the Fourth Field Army "to prepare the 43rd and 40th Armies for attacks on Qiongya.[24] Then the high command approved the campaign proposal, including the deployment of two infantry armies, three artillery regiments, and combat-engineering troops, totaling one hundred thousand troops. The PLA also instructed guerrilla troops (about twenty thousand men) on Hainan to support the landing campaign. The Fourth Field Army also ordered its Fifteenth Army Group to prepare for a Hainan landing campaign.[25]

The landing forces additionally secured enough transport boats before their landing. On 17 February, Mao sent another telegram to the Fourth Command with the following instructions: "[You] must confirm the guarantee of landing transportation and preparation before you launch the attack. Avoid push and rush, avoid mistake and loss."[26] Following Mao and the high command's instructions, the Fourth Field Army instructed its Fifteenth Army Group to take three months to prepare for its Hainan landing. In December 1949, the army group command had ordered its 40th and 43rd

Armies to move into coastal areas across from Hainan and begin their landing training. Meanwhile, the Fifteenth Army Group Command collected 2,130 fishing junks and employed more than six thousand boat crewmen to provide cross-strait transportation.[27]

From 5 to 10 March, the Fifteenth Army Group began its small-scale night landings by sending battalion-size landing forces to cross the Qiongzhou Strait. The landing forces quickly overran the KMT garrison and reached local guerrillas on Hainan. From 26 to 31 March, the 40th and 43rd Armies sent two regiments with artillery units across the strait, and they successfully landed on Hainan. These vanguard troops established their bases and prepared sites for the large-scale landing of the Fifteenth Army Group.[28]

At 1930 on 16 April, the first landing wave of fifty thousand troops in 350 boats sailed to Hainan. The KMT air patrol reported the assaulting forces within ten to fifteen minutes of the fleet leaving the shore. Throughout the night, six KMT warships attacked the PLA landing force but failed to stop the crossing, with one KMT ship sunk and two damaged. By 0600 the next morning, the first PLA wave had landed on Hainan. Then, the 118th and 119th Divisions of the 40th Army broke through the KMT defense and secured the landing sites. Meanwhile, the 128th Division of the 43rd Army moved deeper and engaged the KMT's 252nd Division—the main force for Hainan's defense. By 22 April, the 252nd Division had been destroyed, and the KMT defense collapsed. The next day, the PLA took over Haikou, the capital city of Hainan. On 23 April, the second wave of fifty thousand PLA troops left the mainland, landing on Hainan the next morning. By 1 May, the battle of Hainan was over, with the PLA victorious.[29]

The successful landing on Hainan encouraged the PLA to prepare for a Taiwan landing in the spring of 1950. On returning from Moscow on 4 March, Mao met with the PLA high command. During the discussion, Mao instructed Nie Rongzhen, acting chief of the General Staff, along with Su Yu, to plan attacks on Taiwan. Mao emphasized the importance of training airborne forces and preparing an additional four amphibious divisions.[30] On 11 March, Su met Xiao Jinguang to discuss detailed plans for Taiwan's liberation. In April, the CMC approved the Su/Xiao plan. The Third Field Army began landing training in the late spring. According to the plan, the Third Field Army, including its Seventh, Eighth, and Ninth Army Groups, and the navy would deploy half a million troops to attack Taiwan.[31] The Thirteenth Army Group of the Fourth Field Army, including three armies, remained as a reserve for the attack, while the Nineteenth Army Group deployed its three armies along the mainland coast as a mobile force. Total forces for the invasion of Taiwan included nearly eight hundred thousand men.[32]

In May, the Ninth Army Group defeated 120,000 KMT defenders on the Zhoushan island group and occupied those islands in the East China Sea. In early June, the army group landed on the KMT-occupied Dongshan and Wanshan island groups and took forty-eight small islands. Thus, in late spring 1950, people on both sides of the Taiwan Strait expected an imminent PLA attack on Jinmen and Taiwan.[33] When the CCP held its Third Plenary Session of the Seventh National Congress 6–9 June 1950 in Beijing, Mao urged the party to regard the liberation of Taiwan and Tibet as its central tasks. Su reported on PLA preparations for invading Taiwan.[34]

However, the Korean War broke out on 25 June, which altered Mao's design.[35] The war surprised Mao and others in the Chinese leadership, since neither the North Koreans nor the Russians had informed them of the attack schedule.[36] But the unexpected and abrupt U.S. policy shift toward Taiwan's security, from "hands-off" to "hands-on," was shocking to them.[37] On 27 June, two days after the North Korean invasion of the South and after having reached consensus between Congress and the Pentagon, President Harry S. Truman announced the U.S. Seventh Fleet's deployment to the Taiwan Strait as a preventive measure against Chinese Communist attacks on KMT-held Taiwan. The Seventh Fleet's presence in the Taiwan Strait marked a turning point in the cross-strait situation. With direct American involvement in the Taiwan Strait, the PLA now faced a serious challenge.[38] One of Mao's speeches reflects Beijing's point of view. Before June 1950, liberating Taiwan from Nationalist forces was the PLA's primary task; after June, Mao stated, "The American armed forces have occupied Taiwan, invaded Korea, and reached the boundary of Northeast China. Now we must fight against the American forces in both Korea and Taiwan."[39]

Truman's order secured the ROC by preventing a planned PLA landing on Taiwan by the end of June 1950.[40] An amphibious campaign against U.S. forces in the Taiwan Strait in the summer of 1950 could have been a military disaster for the PLA. On 30 June, Premier Zhou Enlai officially postponed the PLA's landing operation against Taiwan.[41] Later the CMC cabled Chen Yi, commander of the Third Field Army, that there would be no attack on Taiwan until 1952 at the earliest.[42]

The Seventh Fleet's presence in the Taiwan Strait totally changed the balance of military power in the Chinese Civil War. Communist leaders faced a new challenge; what had been part of the civil struggle had been transformed into an international confrontation. From then on, Chinese leaders had to include U.S. military power and strategy in their war decisions regarding a new amphibious campaign across the Taiwan Strait.

Yijiangshan: The First Joint Operation

By 1953, Chinese leaders had learned a hard lesson in Korea: that it was best to avoid a full-scale war against the West, particularly the United States. The PLA opted instead to fight "limited wars," since they curbed human loss and economic cost. Its limited attacks in the Taiwan Strait continued to promote PRC interests while avoiding total war with the United States. After the Korean armistice in 1953, the PLA focused on the Taiwan Strait, planning a new amphibious campaign against the KMT-held offshore islands.

Zhang Aiping, chief of Zhejiang Command (ZC), East China Military Region (ECMR), proposed a "piecemeal" attack—one island at a time, beginning with the northernmost small islands (the Dachen Islands) in the East China Sea. Zhang's proposal avoided the U.S. Seventh Fleet, which was located about a hundred miles away in the South China Sea, and exploited the Dachen island group's location, which was more than two hundred miles away from Taiwan. After success there, he would move south and attack larger islands, one by one.[43]

The high command approved Zhang's three-phase plan. The campaign would commence with an amphibious assault involving land, air, and naval forces—the first time the PLA would conduct joint operations. His second phase would focus on gaining control of the air and sea to isolate the KMT garrisons on the Dachens and surrounding islands. The third phase involved island landing operations, for which the 24th Army began training.[44]

As the situation grew more unfavorable for the KMT, Chiang Kai-shek personally visited KMT garrisons on the Dachen Islands from 6 to 7 May. He told his troops there to avoid panic under any circumstances. Chiang Wei-kuo recalled in an interview that his father's visit strengthened the troops' morale and quelled rumors of an evacuation from the islands. After Chiang Kai-shek's visit, the Dachen Islands' garrisons received reinforcements and more supplies.[45]

In early May 1954, the PLA readied for its landing on Dongji, a group of small islands north of the Dachens. On 15 May, the troops landed at the Dongji Islands and eliminated the KMT garrison, capturing sixty prisoners. With Zhang Aiping's success, the CMC decided in July that the ECMR and ZC would launch a similar attack in September on the Dachen Islands, the much larger island group off the Zhejiang coast.[46]

Zhang learned lessons from the Dongji amphibious campaign. He established a joint command, the Zhejiang Front Command (ZFC), in the summer of 1954 at Ningbo, for the Dachens campaign. This joint command was a tripartite headquarters that included commanders from the air force, navy, and army. They convened their first joint meeting on 31 August and

discussed details for the Dachens campaign. Zhang presented his cautious, step-by-step plan to the branch commanders. To prepare for the PLA's first joint attack, Zhang emphasized the importance of close cooperation among the services, and he sent infantry commanders to the navy and air forces for training.[47]

Zhang and Nie decided on Yijiangshan, a half-square-mile islet, seven miles north of the Dachen Islands, as the first target of the landing campaign.[48] Chinese officers and their Russian advisers could not agree on the timing of the PLA landing; the ZFC commanders ultimately decided on noon on 18 January 1955, weather permitting. The attack began at 0800 on 18 January, with fifty-four bombers and eighteen fighters raiding key KMT positions, headquarters, and defense works at both Yijiangshan and the Dachens. The bombers dropped 127 tons of ordnance over the course of six hours. By 1220, coastal artillery at Toumenshan started a two-hour bombardment of Yijiangshan. Four artillery battalions plus twelve artillery companies barraged the island with forty thousand shells. During the cannonade, from 1318 to 1415, four escort ships and two gunboats fired from the surrounding waters at the island's defensive positions. The prelanding bombardment destroyed almost all the defense works, artillery positions, and communications on Yijiangshan. The heavy, repeated shelling also neutralized the Dachens' supportive fire.[49]

Around 1215, 188 ships of various types, including four escort ships, two gunboats, twelve torpedo boats, six rocket gunboats, and more than 140 landing craft, transported Zhang's ten-thousand-man invasion force, along with 3,700 sailors, to Yijiangshan. Coordinating with the bombardment and amphibious landings, PLAAF MiG-15s conducted low-altitude strikes on the KMT beachhead at 1425. The first wave landed at Yijiangshan after 1430. In the east, the troops suffered more than thirty casualties before landing, as KMT 60 mm rockets hit two of their transports. The landing troops rushed the beach and took over defensive positions, suffering forty PLA casualties. With support from the second wave, they occupied key heights on the island. By 1730, the entire island had fallen under PLA control.[50]

By next morning, the PLA had annihilated all remaining KMT pockets of resistance. The KMT lost its entire garrison of 1,086 men: 567 dead and 519 prisoners. The PLA suffered 2,092 total casualties: the army had 893 dead and 1,037 wounded, losing nearly 50 percent of its first landing wave's strength; naval forces had 23 dead and 139 wounded.[51] The navy also lost one landing craft and twenty-one ships were damaged, while the PLAAF suffered no losses, although eight bombers and fighters were damaged.[52]

With the battle of Yijiangshan, the PLA had learned how to invade a KMT-held island without risking a war with the United States and how to conduct joint naval and air operations. First, PLA field generals had worked closely with Beijing to avoid any conflict with the U.S. armed forces in the region. Maj. Gen. Xu Yan, from China's National Defense University, points out that Beijing was convinced that the United States would not intervene in the Yijiangshan landing.[53] To keep the United States out of the Dachens area, Nie Fengzhi, commander of the ZFC air forces, personally instructed his pilots not to engage any U.S. aircraft without his permission. Nie recalled that "throughout the whole campaign we had an excellent result with no involvement with foreign air forces."[54]

Another lesson the PLA learned was that performance among the different services could be uneven. The PLAAF 2nd Division had engaged the KMT air force over the Dachens area since the spring of 1954. Although Taiwan recently had received American F-84 fighters, the KMT air force had yet to deploy them. Moreover, KMT pilots were no match for the PLAAF pilots, with their Soviet-made MiG-15 jet fighters and fresh experience from the Korean War.[55] In six air engagements, six KMT fighters were shot down, while the PLAAF lost only two.[56] By May 1955, the PLA controlled the skies north of the Dachen Islands.

The PLAAF began its assault on the Dachen Islands on 1 November 1954. For four days, bombers and fighters raided the Dachen Islands and Yijiangshan, flying more than one hundred sorties and dropping over one thousand bombs.[57] The ZFC dominated both air and sea around the Dachen Islands. Between 21 December 1954 and 10 January 1955, the ZFC air force conducted five heavy raids against the Dachen Islands, totaling twenty-eight bomber and 116 fighter sorties. On 10 January, the PLAAF raided Dachen Harbor, sinking one KMT tank landing ship and damaging four others.[58] Professor Lu Xiaoping from the PLAAF Command College emphasizes the service's success in providing air support for the Yijiangshan landing. "During the combat implementation, the Air Force units and Army landing force operated in close coordination, attacking the defending enemy forces with flexibility, protecting the frontal charge of the landing unit."[59]

In contrast, military historian Zhongtian Han argues that the PLAN performed poorly during the Yijiangshan campaign. The ECMR East China Sea Fleet (ECSF) targeted Sanmen Bay with six medium escort ships and ten gunboats. On 18 March, the ECSF attacked KMT naval forces north of the Dachen Islands, sinking one KMT warship and damaging another. From 18 March to 20 May, the ECSF engaged the KMT navy in twelve battles, damaging nine KMT ships. Nevertheless, the PLAN lost its warship

Ruijin during the battle. Han believes the PLA was successful at the strategic adaptation of joint operations, but failed at the operational level.[60]

Analysis of the PLA's landing experiences from 1949 to 1955 indicates that Chinese amphibious campaign doctrine evolved rapidly, because Chinese generals were capable of adjusting to changing conditions and consistently reassessing their own performance. Moreover, their changes in strategic planning about coastal offensives did not occur only in the crucible of combat or after suffering another humiliating defeat like the Jinmen landing of 1949; their Korean War experience paid off during offshore operations.

The PLA demonstrated four key capabilities: planning, learning, adapting, and political control. Although there was always a learning curve, the PLA adapted to amphibious warfare and proved the political morale and combat effectiveness of its personnel. The PLA high command centralized preparations, operations, and logistics for its offshore attacks from 1950 to 1955. These findings also describe a swift transformation of a PLA landing campaign from an army-based attack to a joint operation, with emphasis on air raids, naval support, cross-strait transportation, and communication among landing troops. Ultimately, the Chinese landing campaigns in the early 1950s achieved their campaign goals by seizing Hainan and all the offshore islands in the East China Sea that have been the subject of this chapter.

However, Chinese leaders were frustrated by a technological gap of relevant air and naval powers over the Taiwan Strait, making their operational objectives nearly unachievable after 1955. The PLA was an army eager to learn, and it quickly recognized the disparity between its weapons and those available to the American military. Beginning in 1954, the PLA engaged in a "limited war" in the Taiwan Strait, avoiding full-scale war against the United States.

In addition to using Russian-model armaments from the 1950s, the Chinese also tried to improve their own technology, and in the 1960s they developed their own weapon systems, including strategic weapons. The main driver behind Beijing's efforts to build hundreds of nuclear bombs was to avoid being subjected again to 1950s-style nuclear blackmail by Washington in the Taiwan Strait. The problem of Taiwan and the frequent crises in the Taiwan Strait with the KMT and the United States have been used to justify China's nuclear modernization.[61]

During his second term (2017–22) and into his third (2022–27), Xi Jinping has continued to employ nationalism as an ideology to unite China and prepare the country for a large-scale cross-strait invasion. If he has learned lessons from Mao's era, prior to any Taiwan campaign he will

launch a nationwide movement to mobilize the population, mass media, financial institutions, and the economy while establishing a centralized command system for the amphibious operation. From Mao to Xi, the Taiwan issue has garnered more attention than any other military-related topic. Moreover, as other chapters in this volume demonstrate, the PLA has copious new military hardware with which to enhance its capabilities for air-ground integrated attacks, long-distance maneuver, and rapid assaults.

Nevertheless, the most important lesson Beijing learned from its amphibious campaigns is not to fight a large-scale war against the United States in the Taiwan Strait. Any major U.S. intervention would endanger the PLA's landing campaign. To keep America away from the strait, Beijing may seek to use nuclear deterrence, as it did from 1965 to 1968 to confine American bombing of North Vietnam to areas south of the twentieth parallel. However, Mao did not offer a historical lesson on nuclear deterrence across the Taiwan Strait, and Xi will have to learn it on his own.

Notes

1. 毛泽东 [Mao Zedong], 关于兵力部署的意见给林彪的电报 ["Telegram to Lin Biao: My Suggestions on Your Troop Disposition and Battle Array"], 31 October 1949, in 建国以来毛泽东文稿 [*Mao Zedong's Manuscripts since the Founding of the State*] (Beijing: CCP Central Archival and Manuscript Press, 1989) [hereafter *Mao's Manuscripts since 1949*], vol. 1, p. 107.
2. 中华民国国防部 [Defense Ministry, ROC], 国军后勤史 [*Logistics History of the KMT Armed Forces*] (Taipei: Bureau of History and Political Records, Defense Ministry, 1992), vol. 6, pp. 199–200.
3. 解放军南京军区第三野战军战史编辑室 [War History Editorial Office for the Third Field Army, PLA Nanjing Military Region Command], 中国人民解放军第三野战军战史 [*War History of the PLA Third Field Army*] (Beijing: PLA Press, 1996), vol. 4, pp. 374–77.
4. 郝柏村上将 [Chief Gen. Hau Pei-tsun (KMT Army [Ret.])], interview by author, Taipei, May 1994. Hau (1919–2020) served as the KMT army commander on the offshore islands during the PLA attack on Jinmen in 1949. He later served as ROC defense minister in the 1980s.
5. Compilation Committee of ROC History, *A Pictorial History of the Republic of China: Its Founding and Development* (Taipei: Modern China, 1981), vol. 2, p. 297. The KMT army officially claimed PLA casualties of about twenty thousand men, including 7,200 prisoners. According to the author's interviews in both Taiwan and China, a figure of ten thousand PLA casualties seems most realistic.
6. 中央军委 [CMC], 军委关于攻击金门岛失利的教训的通报 ["Circular on the Lesson of Jinmen Battle"], 29 October 1949. In 1987, the Archives and Research Division of the CCP Central Committee found that Mao drafted the original

document. The division reprinted it from Mao's manuscript and included it in *Mao's Manuscripts since 1949,* vol. 1, pp. 100–101.

7. Su Yu's words quoted in 叶飞 [Ye Fei], 叶飞回忆录 [*Memoirs of Ye Fei*] (Beijing: PLA Press, 1988), p. 608.
8. Gen. Chiang Wei-kuo (KMT Army [Ret.]), interviews by author, Rongmin General Hospital, Taipei, 26 May 1994.
9. Mao Zedong, My Suggestions on Your Troop Disposition and Battle Array. In his telegram, Mao told Lin, "Do not attack the Leizhou Peninsula, much less take a chance to attack the Hainan Island." See *Mao's Manuscripts since 1949,* vol. 1, p. 107.
10. Two of these CMC telegrams were drafted by Mao to Su Yu. The first one is 军委关于同意定海作战方案给粟裕等的电报 ["Telegram to Su Yu for the Operation Plan of the Dinghai Campaign"], 4 November 1949, and the second is 关于定海作战部署给粟裕的电报 ["Telegram to Su Yu: The Disposition of the Dinghai Campaign"], 14 November 1949. The latter reads, "In view of the military failure on Jinmen, you must check out closely and seriously all problems, such as boat transportation, troop reinforcement, and attack opportunity on the Dinghai landing. If it is not well prepared, we would rather postpone the attack than feel sorry about it later." *Mao's Manuscripts since 1949,* vol. 1, pp. 118, 137.
11. He Di, "The Last Campaign to Unify China: The CCP's Unrealized Plan to Liberate Taiwan, 1949–1950," in *Chinese Warfighting: The PLA Experience since 1949,* ed. Mark A. Ryan, David M. Finkelstein, and Michael A. McDevitt (Armonk, NY: M. E. Sharpe, 2003), p. 88.
12. 解放军军事科学院军事历史研究部 [Military History Research Division, PLA Academy of Military Sciences, 中国人民解放军战史 [*War History of the Chinese People's Liberation Army*] (Beijing: Military Science, 1987), vol. 3, p. 359.
13. 毛泽东 [Mao Zedong], 渡海作战必须注意的问题 ["Pay Attention to These Issues in Amphibious Campaigns"], 18 December 1949, responding to Lin's telegram of 10 December about the Fourth Field Army's campaign proposal, including a landing campaign on Hainan Island. This document is in 建国以来毛泽东军事文稿 [*Mao Zedong's Military Manuscripts since the Founding of the PRC*] (Beijing: Military Science and CCP Central Archival and Manuscript Press, 2010), [hereafter *Mao's Military Manuscripts since 1949*], vol. 1, pp. 104–106.
14. 肖锋少将 [Maj. Gen. Xiao Feng], 回忆金门之战 ["Recollection of the Battle of Kinmen"], in 回顾金门登陆战 [*Recollections of the Battle of Kinmen Landing*], ed. 肖锋 [Xiao Feng] (Beijing: People's Press, 1994), p. 55. Xiao Feng was deputy commander of the 28th Army in the battle of Jinmen. His rank was senior colonel in 1955 and major general in 1961.
15. CMC, "Circular on the Lesson of Jinmen Battle," p. 101.
16. Ye, *Memoirs of Ye Fei,* p. 608; staff member of the Tenth Army Group HQ, interview by author, Hangzhou, Zhejiang, 6 July 2006. Ye was the commander of the Tenth Army Group from 1949 to 1955. 星火燎原编辑部 [Xinghuo Liaoyuan Composition Department], 中国人民解放军将帅名录 [*Marshals and Generals of the PLA*] (Beijing: PLA Press, 1992), vol. 1, pp. 58–59.

17. Xiaoming Zhang, *Red Wings over the Yalu: China, the Soviet Union, and the Air War in Korea* (College Station: Texas A&M Univ. Press, 2002), p. 6.
18. 杨国宇 [Yang Guoyu], 当代中国海军 [*Contemporary Chinese Navy*] (Beijing: China Social Sciences, 1987), p. 17.
19. Ibid., pp. 48, 52.
20. 韩怀智 [Han Huaizhi], 当代中国军队的军事工作 [*Military Affairs of Contemporary China's Armed Forces*] (Beijing: China Social Sciences, 1989), vol. 2, p. 161.
21. Mao's telegrams to Stalin on 11, 15, and 25 February 1950, as quoted in 楚峰 [Chu Feng], 二十世纪五十年代中苏军事关系研究 ["The Sino-Soviet Military Relations in the 1950s"] (PhD diss., Party Univ. of the CCP Central Committee, Beijing, 2006), pp. 45, 59.
22. 毛泽东 [Mao Zedong], 大力做好解放海南岛的准备工作 ["Make Great Campaign Preparations to Liberate Hainan Island"], in *Mao's Military Manuscripts since 1949,* vol. 1, pp. 119–20.
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26. Mao's telegram, quoted in Han, *Military Affairs of Contemporary China's Armed Forces,* vol. 1, p. 136.
27. 张爱萍大将 [Gen. Zhang Aiping], 中国人民解放军 [*The Chinese People's Liberation Army*] (Beijing: Contemporary China, 1994), vol. 1, pp. 75–76.
28. Han, *Military Affairs of Contemporary China's Armed Forces,* vol. 1, pp. 139–43.
29. 国防大学《战史简编》编写组 [War History Editorial Committee, PLA National Defense Univ.], 中国人民解放军战史简编 [*A Brief History of the Chinese PLA Revolutionary War*] (Beijing: PLA Press, 2001), p. 626.
30. 毛泽东 [Mao Zedong], 关于同意粟裕调四个师演习海战等问题给刘少奇的电报 ["Telegram to Liu Shaoqi: Approval of Disposing Four Divisions for Landing Campaign Exercise"], 10 February 1950, and 关于确定先打定海再打金门的方针的批语 ["Instruction on the Proposal of Attacking Dinghai First, Jinmen Second, Campaign Strategy"], 28 March 1950, in *Mao's Manuscripts since 1949,* vol. 1, pp. 256–57, 282.
31. 肖劲光大将 [Adm. Xiao Jinguang], 肖劲光回忆录 [*Memoirs of Xiao Jinguang*] (Beijing: PLA Press, 1988), vol. 2, pp. 8, 26.
32. He, "The Last Campaign to Unify China," pp. 82–83.
33. Chiang Wei-kuo, interview by author, Taipei, 23 May 1994. General Chiang recalled that his father, Chiang Kai-shek, and KMT intelligence had information on the PLA's landing preparations in the spring of 1950.

34. 中共党史研究室 [CCP Party History Research Division], 中国共产党历史大事记, 1919–1987 [*Major Historical Events of the CCP, 1919–1987*] (Beijing: People's Press, 1989), pp. 191–92.
35. Gen. Ye Fei, interview by author, Hangzhou, Zhejiang, July 1996. Ye served as commander of the Tenth Army Group, Third Field Army of the PLA, from 1949 to 1951.
36. Mao was very dissatisfied with this and later confided, "They [the North Koreans] are our next-door neighbor, but they did not consult with us about the outbreak of the war." Mao's quote is in 李海文 [Li Haiwen], 中共中央什么时候决定志愿军出国作战? ["When Did the CCP Central Committee Decide to Send the Volunteers to Fight Abroad?"], 党的文献 [*Party Literature and Archives*] 5 (1993), p. 85, cited in Shen Zhihua, "China Sends Troops to Korea: Beijing's Policy-Making Process," in *China and the United States: A New Cold War History,* ed. Xiaobing Li and Hongshan Li (Lanham, MD: Univ. Press of America, 1998), p. 20.
37. Xiaobing Li, "Truman and Taiwan: A U.S. Policy Change from Face to Faith," in *Northeast Asia and the Legacy of Harry S. Truman: Japan, China, and the Two Koreas,* ed. James I. Matray (Kirksville, MO: Truman State Univ. Press, 2012), pp. 127–28.
38. Hau Pei-tsun, interviews by author, Taipei, 23–24 May 1994. As the commander of the KMT front artillery force on Jinmen Island, Hau felt relieved when he was informed of the U.S. Seventh Fleet's patrol in the Taiwan Strait in June 1950.
39. 毛泽东 [Mao Zedong], 三大运动的伟大胜利 ["The Great Achievements of the Three Glorious Movements"], a speech at the Third Plenary Session of the First National Committee of the Chinese People's Political Consultative Conference, 23 October 1951, in *Mao's Manuscripts since 1949,* vol. 2, pp. 481–86; 毛泽东选集 [*Selected Works of Mao Zedong*] (Beijing: People's Press, 1978), vol. 5, pp. 50–52.
40. Xiao, *Memoirs of Xiao Jinguang,* vol. 2, p. 26.
41. Ibid.
42. 刘树发 [Liu Shufa], 陈毅年谱: 1901–1972 [*A Chronological Record of Chen Yi: 1901–1972*] (Beijing: People's Press, 1995), vol. 2, pp. 632–33.
43. Lt. Gen. Xu Changyou, interviews by author, Shanghai, April 2000. Xu served as Gen. Zhang Aiping's aide and then the deputy secretary general of the CMC. He was the vice-commissar of the PLAN East Sea Fleet at the time of the interview.
44. 东方鹤 [Dong Fanghe], 张爱萍传 [*Biography of Zhang Aiping*] (Beijing: People's Press, 2000), vol. 2, pp. 663–64; Xiaobing Li, "PLA Attacks and Amphibious Operations during the Taiwan Strait Crises of 1954–55 and 1958," in Ryan, Finkelstein, and McDevitt, *Chinese Warfighting,* p. 146.
45. Chiang Wei-kuo, interviews by author, Taipei, 25–27 May 1994. When asked during the interview about his father's secret visit to the Dachens, General Chiang pointed out that his father recognized the strategic importance of these islands after the Korean War. Chiang Kai-shek made his trip to these offshore islands without informing any KMT officials or American representatives in Taiwan other than his naval commanders.
46. Dong, *Biography of Zhang Aiping,* vol. 2, pp. 664–65; Li, "PLA Attacks and Amphibious Operations," p. 148.

47. 胡彦林中将 [Vice Adm. Hu Yanlin], 威震海疆: 人民海军征战纪实 [*Shocking the Sea: Records of the People's Navy's Battles*] (Beijing: National Defense Univ. Press, 1996), pp. 210–15.
48. Dong, *Biography of Zhang Aiping,* vol. 2, pp. 674–75; Han, *Military Affairs of Contemporary China's Armed Forces,* vol. 1, pp. 216–17; Li, "PLA Attacks and Amphibious Operations," p. 152.
49. 卢辉 [Lu Hui], 三军战一江 [*Joint Forces Battle Yijiang*] (Beijing: China United Literature Publishing House, 2014), p. 126.
50. 杨忠义 [Yang Zhongyi], 苏联专家与中国海军航空兵 [*Soviet Advisers and PLAN Air Force*] (Beijing: PLA Press, 2013), p. 220.
51. 地久 [Di Jiu] and 克峰 [Ke Feng], 潮涨潮落: 国共角逐台湾海峡纪实 [*Ebb and Flow: Records of the CCP-KMT Confrontation in the Taiwan Strait*] (Beijing: China Industrial and Commercial Publishing, 1996), pp. 210–12.
52. Han, *Military Affairs of Contemporary China's Armed Forces,* vol. 1, pp. 220–21.
53. 徐焰 [Xu Yan], 抗美援朝影响了台湾问题的解决吗? ["Did the War to Resist the U.S. and Aid Korea Alter the Solution of the Taiwan Issue?"], in 徐焰讲稿自选集 [*Self-selected Lecture Notes of Xu Yan*], ed. 徐焰 [Xu Yan] (Beijing: National Defense Univ. Press, 2014), pp. 118, 120–21. Xu is a professor at China's National Defense University and deputy secretary general of the Chinese Military History Society.
54. 聂凤智 [Nie Fengzhi], 云击鹰翔震海空 ["Soaring Eagles Strike from the Clouds and Shake the Sea and Sky"], in 三军挥戈战东海 [*Joint Forces Wield Spears and Fight in the East China Sea*], ed. 聂凤智 [Nie Fengzhi] (Beijing: PLA Press, 1985), p. 16.
55. The air force bases in east coast cities such as Shanghai, Hangzhou, and Ningbo also were used by Zhang's jets in the air campaigns.
56. 王定烈 [Wang Dinglie], 当代中国空军 [*Contemporary Chinese Air Force*] (Beijing: China Social Sciences, 1989), p. 324.
57. 马冠三 [Ma Guansan], 鏖战东海忆当年 ["Remember the Combat Years in the East China Sea"], in Nie, *Joint Forces Wield Spears,* p. 29. Ma was deputy commander of the ZFC naval force.
58. Han, *Military Affairs of Contemporary China's Armed Forces,* vol. 1, pp. 215–16.
59. Lu Xiaoping et al., *The PLA Air Force* (Beijing: China Intercontinental, 2012), p. 52.
60. Zhongtian Han, "The PRC's Naval-Air Campaign in the East China Sea, 1954–1955" (paper presented at the annual meeting of the Chinese Military History Society, 10 May 2020, virtual [Zoom]).
61. *The Taiwan Question and China's Reunification in the New Era* (Beijing: Taiwan Affairs Office of the State Council and the State Council Information Office, August 2022), pp. 15–16, english.scio.gov.cn/whitepapers/2022-08/10/content_78365819.htm.

Christopher Yung and Zoe Haver

3. The Six Pillars of PLA Amphibious Doctrine

What are the principles that guide the development and potential use of the People's Liberation Army (PLA) amphibious force? How might these principles translate into action in a large-scale invasion of Taiwan?

This chapter seeks to answer these questions through analysis of the writings of PLA experts on amphibious warfare. These include edited volumes and instructional materials published by the Chinese Academy of Military Science and other authoritative PLA publishers. This chapter also examines scholarly articles that PLA analysts have published in academic periodicals, which provide indications of how the PLA may be developing new technical and tactical solutions to doctrinal challenges. From these works, this chapter distills the core principles that define PLA thinking on amphibious operations. These principles represent the doctrinal foundation of PLA amphibious warfare.[1]

This chapter comprises two main parts. Part 1 outlines the current amphibious missions of the PLA Navy (PLAN), with a focus on a cross-strait invasion. Part 2—the core of the chapter—examines the following six key principles of PLA thinking on amphibious warfare:

1. Dominance of the three domains
2. Key-point strikes
3. Concentration of "elite strengths"

4. Rapid and continuous assaults
5. Integrated and flexible support operations
6. Psychological attacks

Each principle also is compared to historical amphibious operations and the principles underlying their execution. The chapter concludes with a summary of key findings.

The PLAN's Current Amphibious Missions

The PLAN is charged with preparing to execute three main amphibious missions. The most obvious and pressing mission is a cross-strait assault against Taiwan—the focus of this chapter. The service also is responsible for asserting and defending China's maritime and territorial claims in the South China Sea and East China Sea. Carrying out this mission could involve conducting lower-intensity amphibious assaults on islands and smaller features, followed by a struggle to keep rival claimants or the United States from retaking those features. The third amphibious mission is associated with out-of-area (or "far seas") operations in support of the Belt and Road Initiative (BRI) or China's other overseas interests. These could include transporting special-forces troops to protect Chinese nationals and businesses from terrorist or insurgent threats abroad, conducting a large-scale evacuation of noncombatants, or delivering supplies and support personnel to help build partner capacity in aid of the BRI and support other Chinese foreign-policy efforts.[2]

Of these three amphibious missions, the highest priority, as noted, is a Taiwan contingency. It is also the most difficult to address militarily, therefore demanding the most attention doctrinally. When formulating amphibious doctrine, therefore, the PLA likely expends most of its time and effort on preparing for a large-scale invasion of Taiwan.

Core Principles of PLA Amphibious Doctrine

The PLA has been wrestling with the challenges associated with amphibious warfare since as far back as 1949, when it confronted the military problems of taking Hainan Island, offshore islands in the Taiwan Strait, and Taiwan itself. Mao Zedong placed Su Yu in charge of planning the amphibious assault against Taiwan. During this planning, Su wrestled with the basics of amphibious warfare, as they applied to the case in question: providing air cover, establishing surface-ship superiority around the strait, and obtaining

enough "lift" to carry the troops across the strait.[3] Over the subsequent decades, the PLA has studied the most famous amphibious campaigns in military history, emulated the best practices of other navies, and incorporated some of the basics of amphibious doctrine.

PLA writings, especially the naval sections of the 2006 *Science of Campaigns,* reveal that the PLA has adopted a number of established doctrinal concepts. These include the need to accomplish the following:

- Organize two distinct components of an attack force, a sea component and a land component, but also establish a single, unified amphibious command to oversee the operation
- Provide air support to protect the amphibious task force
- Provide naval-gunfire support to suppress, if not destroy, coastal defenses
- Provide specialized landing vessels to transport ground forces, and then to transition them from water to land
- Determine and plan for the right mix of assault forces and reserves to make initial contact with the enemy, penetrate enemy defenses ashore, and then push through and move inland with sufficient momentum to establish a firm, defensible lodgment
- Load transports in the order that enables units to off-load prepared to fight[4]

Examination of PLA doctrinal publications, however, also makes evident that the PLA has incorporated new or emergent doctrinal thinking into its amphibious doctrine as it continues to wrestle with the specifics of a Taiwan campaign. This new doctrinal thinking can be traced specifically to larger PLA thinking on war fighting that has emerged since the 1993 publication of the *Military Strategic Guidelines.* The Chinese military has incorporated an assortment of new concepts, such as "informatization," "key-point strikes," and "integrated joint operations." These new ideas and concepts are very visible in chapter 13 of *Science of Campaigns,* which focuses on joint landing campaigns.[5] The remainder of this chapter addresses six of these newer principles.[6]

Principle 1: Dominance of the Three Domains

Since the beginning of World War II, amphibious doctrine has had to address the question of managing operations and establishing dominance in three domains: air, sea, and land. The history of the various World War II amphibious campaigns is essentially the history of the Allies figuring out how to establish dominance in the air, on (and under) the sea, and at the

point of the landing. The real challenge at the beginning of the war centered on how to determine who was in charge of which domain, and at what point(s) during the operation. In the central Pacific, a particularly thorny question—which commander (the amphibious-force commander or the land-force commander) had overall authority—led to the formal establishment of the Commander, Amphibious Task Force–Commander, Landing Force doctrine. British operations in North Africa early in the war involved nasty interservice arguments over whether the Royal Air Force should exercise centralized control over all air operations or instead whether the British ground forces and Royal Navy should retain limited control over aircraft for specific operations.[7] In different theaters of the war, the Allies came to varying conclusions on how to address these problems; however, it became clear that the best system was one that brought about the following conditions:

- The initial establishment of air superiority
- Effective dominance by ground forces in land warfare and maritime superiority in the maritime domain
- Coordination between maritime and air forces and between ground and air forces
- The ability to pass control back and forth among domains, to the best ability of the forces and commands involved[8]

Contemporary PLA amphibious doctrine also emphasizes multidomain dominance, but stresses the concept's application to the sea, air, and information domains—known as the "three dominances." According to *Science of Campaigns,* "[s]eizing information dominance in a landing campaign is the crux to seizing air dominance and sea dominance," and "[t]he goals in seizure of information dominance are to greatly reduce the operational effectiveness of the enemy's electronic equipment, and to ensure the full realization of the operational effectiveness of friendly electronic equipment."[9]

PLA campaign literature states that it is essential, first, to seize the advantage over the adversary by degrading its command-and-control (C2) networks and the ability of different nodes within the system to communicate with each other.[10] At that point, the PLA would launch long-range strikes in an attempt to disrupt the adversary's ability to resist or engage in military operations effectively. The PLA then would be in a position to seize dominance in the relevant contested domains—in the case of Taiwan, the air and maritime domains.

There are almost no publicly available studies or analyses that discredit this approach. However, interestingly, it appears that PLA researchers do not see it as a silver bullet for the Taiwan campaign. This is consistent with the appearance of a number of PLA articles expressing concern that the PLA

still is unable to perform missions adequately in support of "informatized war."[11] For example, our searches of Chinese scholarly journals uncovered a number of articles in which researchers from the PLAN Marine Corps training base appear to assume that enemy capabilities within the air and maritime domains will be quite robust, suggesting that the PLA still is sorting out how to address these threats operationally and tactically.

For example, one study examined how best to distribute the firepower of amphibious assault ships armed with antiair-missile capabilities for the purposes of enhancing the defense of the amphibious task force (ATF).[12] A second study looked at various tactical situations the ATF might encounter and examined the capabilities of different antiair weapons systems to meet those different threats.[13] A third study considered hard- and soft-weapons capabilities to meet the air threat.[14] A fourth study probed the effectiveness of antiair weaponry on amphibious assault ships, depending on the type of air targets.[15] Finally, one study analyzed the entire antiair-warfare system through a comprehensive operational simulation confrontation between the PLA and an adversary.[16]

This series of studies examining the effectiveness of defensive weapons systems on amphibious assault ships indicates that PLA researchers are not complacent about the capacity of information-dominance and systems-disruption efforts to eliminate threats in the air and maritime domains. It further suggests that the PLA does not believe that its ability to seize air superiority over the Taiwan Strait can be assured.

Principle 2: Key-Point Strikes

During World War II, the first combatant force to use naval gunfire to strike targets ashore was the Imperial Japanese Navy during the Guadalcanal campaign. The Allies subsequently used and further developed this tactic in all their amphibious campaigns in numerous theaters of the war. The focus of naval-gunfire support and strike warfare in support of an amphibious landing was on breaking coastal defenses. During the planning for the June 1944 Normandy landing, some consideration went into striking targets deep inland in anticipation of a German armored response to D-day. Likewise, early Allied planning called for attrition of the Luftwaffe and strikes on railway networks to slow the defense's response.[17] However, the vast majority of planning went into how either to destroy coastal defenses or to stun the defenders into submission prior to the assault.

The PLA has taken the concept of strike operations as preparation for invasion and expanded the doctrine to include attacking all elements of the adversary's system of defense. As part of the larger concept of "systems-destruction warfare," the PLA concept of key-point strikes includes attacks

on early-warning detection systems, command and communications systems, missile positions, air-defense systems, hangars and runways, bases, and harbors and anchorage areas.[18] Additionally, the PLA concept calls for coordinated strikes using missiles, aircraft, special forces, and information-warfare assets. To do this, the PLA subscribes to the continued development and refinement of a reconnaissance/targeting/intelligence/battle-damage-assessment process, planning that conceptually focuses on systems warfare and systems-on-systems attacks, and the capability to coordinate and synchronize these strike-warfare operations.[19]

Although PLA joint doctrine appears to have embraced fully the importance of "key-point strikes" and "systems-destruction warfare," its direct application to an amphibious assault does not appear to be completely settled. The presence of PLA Rocket Force (PLARF) personnel during PLA amphibious exercises strongly suggests a key role for that branch of the PLA, including to conduct ballistic-missile strikes against key nodes, transportation networks, communications sites, and C2 sites, but also to attack Taiwan's coastal defenses directly.[20] However, numerous studies by PLA researchers have focused on placing missiles and other sources of firepower on local assets such as surface ships, armored assault vehicles and landing craft, and unmanned systems.[21] This suggests either that the PLA is not completely confident that short-range ballistic missiles alone will accomplish the mission or that it simply wants to enjoy plenty of redundancy in its firepower system when it attempts to break through Taiwan's coastal defenses.

Principle 3: Concentration of "Elite Strengths"

Regarding the question of how to concentrate amphibious forces during landing operations, the Allies during World War II came to different conclusions depending on the theater of operation. For instance, given the objectives of the ground campaigns following landing operations and the geography of the respective landing areas, the North African and Sicilian operations called for dispersed landings. Conversely, the Central Pacific operations directed at tiny atolls had very few options but to land at the point of heaviest Japanese defenses; by necessity, they concentrated their amphibious assaults.[22]

The PLA traditionally has called for local superiority at the point of attack and therefore has been inclined to concentrate its attack forces.[23] The challenge of Taiwan's geography, which provides only a few landing options, has prompted the PLA further to concentration of its attack. *Science of Campaigns* states the following:

> Concentration of elite strengths is a law for defeating one's opponent in a localized war campaign under informationized conditions, and is also an important material basis in striving for victory in a campaign. In a future landing campaign, under conditions where the enemy has superiority in high-performance naval and aerial ordnance and in advance development of the battlefield, if one wants to break through the enemy's defenses and win a victory in the campaign, one must concentrate elite strengths—Navy, Air Force, and 2nd Artillery Corps [PLARF] force-units, and the landing assault force-units—to form a dominant position over the enemy.[24]

Such concentration involves several key characteristics. It hinges on the synthesis of high-tech weaponry, high-quality troops, and manpower and material resources. It also calls for a focused effort at the main-direction and key-point areas of attack; concentration of effort at critical junctures in the campaign, particularly the first engagement; and concentration of capabilities to resist and defend against an enemy's military intervention.[25] For the PLA, concentration requires advanced command, control, communications, computers, intelligence, surveillance, and reconnaissance fusion that is networked and integrated with all the principal actors involved in the amphibious assault; maneuverability and agility of the operational forces; and seamless, integrated joint operations by the invasion force.[26]

The PLA's emphasis on concentration of elite capabilities is demonstrated in other doctrinal writings. Chapter 2 of the 2013 *Science of Military Strategy* discusses the core principles and elements of the PLA's "active defense" strategy, highlighting the importance of concentrating superior forces to "annihilate" enemy forces. In principle, achieving localized superiority can help the PLA secure the initiative and preserve freedom of maneuver for friendly forces. The overall strategic initiative can be gained through a series of localized victories.[27] In an amphibious campaign, concentrated forces could seek to achieve local overmatch in Taiwan's relatively few landing areas.

Enhanced C2 of PLA forces at the tactical and operational levels will be necessary to accumulate consecutive tactical victories and achieve localized superiority. Evidence of the focus on this point includes publicly available reporting on PLA exercises that portrays a highly centralized C2 process at the brigade-command level. This process reportedly integrates tasks such as receiving reconnaissance reports on enemy dispositions from reconnaissance teams, ordering missile attacks on enemy artillery and missile positions, and using integrated command platforms to coordinate unmanned vessels to break up and destroy obstacles and mines.[28] PLA doctrinal

publications have claimed that to manage this process effectively, the PLA command in charge of the campaign must speed up the "reconnaissance-control-attack-evaluation" cycle, which suggests that the key to mastering this cycle is improving the process of collecting and evaluating real-time battlefield intelligence, deciding what to do with the gathered information, and then rapidly directing units in the field to take action.[29]

Achieving force concentration in landing areas requires high levels of joint coordination and control of a multitude of different force elements in a complex and changing battlefield environment. We found PLA research that seeks to improve on a centralized decision-making process for the joint-landing campaign. One such study analyzed the use of an algorithm in support of a C2 method for adjusting mission plans in response to emergencies or other incidents arising suddenly from a complex, changeable battlefield environment.[30] Another study tests a large-scale loading-optimization model that could help the overall amphibious commander to centralize planning and management for a large-scale amphibious assault, which would include the management and assignment of available ships, the identification and use of berthing spaces, the assignment of forces for embarkation, and the rerouting of forces owing to changing circumstances.[31] This essentially follows the Normandy model, which centralized C2 of the entire Allied force conducting the invasion.[32]

Principle 4: Rapid and Continuous Assaults

A long-standing challenge of large-scale amphibious operations has been the difficulty of quickly breaking through concentrated defenses, conducting a landing, and then moving inland rapidly with minimal operational pause. Many of the World War II operations, but especially the June 1944 D-day landings in Normandy, presented the thorny problem of how to breach and traverse sea-mine fields, obstacles in the surf zone, mines and obstacles on the beaches, and concentrated coastal defenses that included coastal-defense bunkers, artillery presighted in on beaches, and defenders in open emplacements armed with automatic weapons.[33]

Anticipating similar challenges to PLA efforts to penetrate Taiwan's defenses, *Science of Campaigns* calls for the conduct of rapid and continuous amphibious assaults. It correctly emphasizes eliminating obstacles and mines at the landing area; calls for the combination and coordination of amphibious vehicle, helicopter, hovercraft, and surface-effect-craft assaults; advocates for the achievement of surprise at the point of landing; and calls for actions and tactics to facilitate the landing of second-echelon and follow-on forces.[34]

The PLA seems aware that enemy mines on the beaches, in the surf, and in the Taiwan Strait would pose a tremendous challenge to its ability to conduct rapid, continuous amphibious operations. It has spent some time wrestling with the mine and obstacle problems. As Thomas Shugart argues in chapter 11 of this volume, there is evidence that PLA planners propose to manage the mine problem through offensive mining of the enemy's ports and harbors—an approach that is diametrically opposite to the U.S. Navy's defensive approach to mine countermeasures. At the same time, we identified a number of different PLA studies on the defensive-mining problem. These include papers that address how to locate, track, and mark mines; how to use rotary-wing unmanned aerial vehicles to destroy identified mines; and how to set up a comprehensive system to counter the enemy mine problem.[35] The diversity of research on this topic strongly suggests that PLA joint doctrine remains unsettled about the most efficacious approach to addressing the mine problem in a Taiwan scenario.

Principle 5: Integrated and Flexible Support Operations

Another traditional challenge of amphibious operations is supplying the invasion force once it has landed successfully and is starting to move inland to achieve the campaign's larger objectives. During the Allied invasion of North Africa (Operation Torch), Gen. George S. Patton Jr. was infamously frustrated that initially he could not take his tanks to Casablanca, because they could not make the journey from the landing sites in Morocco without refueling, and the landing force had no trucks to carry fuel supplies.[36] In the earliest amphibious operations of the war, the U.S. Navy and U.S. Army repeatedly loaded landing craft with bulk stores and other difficult-to-haul matériel, causing those stores to be stockpiled on beaches for twenty-four hours or more—a practice that left Allied logistics vulnerable to air attack.[37] Both the Americans and the Japanese had difficulty providing steady, uninterrupted, and protected supplies to their forces on Guadalcanal.[38] Japanese supply problems were so severe that the Japanese combatants referred to Guadalcanal as "Starvation Island." The planners for the Normandy invasion were sufficiently concerned about the difficulty of providing fuel to their invading force continuously that they incorporated a new scheme: establishing a fuel farm on the Isle of Wight and running a large pipeline from there to the invasion beaches (the scheme was known as Pipelines under the Ocean, or PLUTO).[39]

In light of the need to supply PLA forces continuously after they succeed in creating a lodgment on Taiwan, chapter 13 of *Science of Campaigns* calls for the development and employment of an integrated and flexible support

system for the amphibious invasion. In particular, the text calls for the following:

- A military-civilian integrated supply and logistical support system
- Flexible and agile support modes of logistical operations
- A process to integrate comprehensively and unify the wide array of supporting activities and units

These activities encompass not only the provision of fuel, food, and ammunition but the performance of vital functions such as medical support.[40]

Given the magnitude of effort associated with a Taiwan invasion and its related logistics-support operations, it would be extremely difficult to execute integrated and flexible support operations effectively for such a mission. As J. Michael Dahm shows in his chapter, the execution of military-civil fusion operations in support of a Taiwan mission must overcome challenges that include ensuring civilian compliance with military requirements and adequate training to enable civilian performance of wartime duties. To conduct integrated and flexible support operations in support of a large-scale invasion of Taiwan, the PLA also must transition from a traditional approach to combat-service support, centered on warehouses and depots, to one centered on agile, just-in-time logistics and dynamic logistics operations. According to experienced observers of PLA logistics reform, the PLA has not achieved this level of transformation.[41]

The large number of studies by PLA researchers that explore various means of providing logistical support to a PLA invading force strongly suggests that logistical and support operations are a work in progress. One such study, for example, analyzed the use of amphibious transport dock–class ships for medical support (as opposed to providing on-site medical-ship care for the invasion).[42] Other studies explored how to ensure timely medical care for the PLAN special operations forces and medical support for naval aviators conducting maritime missions, further suggesting that the PLA's approach to providing medical support in a cross-strait invasion remains under development.[43]

Beyond the question of medical support, studies examining various logistical challenges that the PLA invasion force would face also suggest that the service has not worked out entirely other aspects of logistical support for this campaign. For instance, we discovered two studies highlighting PLA researchers' continuing concern about providing sufficient petroleum, oil, and lubricant supplies and other necessary war matériel to the invasion force. The first study examines the Allies' use of artificial harbors near or onto the landing site to ensure continued access to supplies; the second develops a method for comprehensively modeling the overall fuel

requirements of the amphibious campaign.[44] The PLA also appears still to be wrestling with plans related to the delivery of spare parts to the forces operating ashore. For example, one study develops a predictive model to help logisticians figure out how many and what kind of spare parts would need to be delivered to the invasion force for it to repair damaged armored amphibious vehicles; another study analyzes how to reduce amphibious armored equipment damage during landing operations, with specific logistics-support recommendations related to command, support sites, and military-civil fusion.[45] Finally, as mentioned above, the PLA appears to have embraced military-civil fusion wholeheartedly as part of the solution for delivering invasion-force equipment—in particular, the use of civilian vessels to supplement amphibious lift. The implementation of this solution, however, still appears to require a great deal of additional conceptualization and detailed planning. For instance, one study develops a model to help logisticians effectively use space on mobilized civilian general cargo, roll-on/roll-off, dry-bulk, and containerships for military-equipment transportation during a landing campaign.[46]

Principle 6: Psychological Attacks

During World War II, Allied campaigns employed psychological operations as precursors to major amphibious landings. A major component of Operation Neptune, the Allied airborne and amphibious assault on Normandy, involved a highly developed deception campaign to convince Nazi Germany that the invasion would take place either in the Scandinavian countries (Fortitude North) or at Calais (Fortitude South). Planning for Fortitude centered on psychological-operations principles that prescribe reinforcing what an enemy already believes or is inclined to believe. In this case, the German high command was inclined to believe that the invasion would take place in Calais. As a result, the deception campaign centered on reinforcing this idea through the creation of a "phantom army" near Dover, complete with fake message traffic, fabricated reports from German agents captured by the Allies, false movement of troops, the assignment of General Patton—whom the German high command expected to be placed in command of the invasion—to command the phantom army, and even the movement of a token number of forces toward Calais on D-day itself.[47]

Psychological operations also were manifest in the extensive use of propaganda leaflets dropped into France and other German-occupied countries just prior to and following the beach assault. In the first week of the invasion, more than twenty thousand leaflets were dropped into Normandy and additional appeals were broadcast into France via radio. German and other Axis military personnel were subjected to hundreds of propaganda

leaflets dropped by special Allied "leaflet squadrons." The leaflets described the extent of the Allied effort, asserted the hopelessness of the Axis cause, and warned the defenders that if they remained in place they surely would perish. The radio broadcasts warned French citizens to stay clear of the areas impacted by the assault, but also requested their assistance in sabotaging rail and road networks.[48]

PLA campaign literature identifies psychological operations as being key to successful military campaigns, including amphibious invasions.[49] One PLA author explains that such operations consist of the following three components:

- Extensive use of propaganda (through print media, television, radio, and social media) to affect the mood, morale, and fighting spirit of the defenders and adversary citizens
- A large display of weaponry and military capability and an apparent willingness (through demonstrations) to use overwhelming force, to terrify the opposing army and citizenry into surrendering their positions
- Psychological deception, trickery, and sleight of hand used to lull defenders into complacency and fool enemy forces into believing the attack will take place elsewhere[50]

The article specifically cites the Allies' Operation Body Guard, which, the author claims, aimed at psychologically lulling German defenses into complacency while the Allies launched the Normandy amphibious and airborne invasion.[51]

The PLA also discusses psychological attacks in *Science of Campaigns,* with specific recommendations for creating psychological effects prior to the assault. The landing-campaign chapter calls for actions that isolate and split up enemy formations and defenses. It specifically advocates using a full range of psychological-warfare tools, including focused propaganda. Moreover, it recommends that the PLA select targets carefully to reduce civilian casualties by using precision-guided munitions to control effects, thereby seeking to mitigate animosity in the population.[52]

Analysis of PLA writings confirms that China's military largely has accepted a wide body of Western doctrine related to amphibious operations. Included are doctrines on the following:

- Ensuring amphibious C2
- Establishing maritime and air superiority
- Embarking forces and loading amphibious ships properly
- Providing escorts for assault forces

- Isolating the area of the amphibious objective
- Conducting naval strikes on coastal defenses ashore
- Determining the right mix of assault forces and follow-on echelons
- Providing specialized landing vessels to perform amphibious functions

Although the subjects of force-structure development and PLA exercises lie beyond the scope of this chapter, observable trends in these areas reinforce the conclusion that the PLA broadly, and the PLAN specifically, largely have accepted basic tenets of amphibious doctrine as practiced in the West.[53] The most prominent examples include the development and acquisition of landing-helicopter-assault ships and LPDs, hovercraft assault platforms, armored amphibious-assault vehicles, and new classes of mine-warfare vessels.

This chapter has identified the six key principles that reside at the core of Chinese amphibious doctrine. Those principles reflect the PLA's current thinking on the war-fighting environment and the specific challenges of conducting an amphibious assault against Taiwan. These principles reflect the PLA's aspirations, not necessarily its current capabilities. This chapter examined a number of academic studies by PLA researchers aimed at developing tactics and technical solutions to realize these doctrinal principles. The journals associated with these studies are highly technical, but the large volume of these studies reflects the heightened importance the PLA has placed on realizing these approaches in a large-scale invasion of Taiwan.

Notes

1. Where the subject under discussion is larger doctrine, this chapter refers to the PLA's amphibious doctrine; where the subject is naval missions and doctrine specifically, the chapter refers to the PLAN. As a result, the reader will note a switching back and forth between the terms *PLA* and *PLAN*.
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6. Other texts, such as the 2013 edition of the Academy of Military Science's *Science of Military Strategy* and the 2020 edition of National Defense University's *Science of Military Strategy,* also reference some of these concepts, albeit in less depth. See 肖天亮 [Xiao Tianliang], ed., 战略学 [*Science of Military Strategy*] (Beijing: National Defense Univ. Press, 2020), pp. 231–32; and Academy of Military Science Military Strategy Studies Department, *Science of Military Strategy,* trans. CASI and Project Everest, In Their Own Words: Foreign Military Thought (Montgomery, AL: CASI, 2021), pp. 250, 263, 278, available at www.airuniversity.af.edu/CASI/Display/Article/2485204/plas-science-of-military-strategy-2013/. For the original Chinese source of the latter, see 军事科学院军事战略研究部 [Academy of Military Science Military Strategy Studies Department], 战略学 [*Science of Military Strategy*], ed. 寿晓松 [Shou Xiaosong] (Beijing: Military Science, 2013).
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17. Yung, *Gators of Neptune,* pp. 80, 126.
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PART II

The Joint Amphibious Force

Dennis J. Blasko

4. The PLAGF Amphibious Force

Missions, Organization, Capabilities, and Training

One of the most important missions assigned to the People's Liberation Army (PLA) ground forces (PLAGF) is to provide forces equipped and trained to enhance China's military posture to deter Taiwan from taking further steps toward independence. All four services—the PLAGF, the PLA Navy (PLAN), the PLA Air Force (PLAAF), and the PLA Rocket Force (PLARF)—plus the Strategic Support Force and Joint Logistics Support Force, have a role in this effort. If deterrence fails, one military option available to the senior Chinese Communist Party leadership is to order the PLA to conduct what would be an extremely difficult and complex operation known as a joint island landing campaign, which would be supported by a joint-firepower campaign. Although a traditional over-the-beach amphibious landing likely would not be the first military course of action undertaken in a campaign directed against Taiwan, the PLA clearly is preparing for this possibility should other options fail.

The core of the PLAGF's contribution to the Taiwan deterrence and war-fighting missions resides in six amphibious combined-arms brigades (ACABs) assigned, two each, to the three group armies stationed closest to Taiwan in the Eastern and Southern Theater Commands (TCs). Reforms undertaken since 2017—which include increasing the capabilities and capacities of PLAGF helicopter units and special-operations forces (SOFs), long-range multiple-rocket launchers and air-defense weapons, and nonkinetic electronic-warfare and cyberattack units—have expanded greatly

the options available to PLAGF commanders to conduct joint island landing and joint-firepower campaigns.

If ordered to conduct operations against Taiwan or its offshore islands, the six ACABs will work in concert with elements of their parent group armies and theater commands in an operation that likely will be reinforced by additional PLAGF units from outside the region. Any PLAGF action against Taiwan will be coordinated with units from the other services and forces, and it also will involve militia forces and civilian assets in support. However, because the various forces involved are dispersed in peacetime, it will require days, if not weeks, to move and assemble the units within striking range of Taiwan and prepare them for launching an assault.

Once these forces are ashore, they will face the fact that Taiwan's topography is not optimal for conducting rapid, large-scale, mechanized, offensive movements. Only a few beaches along its west coast are suitable for amphibious landing, and behind them the terrain soon becomes mountainous and checkered with rice paddies and urban sprawl. Given the restrictions that the terrain imposes, the PLA leadership apparently has sought to modernize PLAGF capabilities, as well as capabilities in the other services, in an attempt to shift the decisive phase of a joint island landing campaign away from a traditional over-the-beach amphibious assault followed by a mechanized ground movement inland. Instead, the effort will entail a series of airborne (parachute) or airmobile (helicopter) assault operations to seize ports of entry on the coast, airfields, and other key terrain/objectives closer to the center of gravity of Taiwan's defenses. This will enable the rapid insertion of second-echelon, follow-on forces by sea and air.[1] Nonetheless, a large-scale assault by multiple ACABs remains a major component of China's deterrence posture and any joint-landing operation.[2]

This chapter first addresses the current status of the PLAGF's ACABs and the support they are likely to receive from their brother army units. It then discusses training, including examining PLAGF amphibious and sea-transport exercises and drills conducted in 2021 that involved both amphibious and nonamphibious PLAGF units. This analysis is consistent with, and supports, the U.S. Defense Department's assessment in 2020 and 2021 that "[b]oth PLAA [PLA Army] and PLAMC [PLAN Marine Corps] units equipped for amphibious operations conduct regular company- to battalion-level amphibious training exercises, and the PLA continues to integrate aerial insertion training into larger exercises. . . . The PLA rarely conducts amphibious exercises involving echelons above a battalion, although both PLAA and PLANMC units have emphasized the development of combined-arms battalion formations since 2012."[3]

Order of Battle

Prior to the 2017 reforms, three PLAGF amphibious units were stationed on China's east coast:

- The 1st Amphibious Mechanized Infantry Division, First Group Army (GA), located in Hangzhou, Zhejiang, in the Nanjing Military Region
- The 14th Amphibious Armored Brigade, Thirty-First GA, located in Zhangzhou, Fujian, in the Nanjing Military Region
- The 124th Amphibious Infantry Division, Forty-Second GA, located in Boluo, Guangdong, in the Guangzhou Military Region[4]

Like most of the other PLAGF divisions, the 1st Amphibious Mechanized Infantry Division and the 124th Amphibious Infantry Division were disbanded, and each was transformed into two ACABs. The 14th Amphibious Armored Brigade also was transformed into an ACAB, and elements of the former 91st Motorized Infantry Division, also in Zhangzhou, were equipped to form a sixth ACAB. Several units were transferred from their previous garrison locations to new areas, with moves that included crossing former military region boundaries. As a result, four ACABs are subordinate to the Eastern TC and two to the Southern TC, distributed across three group armies.[5]

PLAGF Amphibious Combined-Arms Brigades

The six new ACABs are structured similar to heavy combined-arms brigades, but have been issued amphibious assault guns—capable of swimming in the ocean—instead of main battle tanks, and amphibious infantry fighting vehicles / armored personnel carriers—also capable of swimming—instead of vehicles that sink.[6] Each ACAB is composed of the following:

Table 1. PLAGF Amphibious Combined-Arms Brigades (ACABs)

Group Army	Brigade Name	Location
72nd	5th ACAB	Hangzhou, Zhejiang
	124th ACAB	Hangzhou, Zhejiang
73rd	14th ACAB	Zhangzhou, Fujian
	91st ACAB	Zhangzhou, Fujian
74th	1st ACAB	Boluo, Guangdong
	125th ACAB	Bao'an, Guangdong

- Four combined-arms battalions—each with two amphibious assault gun companies, two amphibious mechanized infantry companies, a firepower company (mortars and man-portable air defense systems [MANPADS]), and a service support company (with reconnaissance and engineer platoons)
- One reconnaissance battalion with amphibious recon vehicles, small unmanned aerial vehicles (UAVs), and technical reconnaissance systems
- One artillery battalion with amphibious 122 mm howitzers, tracked 122 mm rocket launchers, and antitank guided-missile systems
- One air-defense battalion with tracked antiaircraft gun systems, short-range surface-to-air missile systems, and MANPADS
- One operational support battalion with command-and-control (C2) vehicles, electronic-warfare systems, engineering equipment, chemical-defense systems, and security elements
- One service support battalion with supply, medical, and repair and maintenance units[7]

Within the four amphibious combined-arms battalions, each assault gun and mechanized infantry company at full strength is equipped with fourteen vehicles, while the firepower and service support companies add another estimated fifteen to twenty vehicles.[8] A single amphibious combined-arms battalion incorporates about eighty total vehicles of all types and an estimated five to six hundred soldiers. The other five battalions within the brigade are smaller in personnel numbers and have fewer vehicles, adding an estimated two thousand or more personnel and probably about another hundred vehicles (but not all of them can swim). Thus, a full ACAB amounts to an estimated five thousand personnel and over four hundred vehicles—numbers that are important for planning how many amphibious ships or craft are needed to transport a complete unit. In total, the six ACABs command twenty-four amphibious combined-arms battalions and six reconnaissance battalions—units dedicated to being the first wave of an over-the-beach amphibious assault.

Group Army Support for Amphibious Operations

In any amphibious operation, ACABs almost certainly would be supported by other elements of the group army to which they belong. As a result of the 2017 structural reforms, each group army has a mostly standardized structure comprising a total of six combined-arms brigades and six or seven supporting brigades. Combined-arms brigades are categorized as "heavy"

(or amphibious), with tracked armored vehicles; "medium," with wheeled armored vehicles; or "light," transported by trucks or, increasingly, Mengshi (Warrior) wheeled armored vehicles. Although each group army has six combined-arms brigades, the distribution of brigade type—heavy, medium, and light—varies among the group armies (usually there are one to four of each type per group army). Nonamphibious brigades from the five group armies in the Eastern and Southern Theaters (Seventy-first through Seventy-fifth) and the three group armies in the Northern TC (Seventy-eighth through Eightieth) may engage in cross-beach landing training (from PLAGF amphibious craft or PLAN landing ships) or sea-transport movements (using commercial civilian ships). These exercises likely replicate the second echelon of an amphibious-landing campaign, coordinated to arrive after first-echelon forces have secured landing beaches or ports.[9]

The supporting brigades in a group army consist of an artillery brigade, an air-defense brigade, a SOF brigade, an army aviation (helicopter) or air-assault (helicopters and organic infantry) brigade, an engineer and chemical-defense brigade (five group armies have a separate engineer brigade and chemical-defense brigade), and a service support brigade. Nearly all these assets could be used to support amphibious operations.[10]

Group army artillery brigades would play an important role in providing fire support for the invasion. As a result of the 2017 reforms, all now are assigned a battalion of 300 mm PHL03 long-range, multiple-rocket launch systems having a range of 70 to 160 kilometers, depending on the type of munition. When properly positioned along China's coasts and offshore islands, these weapons could deliver fire on the Penghu Islands and the beaches on the west coast of Taiwan from Taichung north. More recently, the longer-range 370 mm PCH191 system has been deployed to the three group armies opposite Taiwan with ACABs, adding a second long-range, multiple-rocket launch battalion to their artillery brigades.[11] This new system greatly expands the area on the mainland from which these units can bring most of Taiwan's west coast (from Tainan north) under fire. Group army air-defense brigades along the coast will integrate their HQ-16-series medium-range surface-to-air missile and electronic-warfare units with PLAAF and PLAN air defenses to protect PLA assembly areas and sea movements in the Taiwan Strait.

PLAGF aviation brigades, air-assault brigades, or both provide group army commanders the ability to transport troops across the strait and deliver aerial fire support to both amphibious landings and airmobile operations farther inland. Army aviation units in group armies frequently train with SOF units and are likely to be employed to insert small SOF teams beyond the beach to capture important inland objectives. PLAGF helicopter

units train less frequently with infantry units, but army aviation brigades provide the group army commander the option of conducting airmobile operations to deliver units up to an infantry battalion in size to seize key terrain, such as airfields, as well as supporting landing operations with reconnaissance and attack helicopters. Except for the Seventy-third Group Army Aviation Brigade stationed in Fujian, which could make the round-trip flight to Taiwan from its home airfields, other army aviation brigades likely would need to predeploy to forward airfields and field-arming and refueling points prior to the start of a major operation. Some assembly and recovery field sites are likely to be situated on offshore islands closer to Taiwan than those on the mainland. In recent years, PLAGF helicopter units have practiced operations from PLAN ships and large commercial ships.[12] In addition to the army aviation and SOF brigades in the Seventy-second, Seventy-third, and Seventy-fourth Group Armies, several other out-of-area army aviation and SOF brigades are likely to reinforce the cross-strait mission.[13]

Other elements of the Seventy-second, Seventy-third, and Seventy-fourth Group Armies likely also would support the amphibious invasion. Group army engineer units, for example, may facilitate the movement to assembly areas and provide construction and camouflage support for units once they have arrived at points of embarkation. Chemical-defense units are capable of generating smoke to conceal key areas at critical periods of an amphibious operation. Service support brigades augment assault units with additional trucks and heavy equipment transporters necessary to move personnel, weapons, and supplies to assembly areas. Their communications, electronic-warfare, and UAV units will be integrated with other, nonarmy assets to maintain C2, produce nonkinetic combat effects, and gather intelligence.[14]

No ACABs are located in immediate proximity to the assembly and embarkation points, so they will need to make a land movement (by road or rail) of hours or days to reach their designated areas. Despite the conventional wisdom that Taiwan is located "about a hundred miles from the mainland," that rule of thumb applies only to units near coastal Fujian. Other units will have to make land, sea, or air movements much longer than a hundred miles to get into position to start combat operations or to reach Taiwan. Nonetheless, units probably have practiced many of these preassault tasks for many years during the course of routine training.

The PLA Training Cycle and Amphibious-Unit Training

All PLA units create annual training plans (or schedules) that include training objectives and the dates of major events, especially large exercises and

evaluations, training competitions, and training with foreign forces. They base these plans on guidance issued at an end-of-year training conference.[15]

For most PLAGF units (and ground units in the other services, such as the PLANMC, PLAAF Airborne Corps, and PLARF), which comprise a high percentage of two-year conscripts (estimated to amount to about 50 percent of personnel in squads, platoons, and companies), unit manning levels and training are dependent on the annual conscription cycle.[16] For decades, the PLA inducted new conscripts once a year; new soldiers entered basic training in September just as conscripts who had served two years were demobilized. For the next three months, while basic training was under way, only half a "conscript heavy" unit's authorized number of conscripts were available for unit training. Shortly after new soldiers entered their permanent companies in December or January and were integrated into their billets, the annual unit training cycle would begin. However, the new soldiers were not yet fully trained to be part of teams, and they also had to undergo on-the-job professional training in such areas as driving or heavy-weapons gunnery. As a result, the first four months (roughly through April) of unit training every year started with the basics of team building and improving the individual skills necessary to conduct larger, more-complex training.[17]

In 2021, the PLA changed from once-a-year conscription to a twice-a-year cycle, in the spring and fall.[18] Depending on how well this policy is implemented, it could raise significantly the level of readiness for "conscript heavy" units and allow them to take part in more-complex training throughout the year.

The Annual Training Cycle and Amphibious and Sea-Transport Training

In addition to developing proficiencies in the normal attack, defend, and withdraw tasks that any ground-combat unit must master, PLAGF amphibious units also must develop an array of specialized skills unique to their amphibious mission. It appears that battalions require about a month of shore-based training to prepare them to accomplish these basic tasks, so that they can participate in battalion-size or larger amphibious exercises.[19] Therefore, every year amphibious units rotate into and out of a limited number of coastal (beach) locations to develop these specialized abilities; they also deploy to inland training areas, often near their barracks, to train on the more-general tasks that all combined-arms battalions must be capable of conducting.[20] Many aspects of amphibious training also are more dependent on weather conditions, especially sea states, than other military training is, so most amphibious and sea-movement training occurs from around March to September. The limited window of good weather is a factor that

may interfere with units' completing all required training tasks every year. In addition to dedicated amphibious units, other PLAGF units located near the coast (not equipped with amphibious vehicles) also take part in shore-landing and sea-movement training.

The three largest permanent army amphibious training areas are at Dongshan Island in southern Fujian Province, at Dacheng Bay near the Fujian/Guangdong provincial border, and near Shanwei, Guangdong Province, with several other, smaller training areas located along the coast. The Dacheng Bay training area can accommodate an entire ACAB, while the others appear to be more suitable for an amphibious combined-arms battalion.[21] Basic tasks practiced at shore training areas include personal survival swimming; armored amphibious vehicle (AAV) driving, maintenance, and rescue/recovery; loading and unloading of AAVs on PLAGF landing craft onshore, on PLAN amphibious ships anchored offshore, or both; AAVs' entering the sea from shore for landing-formation practice or gunnery against shore-based targets; assault landing by AAVs swimming to shore from PLAN amphibious ships; shore landing by troops in small (squad size) motor boats; offshore and onshore obstacle clearance; and movement inland to destroy enemy forces. Progressive training for these tasks begins with squad and platoon drills, moving up to company and battalion formations. Every training season, new conscript vehicle drivers, gunners, and infantrymen must undergo this training to prepare themselves and the unit for larger battalion-evaluation exercises.[22]

In 2020, the *PLA Daily* produced a short video of a typical sequence of events in a battalion joint-landing exercise supported by brigade, group army, and PLAN assets. It covered the following:

- Day and night loading of PLAN amphibious ships anchored offshore or in port
- Small teams in rubber boats conducting initial reconnaissance of landing beaches, assisted by small UAVs
- Artillery bombarding landing beaches (in this case, 122 mm howitzers and 122 mm multiple-rocket launchers from the brigade artillery battalion provided fire support)[23]
- Attack helicopters (from the group army aviation brigade) firing on targets near the beach, or transport helicopters inserting troops to objectives beyond the shoreline, or both
- Unmanned surface vessels clearing obstacles in the water from the approaches to landing beaches
- Reconnaissance and engineer troops landing in small motorboats to clear beach obstacles

- Amphibious fighting vehicles and assault guns disembarking from PLAN amphibious ships to assault the shore and consolidate the beachhead
- Helicopters inserting additional SOF troops beyond the beach
- Armored amphibious units moving inland to seize key terrain and assigned objectives
- Small unmanned reconnaissance robots advancing inland[24]

Although the recorded demonstration was intended for external audiences, the individual clips and sequence of events conform to PLA amphibious-landing doctrine. Similar exercises probably are conducted by many, if not all, amphibious combined-arms battalions as a culmination and evaluation of their time spent training at the coast.

Battalions are the building blocks of larger operations, so preparing battalions to perform the technical intricacies of amphibious landings is fundamental to any large-scale joint island landing campaign. Execution of each phase of an amphibious operation is extremely difficult on its own, but in combination the phases must be carefully planned, sequenced, and controlled by staffs at brigade and higher levels to ensure that all assets and capabilities are employed properly and do not interfere with actions taken by brother units. However, a large-scale joint island landing does not need to be practiced all at the same time and in the same area; furthermore, some aspects, such as PLARF strikes, can be computer simulated for staff planning purposes.

Annual amphibious training thus includes a lot of small-unit practice before larger exercises can be conducted. Given the total number of amphibious combined-arms battalions to be trained at the small handful of training areas, at least one unit, and usually more, will be conducting some phase of amphibious training throughout the spring and summer, weather permitting. The Chinese military media routinely publicize much of this training, for deterrence and propaganda effects. However, not all exercises are reported in the media, and what is reported often does not identify the units involved, the exercise location, or the length of the exercise. Most of the time, not all elements of the exercises are included in media reports—so what is seen and reported may not represent the totality of the exercise—and some exercises are reported multiple times by multiple media outlets. File footage from other exercises may be used to fill gaps in current reports, and reporting may contain errors in details.

Analysis of PLAGF Amphibious and Sea-Movement Training in 2021

Openly reported training events in 2021 illustrate the annual cycle of PLA amphibious and sea-movement training.[25] What follows is an analysis of

roughly thirty-two army amphibious training events and six sea-movement exercises employing civilian roll-on/roll-off (RO/RO) ships reported in the Chinese media (including two entries observed on Google Earth imagery) from March through October 2021.[26] This analysis covers both amphibious and nonamphibious units across the PLA, including from other TCs and group armies beyond the Seventy-second, Seventy-third, and Seventy-fourth Group Armies. The chapter appendix provides brief descriptions and sourcing data for these events. The events analyzed here certainly do not include all PLAGF amphibious and sea-movement training (since many events are not covered by the Chinese media), but they represent a significant portion of what occurred during 2021.

At least ten of the thirty-eight events were covered by multiple Chinese media reports. Of the total, twenty-nine were conducted by units from the Eastern TC, seven by the Southern TC, and two by the Northern TC. Only nine events revealed training with PLAN sealift assets, and only three included movement by army landing craft (two of the PLAGF units were not amphibious units).

Six exercises used civilian RO/RO ships (four in the Eastern TC and two in the Northern TC, from mid-July to mid-August). Four of the brigades involved in the six movements by civilian RO/RO ships were not amphibious units. The number of sea-movement exercises probably was the most significant aspect of the 2021 training season, as those evolutions represent the landing of the second echelon of an amphibious assault after the first-wave forces (including airmobile or airborne troops) have captured ports where the ships could unload. These sea movements could have been coordinated with other real-troop exercises or with computer simulations to give higher-level staffs training in coordinating multiple units in a single larger notional exercise.

In roughly twenty exercises, no landing ships were observed or mentioned, and amphibious vehicles were observed only swimming to or from shore, sometimes firing at targets onshore. It is possible that sealift was involved in some of these events, but the majority of amphibious training reports portrayed platoons and companies practicing the basics of amphibious movement to shore. These platoons and companies, no doubt, were deployed to amphibious training areas as part of the battalions to which they belong.

Only fourteen events were estimated to involve enough forces to be battalion-level exercises, including all six RO/RO sea-transport exercises (one of which appeared to involve multiple battalions of an air-defense brigade). Thus, as mentioned earlier, this analysis of training activity supports the U.S. Defense Department's conclusion that PLAGF amphibious units

"conduct regular company- to battalion-level amphibious training exercises," with increasing amounts of helicopter or heavy-lift insertion of personnel to support operations on the beach, but these operations rarely involve echelons above the battalion.

Without an examination of the level of amphibious and sea-transport training in previous years at the same level of detail, it is not possible to determine whether the tempo and content of three dozen exercises conducted in 2021 indicate an increase or decrease over normal training patterns. It also is not possible, using only open sources, to determine how many of the PLAGF's twenty-four amphibious combined-arms battalions achieved their targets for operational readiness. However, this analysis does demonstrate that amphibious training is undertaken routinely, somewhere along China's coast, weather permitting, nearly every week from March through October each year.

The modernization of PLAGF amphibious and support units demonstrates the *capability* to conduct amphibious operations. Regular amphibious and combined-arms training activities cover most of the general and specialized skills required to carry out a landing against Taiwan, despite the constraints of the conscription system. Moreover, group armies could render to their subordinate amphibious units significant combined-arms support, especially fire support, which has been enhanced by the recent delivery of advanced multiple-rocket launch systems. Furthermore, the number of sea-movement training events identified in 2021 also indicates effort to prepare second-echelon forces for delivery to Taiwan.

However, PLAGF amphibious capabilities do not necessarily translate into the *capacity* to launch a large-scale amphibious assault on Taiwan effectively. The number of units dedicated to the specialized task of amphibious assault is a small fraction (about 7 percent) of the number of combined-arms brigades in the entire force (six out of eighty-three total combined-arms brigades). Currently, there is no open-source indication of an intention to increase the number of ACABs. Moreover, the PLA lacks the amphibious lift capacity for the approximately thirty thousand personnel and the more than 2,400 vehicles of the six current ACABs.[27]

The PLAGF may be capable of more-modest aims. As the U.S. Defense Department assessed in its 2021 report, the "PLA is capable of attempting various amphibious operations short of a full-scale invasion of Taiwan. With few overt military preparations beyond routine training, the [People's Republic of China] could launch an invasion of small Taiwan-occupied islands in the South China Sea such as Pratas or Itu Aba. A PLA invasion of a medium-sized, better-defended island such as Matsu or Jinmen is within the PLA's capabilities."[28]

Some PLAGF amphibious units could swim to islands in the Matsu or Jinmen groups, be supported by their own organic artillery, and not require PLAN amphibious lift support. Such a scenario would not require performance of the difficult task of delivering large volumes of follow-on forces for the push inland. Such an operation on its own, however, likely would not be decisive enough to force Taiwan to capitulate.

The PLAGF's amphibious capacity has been augmented significantly by other capabilities. Since the 2017 reforms, new army aviation / airmobile and SOF brigades have strengthened options to support a joint island landing campaign beyond the traditional over-the-beach assault. The number of units capable of long-range rocket, missile, and aerial bombardment in all services also has increased over the past five years. New technologies, such as UAVs and robots, are being acquired that may expand capabilities further and complicate Taiwan's defense planning. These capabilities add new dimensions to previous PLA courses of action directed at Taiwan.

Appendix: PLA Ground Forces' Amphibious-Landing and Sea-Transport Training in 2021

No.	Date	Army Unit	Activity / Estimated Size
1	16 March (early spring)	72nd GA	PLAN Type 071 anchored, four AAVs in water to rear, Mi-17 and Z-10 attack helicopters over ship; platoon/company training[1]
2	29 March	73rd GA	Nine AAVs (in three photos) swimming to shore in a "maritime driving drill"; company training[2]
3	6 April	14th ACAB, 73rd GA	Type 63A, AAVs, small boats in landing training and inland movement and rail movement; battalion training[3]
4	9 April	STC / probably 74th GA	Amphibious battalion in parking area behind the beach, no beach activity; battalion training[4]

Notes:

AAV = armored amphibious vehicle; ACAB = amphibious combined-arms brigade; CAB = combined-arms brigade; ETC = Eastern Theater Command; GA = group army; IFV = infantry fighting vehicle; LCAC = air-cushion landing craft; LCM = medium landing craft; LST = tank landing ship; NTC = Northern Theater Command; PLAGF = People's Liberation Army ground forces; PLAN = People's Liberation Army Navy; RO/RO = roll-on/roll-off; STC = Southern Theater Command; UAV = unmanned aerial vehicle.

1. Photo from 中国军网 [*China Military Online*], 16 March 2021, www.81.cn/jfjbmap/content/2021-03/16/content_284858.htm.
2. "Amphibious Armored Vehicles Move Forward at Sea," *China Military Online,* 14 April 2021, english.chinamil.com.cn/view/2021-04/14/content_10021898_3.htm.
3. This reporting could possibly be file footage from different events. 奋进"十四五" 开启新征程训战一体锻造两栖作战劲旅 ["Forge Ahead in the '14th Five-Year Plan' and Open a New Journey, Integrate Training and War Fighting and Forge an Elite Amphibious Force"], 央视网-军事报道 [*CCTV—Military Report*], 6 April 2021, tv.cctv.com/2021/04/06/VIDEoRVvtwVQmtydt4HL8WYQ210406.shtml.
4. Satellite view of 22°49'20" N, 115°33'44" E, *Google Earth,* 9 April 2021.

Appendix. ***continued***

No.	Date	Army Unit	Activity / Estimated Size
5	12 April	74th GA	Five AAVs swimming; platoon/company training[5]
6	20 April	72nd GA	Trucks and armored vehicles loading/unloading on PLAN LST 917 in port; probably company training[6]
7	Late April	72nd GA	Three AAVs swimming from shore (Dongshan); company training[7]
8	29 April	STC / probably 74th GA	Three AAVs swimming ashore, approximately seven on beach, possibly up to fifteen in barracks motor pool (Shanwei); amphibious battalion in parking area behind beach; company training[8]
9	2 May	74th GA	Fourteen AAVs swimming from shore, firing while swimming, and landing on shore; company training[9]
10	11 May	74th GA	AAV swimming from PLAN LST (possibly a continuation of event 9); platoon or higher training[10]
11	12 May	73rd GA	Four AAVs swimming (no shore, no ships visible); platoon training[11]
12	17 May	14th ACAB, 73rd GA	Six to seven Type 63As and AAVs swimming and conducting landing training and movement inland; company training[12]

5. Image from 中国军网 [*China Military Online*], 17 April 2021, www.81.cn/jfjbmap/content/2021-04/17/content_287333.htm.
6. 直击演训场多兵种联合跨海装载航渡演练 ["Witnessing Multiarm Joint Training Exercises in Cross-Sea Loading and Transit Drills"], 央视网-军事报道 [*CCTV—Military Report*], 20 April 2021, tv.cctv.com/2021/04/20/VIDEPAv46kKuqhHi79euLnBy210420.shtml?spm=C53074552346.PLgREq4pd4yq.Ezufm7A0dzE0.63.
7. Photo from 中国军网 [*China Military Online*], 6 May 2021, www.81.cn/jfjbmap/content/2021-05/06/content_288597.htm.
8. Satellite views of 22°41°24° N, 115°25°6° E, and 22°49°20°, 115°33°44° E, *Google Earth,* 29 April 2021.
9. 节日我们在战位上粤东某海域两栖装甲部队泛海强渡 ["We Are at Our Combat Posts during the Festival, Amphibious Armor Units Crossing the Sea in an Area of Eastern Guangdong"], 央视网-军事报道 [*CCTV—Military Report*], 2 May 2021, tv.cctv.com/2021/05/02/VIDEjZDy2eiO0Y2iUJAUjg5w210502.shtml?spm=C52346.PPajx7cbYDEB.S60782.6; 直击演训一线·第74集团军某旅两栖装甲海上协同精准高效 ["Directly to the Front Line of Exercises, Amphibious Armor of the 74th Group Army Coordinates at Sea Accurately and Efficiently"], 正午国防军事 [*Midday National Defense*], 3 May 2021, tv.cctv.com/2021/05/03/VIDECeyR4VoKDqMrIFLBW28F210503.shtml?spm=C28340.PbtJD1QH3ct0.ET7FuMZSfFtz.1.
10. Photo from 中国军网 [*China Military Online*], 19 May 2021, www.81.cn/jfjbmap/content/2021-05/19/content_289689.htm.
11. 泛水编波 ["Surface Crossing Wave Formation"], 中国军网 [*China Military Online*], 14 May 2021, www.81.cn/jfjbmap/content/2021-05/14/content_289286.htm.
12. 百年铸辉煌第73 集团军某旅一连: 铁心向党当先锋 ["A Hundred Years of Glory, First Company of a 73rd Group Army Brigade: Serving as a Vanguard for the Party with Iron Hearts"]央视网-军事报道 [*CCTV—Military Report*], 17 May 2021, tv.cctv.com/2021/05/17/VIDEWNVi2Rios0GwfepgcjqK210517.shtml?spm=C52346.PPajx7cbYDEB.S60782.2.

Appendix. *continued*

No.	Date	Army Unit	Activity / Estimated Size
13	21 May	5th ACAB, 72nd GA	"Amphibious training exercise focused on subjects of basic driving, landing craft ferrying and assault wave formation"; company training[13]
14	18–21 May	73rd GA	*Mengshi* loads/unloads from PLAGF LCM LD174, as well as a truck from LD173; company training[14]
15	Mid-May	74th GA	Two AAVs circling LST "steer on and off a landing ship during the several-week-long realistic combat training"; platoon training[15]
16	23 May	72nd GA	Four AAVs swimming; platoon training[16]
17	26 May	73rd GA	Multiple AAVs swim on/off PLAN LST (similar to training seen in event 15); platoon training[17]
18	7 June	85th CAB, 72nd GA	Armored vehicles, trucks, and dismounted troops load/unload PLAN LSTs 982 (Yuting II), 981 (Yuting II), 939 (Yuting I) at port; battalion training[18]
19	13 June	14th ACAB, 73rd GA	Twelve AAVs landing, 2nd Battalion monthlong amphib training (no landing ships observed); battalion training[19]
20	15 June	73rd GA	Ten AAVs swimming ashore in line and abreast; company training[20]

13. "IFVs Conduct Amphibious Training," *China Military Online,* 11 June 2021, english.chinamil.com.cn/view/2021-06/11/content_10047785_2.htm.
14. "Military Vehicles Pull Out of RO-RO Vessel," *China Military Online,* 27 May 2021, english.chinamil.com.cn/view/2021-05/27/content_10040485.htm.
15. AAV loading/disembarking on two PLAN LSTs anchored off Dongshan can be seen on a Google Earth image dated 19 August 2019 at 23°41'15" N, 117°28'55" E. This also could be a continuation of training from event 9; "IFVs and Landing Ship Conduct Coordination Training," *China Military Online,* 5 June 2021, english.chinamil.com.cn/view/2021-06/05/content_10044245_2.htm.
16. Image from 中国军网 [*China Military Online*], 27 May 2021, www.81.cn/jfjbmap/content/2021-05/27/content_290304.htm.
17. "IFVs and Landing Ship in Coordination Training," *China Military Online,* 8 June 2021, english.chinamil.com.cn/view/2021-06/08/content_10045871.htm.
18. 直击演训场装载航渡锤炼部队两栖作战保障能力 ["Directly to the Training Grounds, Loading and Ferrying Tempers the Troops' Amphibious Combat Support Capabilities"], 央视网-军事报道 [*CCTV—Military Report*], 7 June 2021, tv.cctv.com/2021/06/07/VIDEG2rR4bpkta654OtugXRi210607.shtml; 东部战区两栖演练强化跨海作战能力 ["Eastern Theater Command Amphibious Exercises Strengthen Cross-Sea Combat Capabilities"], 央视网 [*CCTV*], 10 June 2021, v.cctv.com/2021/06/10/VIDEelyDFheIbd2pv3F8wwOb210610.shtml.
19. 海训场上砺精兵 ["Sharpening Soldiers at a Maritime Training Field"], *Chinese Central Television (CCTV),* 13 June 2021, tv.cctv.com/2021/06/13/VIDEWJ5I0ADBZfdN8t7qQHwg210613.shtml?spm=C28340.PbtJD1QH3ct0.ET7FuMZSfFtz.6.
20. "Amphibious Armored Vehicles Make Ways to Beach-Head," *China Military Online,* 18 July 2021, english.chinamil.com.cn/view/2021-07/18/content_10062990_3.htm.

Appendix. *continued*

No.	Date	Army Unit	Activity / Estimated Size
21	10 July	73rd GA	Twelve AAVs swimming ashore; company training[21]
22	19 July	35th CAB, 71st GA	35th CAB loading civilian RO/RO *Bohai Zuan Zhu,* including Type 96 tanks and Type 86 IFVs: event included personnel swim training; battalion training[22]
23	23 July	NTC	Heavy CAB (may be 69th CAB from Weifang) railroad movement to load RO/RO *Bohai Zuan Zhu* (Yantai–Dalian); at least battalion training[23]
24	Late July	91st ACAB, 73rd GA	"In late July, elements of the 73rd GA 91st CAB embarked onto [RO/RO] *Bohai Zhen Zhu* and SCSC *Fortune* at Xiamen Port for a 4-day training event"; probably at least battalion training[24]
25	27 July	14th ACAB, 73rd GA	Battalion command post, small-boat recon, forty to fifty small UAVs, formation of AAVs (three four-vehicle platoons) (Blue force on shore), landing included clearing obstacles, no landing ships observed (Dongshan); battalion training[25]

21. Image from 中国军网 [*China Military Online*], 13 July 2021, www.81.cn/jfjbmap/content/2021-07/13/content_294015.htm.
22. 奋斗百年路启航新征程牢记初心使命争取更大光荣第71集团军某合成旅: 传承英雄精神锻造精兵劲旅 ["Struggle for a Hundred Years, Set Sail for a New Journey, Remember the Original Mission, and Strive for Greater Glory. A Combined-Arms Brigade of the 71st Group Army: Inheriting the Heroic Spirit and Forging Elite Forces"], 央视网-军事报道 [*CCTV—Military Report*], 19 July 2021, tv.cctv.com/2021/07/19/VIDEPnwe0SMxNGTw5Y20sKvm210719.shtml?spm=C53074552346.PLgREq4pd4yq.0.0.
23. 刘海鹏 [Liu Haipeng], 胡兴 [Hu Xing], and 李游 [Li You], 铁水联运探索陆海投送保障 "新模式" ["Combined Rail and Waterway Transport Explores a 'New Model' of Land and Sea Delivery Support"], 中国军网八一电视 [*China Military Online Bayi TV*], 23 July 2021, tv.81.cn/jq360/2021-07/23/content_10066178.htm.
24. 赵亚雄 [Zhao Yaxiong], 范道恒 [Fan Daoheng], and 徐定海 [Xu Dinghai], 军地协同提升两栖部队跨海投送能力 ["Military-Civilian Coordination to Enhance the Ability of Amphibious Forces to Cross the Sea"], 中国军视网 [js7tv.cn], 16 August 2021, www.js7tv.cn/video/202108_255176.html.
25. This same exercise was reported again on 31 August 2021, the report noting the "recent beach raid training exercise . . . amphibious landing drills on subjects of landing craft ferrying, assault wave formation, beach-landing, obstacle breaking, and so on." 第73 集团军某两栖重型合成旅全记录: 东南沿海联合演练渡海登陆119高地 ["Full Record of an Amphibious Heavy Combined-Arms Brigade of the 73rd Group Army: Joint Drills along the Southeast Coast, Crossing the Sea and Landing on Hill 119"], 央视网-正午国防军事 [*CCTV—Midday National Defense*], 27 July 2021, tv.cctv.com/2021/07/27/VIDEamwpfPiwayHlDbs2qbIE210727.shtml; 解放军东南沿海越海夺岛登陆演练台媒: 剑指台湾 ["The People's Liberation Army Crosses the Sea and Seizes an Island in a Landing Exercise, Taiwanese Media: They Are Targeting Taiwan"], 新华网 [*Xinhua Net*], 28 July 2021, www.xinhuanet.com/mil/2021-07/28/c_1211262923.htm; "Amphibious Armored Vehicles Make Ways to Beach-Head," *China Military Online,* 31 August 2021, english.chinamil.com.cn/view/2021-08/31/content_10083283.htm.

Appendix. *continued*

No.	Date	Army Unit	Activity / Estimated Size
26	4 August	2nd CAB, 71st GA	Night railroad movement, tanks/armored vehicles, trucks daytime load/unload RO/RO *Bohai Zuan Zhu,* movement from ETC to NTC; at least battalion training[26]
27	4 August	73rd GA	Fourteen to fifteen small boats in shore assault and obstacle demolition; company training and evaluation[27]
28	Early August	34th CAB, 72nd GA	Five days/nights, *Mengshi,* armored vehicles, port loading, three army LCM LDX65s; battalion training[28]
29	9 August	73rd GA	Five AAVs disembark/embark on PLAN landing ship and launch at sea to circle ship and reload; company training[29]
30	11 August	NTC / Air Defense Brigade, 79th GA	Troops, at least two battalions towed antiair artillery, HQ-16, formation on dock, load/unload COSCO *Yong Xing Dao* RO/RO in Dalian; brigade training[30]
31	12 August (midsummer)	73rd GA	Seven AAVs swim ashore abreast, twelve AAVs swim ashore in line; (likely a continuation of event 29); company training[31]

26. 北部战区直击演训场军地联动探索陆海投送无缝衔接新模式 ["Directly to the Training Ground in the Northern Theater Command, Joint Military-Civilian Movement Explores a New Mode of Seamlessly Connecting Land and Sea Delivery"], 央视网-军事报道 [*CCTV—Military Report*], 4 August 2021, tv.cctv.com/2021/08/04/VIDERiyXyN3x702QuMbb6EP2210804.shtml?spm=C28340.PbtJD1QH3ct0.ET7FuMZSfFtz.9.
27. Image from 中国军网 [*China Military Online*], 8 August 2021, www.81.cn/jfjbmap/content/2021-08/08/content_295982.htm. The same footage of the 4 August 2021 event was included in reports on 25 August and 11 October. 燃! 抢滩登陆演练现场画面 ["Burn! The Scene of a Beach Landing Exercise"], 央视网新闻 [*CCTV News*], 25 August 2021, m.news.cctv.com/2021/08/25/ARTIXd5ZnaxisrgWIc9sNCHk210825.shtml; 赵亚雄 [Zhao Yaxiong] et al., 抢滩登陆演练正在展! ["In Southern Fujian Waters, a Beach Landing Exercise Is Under Way!"], 中国军网八一电视 [*China Military Online Bayi TV*], 11 October 2021, tv.81.cn/jq360/2021-10/11/content_10097575.htm.
28. 直击演训一线, 第72集团军某合成旅5天5夜远程航渡锤炼海上作战保障能力 ["Directly to the Front Line of Training, a Combined-Arms Brigade of the 72nd Group Army Conducts a 5-Day and 5-Night Long-Distance Voyage to Temper Maritime Combat Support Capabilities"], 央视网-正午国防军事 [*CCTV—Midday National Defense*], 5 August 2021, tv.cctv.com/2021/08/05/VIDEPpuHPreiW8HYi7UBIFFq210805.shtml?spm=C28340.PbtJD1QH3ct0.ET7FuMZSfFtz.3; 东南沿海, 陆军登陆演练! ["The Army's Landing Exercise on the Southeastern Coast!"], 环球网 [*Global Times*], 26 August 2021, china.huanqiu.com/article/44Vb0jX2UjP.
29. "Amphibious IFVs Practice Maritime Driving Skills," China Military Online, 27 August 2021, english.chinamil.com.cn/view/2021-08/27/content_10081994.htm.
30. 吴旭升 [Wu Xusheng] et al., 准备登船! 集群跨海投送演练开始! ["Ready to Embark! Grouped Cross-Sea Delivery Exercise Begins!"], 中国军网八一电视 [*China Military Online Bayi TV*], 11 August 2021, tv.81.cn/sytj-tupian/2021-08/11/content_10074519.htm.
31. Image from 中国军网 [*China Military Online*], 12 August 2021, www.81.cn/jfjbmap/content/2021-08/12/content_296304.htm; image from 中国军网 [*China Military Online*], 16 August 2021, www.81.cn/jfjbmap/content/2021-08/16/content_296598.htm.

Appendix. *continued*

No.	Date	Army Unit	Activity / Estimated Size
32	17 August	5th ACAB, 72nd GA	Seventeen AAVs swimming, amphib truck swims ashore, no landing ships observed; company training[32]
33	17 August	74th GA	May be light CAB, five army LCMs land on beach, ten small boats; battalion training[33]
34	17 August	ACAB, 73rd GA	122 mm self-propelled artillery, loading/landing RO/RO *Bohai Zhen Zhu* at ports; battalion training[34]
35	22 August	ETC	PLAN LCAC with elements of unidentified army brigade[35]
36	4 September	72nd GA	"[M]ilitary helicopters and amphibious assault vehicles attached to a brigade of the army under the PLA Eastern Theater Command conduct coordination in a maritime training exercise on September 4, 2021," with three PLAN LSTs; battalion training[36]
37	9 September	ETC	Six AAVs swimming in line; company training[37]
38	14 September	73rd GA	New soldier training, three AAVs swimming, firing drill, eight AAVs swimming (Dongshan); company training[38]
39	26 November	Unidentified army brigade	Two AAVs swimming, no details provided; platoon training[39]

32. 谢权鑫 [Xie Quanxin] et al., 超燃! 水陆两栖卡车海上装备抢救演练! ["On Fire! Amphibious Truck in At-Sea Recovery Drill!"], 中国军网八一电视 [*China Military Online Bayi TV*], 17 August 2021, tv.81.cn/jq360/2021-08/17/content_10076962.htm.
33. 直击演训场渡海登陆检验两栖作战能力 ["Directly to the Training Ground to Cross the Sea and Land, Testing Amphibious Combat Capabilities"], 央视网-军事报道 [*CCTV—Military Report*], 17 August 2021, tv.cctv.com/2021/08/17/VIDEAQfJHQvZya1fyG5XjqCR210817.shtml?spm=C52346.PiumOrlYLNUM.E0VXtwLj8YU7.12.
34. 直击演训场军地协同提升跨海投送能力 ["Directly to the Training Ground, Military-Civilian Coordination to Improve Cross-Sea Delivery Capabilities"], 央视网-军事报道 [*CCTV—Military Report*], 17 August 2021, tv.cctv.com/2021/08/17/VIDEEpnow4vveqIcoXVYlB4P210817.shtml?spm=C52346.PiumOrlYLNUM.E0VXtwLj8YU7.13.
35. Image from 中国军网 [*China Military Online*], 25 August 2021, www.81.cn/jfjbmap/content/2021-08/25/content_297467.htm.
36. "Amphibious Assault Vehicles in Maritime Training Exercise," *China Military Online,* 12 September 2021, english.chinamil.com.cn/view/2021-09/12/content_10088509.htm.
37. 泛水编波 ["Assault Wave Formation"], 中国军网 [*China Military Online*], 12 September 2021, www.81.cn/jfjbmap/content/2021-09/12/content_298856.htm.
38. 赵亚雄 [Zhao Yaxiong] et al., 新兵来了! 海上实弹射击初体验 ["New Recruits Are Here! First Experience of Live Fire at Sea"], 中国军网八一电视 [*China Military Online Bayi TV*], 23 September 2021, tv.81.cn/jq360/2021-09/23/content_10092493.htm; image from 中国军网 [*China Military Online*], 23 September 2021, www.81.cn/jfjbmap/content/2021-09/23/content_299601.htm.
39. Image from 中国军网 [*China Military Online*], 26 November 2021, www.81.cn/jfjbmap/content/2021-11/26/content_303946.htm.

Notes

1. In addition to PLAGF forces, PLAAF airborne units likely will be employed, early on in a joint island landing campaign, to capture inland airfields and perhaps coastal ports. Recent evidence of PLAGF helicopter and SOF training to secure ports and airfields can be found at 陆航+特战! 强强联手展开夜间兵力投送演练 ["Army Aviation + Special Operations! Join Forces to Launch Night Force Projection Exercise"], *PLA Daily,* 21 October 2021, www.81.cn/syjdt/2021-10/21/content_10101220.htm, and "Z-20 Helicopters to Play More Roles in China's Military," *PLA Daily,* 19 December 2020, english.chinamil.com.cn/view/2020-12/19/content_9955018.htm.
2. The emphasis on airborne, airmobile, and SOF operations in this paragraph differs from a generic description of a brigade amphibious operation found in Headquarters, U.S. Army Dept., *Chinese Tactics,* ATP 7-100.3 (Washington, DC: August 2021), sects. 7-54 to 7-57, armypubs.army.mil/epubs/DR_pubs/DR_a/ARN34236-ATP_7-100.3-001-WEB-3.pdf [hereafter *Chinese Tactics*]. ATP 7-100.3 contains a wealth of information about PLAGF organization, equipment, and tactics.
3. U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China 2021* (Washington, DC: Office of the Secretary of Defense, 2021), p. 120. In the 2020 report, this content is located on p. 118.
4. Dennis J. Blasko, "The PLA Army/Ground Forces," in *The PLA as Organization v2.0,* ed. Kevin Pollpeter and Kenneth W. Allen (n.p.: Defense Group Inc., [2015]), pp. 284–85, apps.dtic.mil/sti/pdfs/AD1082742.pdf.
5. Dennis J. Blasko, "The PLA Army after 'Below the Neck' Reforms: Contributing to China's Joint Warfighting, Deterrence and MOOTW Posture," *Journal of Strategic Studies* 44, no. 2 (2021), pp. 170–71.
6. The 14th still is equipped with some older Type 63A light amphibious tanks, but they likely will be retired in the relatively near future. After reforms, Type 63As have been seen in the report "Amphibious Light Tanks Head to Shore in Formation," *PLA Daily,* 2 August 2019, eng.chinamil.com.cn/view/2019-08/02/content_9577563.htm, and video at "PLA Conducts Joint Multi-dimensional Sea-Crossing and Island-Landing Drill," *PLA Daily,* 13 October 2020, english.chinamil.com.cn/view/2020-10/13/content_9917986.htm.
7. Joshua Arostegui, "PLA Army and Marine Corps Amphibious Brigades in a Post-reform Military," in *Crossing the Strait: China's Military Prepares for War with Taiwan,* ed. Joel Wuthnow et al. (Washington, DC: National Defense Univ. Press, 2022), p. 179. See also *Chinese Tactics,* secs. 2–9.
8. Because of the lack of numbers from official Chinese sources, the author uses the word "estimated" to qualify the guesses he made to fill in information gaps throughout this chapter.
9. Blasko, "The PLA Army after 'Below the Neck' Reforms," pp. 162–64.
10. Ibid., pp. 162, 164–65.
11. Liu Zhen, "China's Military Gives Glimpse of Updated Long-Range Rocket System," *South China Morning Post,* 9 January 2021, www.scmp.com/news/china/military/article/3117044/chinas-military-gives-glimpse-updated-long-range-rocket-system.

12. "Army Helicopters Coordinate with Naval Landing Ships in Joint Training," *PLA Daily,* 26 September 2021, english.chinamil.com.cn/view/2021-09/26/content_10093530.htm; "Multi-type Army Helicopters Conduct Deck-Landing Training on Civilian Semi-submersible Vessel," *PLA Daily,* 21 August 2020, english.chinamil.com.cn/view/2020-08/21/content_9887106.htm.
13. It is unlikely that all army aviation or SOF assets will be deployed to support a Taiwan campaign. A few units are likely to remain behind in each theater command in case of emergency on another front. Nonetheless, a total of ten each army aviation and SOF brigades, or two-thirds of available units, would be a reasonable estimate for a phased deployment before and throughout the duration of the campaign.
14. Each theater command army also has a subordinate electronic-countermeasures brigade that will be integrated into the campaign as appropriate.
15. "Regular Press Conference of the Ministry of National Defense on January 27," *PLA Daily,* 7 February 2022, eng.chinamil.com.cn/view/2022-02/07/content_10129458.htm; Chen Guoquan and Li Tang, "Chinese Navy to Conduct Combat Drills in South China Sea," *PLA Daily,* 23 March 2018, eng.chinamil.com.cn/view/2018-03/23/content_7982176.htm.
16. Aviation units in all services and ship units have higher percentages of commissioned and noncommissioned officers than most army, marine, and airborne units and should not be affected as greatly by conscripts coming and going. Accordingly, aviation and ship units should be able to maintain higher levels of readiness and be available for larger and more complex training exercises and real-world missions throughout the year than their ground-focused comrades.
17. Marcus Clay and Dennis J. Blasko, "People Win Wars: The PLA Enlisted Force, and Other Related Matters," *War on the Rocks,* 31 July 2020, warontherocks.com/2020/07/people-win-wars-the-pla-enlisted-force-and-other-related-matters/. In 2013, the period of recruitment and basic training was shifted to the fall; prior to that, recruits went to basic training in December and units were undermanned for three months during the winter portion of the training season.
18. Marcus Clay, Dennis J. Blasko, and Roderick Lee, "People Win Wars: A 2022 Reality Check on PLA Enlisted Force and Related Matters," *War on the Rocks,* 12 August 2022, warontherocks.com/2022/08/people-win-wars-a-2022-reality-check-on-pla-enlisted-force-and-related-matters/.
19. 海训场上砺精兵 ["Sharpening Soldiers at a Maritime Training Field"], *Chinese Central Television (CCTV),* 13 June 2021, tv.cctv.com/2021/06/13/VIDEWJ5I0ADBZfdN8t7qQHwg210613.shtml?spm=C28340.PbtJD1QH3ct0.ET7FuMZSfFtz.6.
20. Because of the limited number of specialized training areas, the number of units, and the time it takes to prepare a battalion for all tasks necessary to conduct an amphibious assault, it is not clear from open sources whether all twenty-four amphibious combined-arms battalions undergo a full cycle of amphibious training at shore locations every year.
21. For example, an ACAB can be seen deployed to Dacheng Bay on Google Earth imagery of 18 July 2020 at 23°37'36" N, 117°13'09" E; an amphibious combined-arms battalion can be seen on Google Earth imagery of Dongshan on 14 August 2019 at 23°40'26" N, 117°28'10" E; and, as an example at a smaller training area, an

amphibious combined-arms battalion can be seen northeast of Shanwei on Google Earth imagery of 9 April 2021 at 22°49'20" N, 115°33'44" E.

22. These observations are based on PLA descriptions of amphibious training events, including those cited in the chapter appendix.
23. In a real-world situation, longer-range artillery / multiple-rocket launchers, or PLAAF, PLAN, and conventional PLARF units, or both would provide fire support for more-distant objectives, augmented by cyber and electronic-warfare operations.
24. "PLA Conducts Joint Multi-dimensional Sea-Crossing and Island-Landing Drill." This video did not depict second-wave landings, which would deliver artillery and other units and supplies to the beach to support the advance inland.
25. PLAN marines conducted additional amphibious training not assessed here.
26. A thirty-ninth event was reported on 26 November 2021, but other than showing two AAVs in the water it provided no details and is not included in the analysis to follow.
27. *Quick Look Report: "Large-Scale Amphibious Warfare in Chinese Military Strategy"* (Newport, RI: China Maritime Studies Institute, [2021]), available at www.andrewerickson.com/2021/06/quick-look-cmsis-4-6-may-2021-conference-large-scale-amphibious-warfare-in-chinese-military-strategy-taiwan-strait-campaign-focus/.
28. U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China 2021,* p. 117.

Conor M. Kennedy

5. The New Chinese Marine Corps

A "Strategic Dagger" in a Cross-Strait Invasion

The People's Liberation Army (PLA) has two main amphibious ground-combat forces: amphibious combined-arms brigades in the army and the marine corps within the navy. For many years, the marine corps remained quite limited. Initially consisting of a single brigade, later expanded to two brigades, the service arm could not contribute much to a large-scale landing campaign across the Taiwan Strait. However, PLA reforms initiated in 2017 have transformed the People's Liberation Army Navy Marine Corps (PLANMC). It has tripled in size, garnering significant attention from Chinese and outside observers. The PLA Navy (PLAN) also has built a number of large amphibious ships to carry the forces involved.

While the latest developments by the PLANMC indicate that it is preparing for more-diverse missions, including greater roles in overseas operations, the service arm's chief mission remains amphibious warfare. This has important implications for Taiwanese security. Advances in the service's ability to conduct modern amphibious-combat operations may both enhance its effectiveness in traditional beach landings and introduce new capabilities in support of an overall joint campaign against Taiwan. This chapter examines the PLANMC's projected role in a cross-strait amphibious campaign and analyzes how new additions to the force could be used against Taiwan.

The chapter contains three main sections. The first discusses the service arm's transformation and future orientation. The second section examines

progress in brigade development to gauge readiness and the capabilities available for landing operations. The third section analyzes the PLANMC's likely roles in the different phases of an invasion of Taiwan (i.e., a joint island landing campaign [JILC]) and explores its current ability to perform these roles.

The "New" PLANMC

Prior to 2017, the PLANMC consisted of just two brigades that were subordinate to the South Sea Fleet (now the Southern Theater Navy [STN]); its personnel numbered around twelve thousand.[1] These two brigades were largely responsible for operations in the South China Sea, including guarding Chinese-occupied features, and for contributing forces to antipiracy escort task forces.[2] As a major beneficiary of the "below the neck" reforms that began in 2017, the force was elevated to corps-leader grade; established a new headquarters subordinate to the PLAN in Beijing; and added several new brigades, including an aviation brigade.[3] This expansion and reform was meant to give the force a greater role in China's military operations and the PLAN's strategy of "near-seas defense and far-seas protection."[4]

The force now is tasked with new missions along with its long-standing amphibious-warfare mission. Over the past decade, the requirement for the PLA to diversify its mission set resulted in an expanded range of military responsibilities for PLANMC forces, including greater emphasis on nonwar military operations.[5] Under the slogan of "all-domain operations" (全域作战), the PLANMC now regularly trains to operate in new environments, including in desert, cold, jungle, and high-elevation training areas.[6] When the "new" PLANMC was established officially in 2017, its leadership called on the force "to strive to build an elite force capable of full-spectrum operations, all-domain operations, operations in all dimensions, and emergency operations at all times."[7] According to the PLANMC's first commandant, units must maintain high levels of readiness to deploy, fight, and win "without additional personnel or equipment and without precombat training" (不经人员装备补充、不经临战训练).[8]

Concepts for maneuver are shifting from traditional linear surface landings to multidimensional precision assaults. For example, the PLANMC deputy chief of staff and former brigade commander Chen Weidong wrote in September 2021 that marine corps assault patterns will include multidimensional projection, multiarm coordinated assault, and over-the-horizon concealed launch. Supported by combined precision information

and firepower offensive capabilities, forces will conduct rapid precision maneuver to strike weak areas throughout adversaries' depth to exploit gaps in their coverages, outflank them, and divide their defensive systems. This is meant to paralyze the enemy, increase operational effects, and reduce friendly exposure on the ground.[9] Many of these concepts reflect growing recognition of the wider utility of fielding versatile amphibious-combat forces across an expanded set of missions beyond the marines' previous focus on beach landings, as well as lessons learned observing decades of U.S. Marine Corps operations.

Most importantly, the PLANMC is seen as the PLAN's future expeditionary force for operating overseas to secure China's national interests and respond to crises.[10] Echoing other official statements, former PLANMC political commissar Yuan Huazhi frankly stated in 2018 that "we must fully recognize the status and role of the marine corps as the 'first choice for military forces to go abroad.'"[11] For the PLANMC to serve this function, its leaders emphasize the importance of readiness, speed, adaptability, and versatility in future-force development. PLANMC forces now are deployed regularly to China's first overseas base, in Djibouti, and eventually will embark on future amphibious-strike-group vessels deployed to the far seas.[12]

While many of these new developments may not be dedicated to accomplishing a traditional landing on Taiwan, a more modern and versatile PLANMC will make the force more effective in any of the operations it conducts in support of such a joint campaign. The next section will examine the postreform PLANMC and the development of its new combined-arms brigades.

PLANMC Force Development

A look at postreform PLANMC development is essential to assessing what capabilities will be available in a cross-strait amphibious invasion. As stated above, several new brigades were formed, most from existing PLA ground forces (PLAGF) units. Four new maneuver brigades were created, two each in the Northern Theater Navy (NTN) and Eastern Theater Navy (ETN). The former PLAN "Jiaolong" commando regiment was upgraded to a brigade and placed under the PLANMC. Additionally, an aviation brigade was formed in Shandong to provide organic aviation support for PLANMC brigades. The below table displays the names and locations of the PLANMC's eight brigades.

Table 1. PLANMC Brigades

Theater Command	Brigade Name	Location
Southern	1st Marine Brigade	Zhanjiang, Guangdong
	2nd Marine Brigade	Zhanjiang, Guangdong
	Special-Operations Brigade	Sanya, Hainan
Eastern	3rd Marine Brigade	Jinjiang, Fujian
	4th Marine Brigade	Jieyang, Guangdong
Northern	5th Marine Brigade	Qingdao, Shandong
	6th Marine Brigade	Qingdao; Yantai, Shandong
	Naval Shipborne Aviation Brigade	Zhucheng, Shandong

The PLA reforms also reorganized the brigade structure. Previous marine brigades in the STN had contained several infantry battalions and an amphibious armor regiment as the primary assault forces. The reforms have reorganized these forces into combined-arms battalions—flattening the chain of command from brigade to battalion in much the same way that PLAGF brigades have done. As the 1st Marine Brigade commander explained in 2020, "The combined-arms battalion as the operational unit to take on independent combat missions is a true portrayal of the past three years of reform and transfer." The 1st Brigade was the first PLANMC unit to test out the new combined-arms battalion structure, forming the 1st Combined-Arms Battalion (Amphibious). With this new structure, personnel comprising reconnaissance (recon), engineering, firepower, and other elements are built into the combined-arms battalion, enhancing combat power and flexibility at the battalion level.[13]

These reforms have encountered challenges. Equipment and units can be reorganized and moved around, but battalion commanders also must have sufficient training and experience to handle the increased burden of coordinating different arms. Commanders and their staffs must grasp an understanding of the new specialties that become their responsibility. In landing exercises, some 1st Brigade battalion staff members reportedly did not make use of the recon elements under their command and lacked understanding of the obstacle-removal procedures of the engineering detachments, causing delays for follow-on units.[14]

Discussions published in PLAN official media indicate that the brigades are working through this transition to develop capable battalion

commanders and staffs and correct old ways of thinking.[15] For example, the service has sought to improve the quality and focus of officer evaluations. In April 2019, PLANMC Headquarters evaluated the capabilities of command and staff officers with respect to operations, command, political work, and integrated support, placing weight on war fighting in the overall evaluations. This was conducted force-wide for over sixty deputy regiment and battalion-grade officers.[16]

Currently, PLANMC brigades consist of the following nine battalions:[17]

- Amphibious mechanized infantry 1st Battalion (两栖机械化步兵一营)
- Amphibious mechanized infantry 2nd Battalion (两栖机械化步兵二营)
- Medium mechanized infantry 3rd Battalion (轻型机械化步兵三营)
- Air-assault infantry battalion (空中突击步兵营)
- Reconnaissance battalion (侦察营)
- Artillery battalion (炮兵营)
- Air-defense battalion (防空营)
- Operational-support battalion (作战支援营)
- Service-support battalion (勤务保障营)

Each amphibious combined-arms battalion likely consists of the following components:[18]

- Four mechanized infantry companies (机步连)
- Firepower company (火力连)
- Reconnaissance platoon (侦察排)
- Air-defense element (防空分队)
- Artillery element (炮兵分队)
- Engineer element (工兵分队)
- Repair team (修理小队)

The four mechanized infantry companies are reported to be equipped with fourteen combat vehicles each, for a total of fifty-six Type 05 vehicles (ZBD-05s and ZTD-05s) per battalion, and thus 112 per brigade.[19] These are the primary amphibious vehicles for PLANMC landing operations. The addition of firepower companies and engineer, recon, and air-defense elements enhances the battalion's ability to operate independently and seize coastal terrain.

The most combat-ready units are found in the STN. The two original, prereform brigades, the 1st and 2nd, are located near Zhanjiang City and are likely the amphibious mechanized forces most ready to mobilize and execute landing operations. These brigades continue to train regularly on the Leizhou Peninsula for amphibious-landing operations. Based in Sanya, the Special-Operations Brigade has grown to around three thousand personnel in an unknown number of battalion formations. Around a thousand of these personnel are transfers from other units. Because the enlarged force initially lacked sufficient professional training staff, a number of experts have been brought in from other special-operations units to bolster training capacity. Additionally, force development appears to emphasize further improvement in coordinated operations. These special-forces units usually are kept at high levels of readiness.[20]

In the NTN, the transformation of the 6th Brigade from the former 77th Motorized Infantry Brigade (Twenty-Sixth Group Army) appears to be near completion. Type 05 assault vehicles and infantry fighting vehicles (IFVs) have been allocated to the two amphibious mechanized infantry battalions, ZBL-09 IFVs and ZTL-11 assault vehicles to the medium mechanized infantry battalion, and CS/VP4 Lynx all-terrain vehicles to unspecified units.[21] The 6th Brigade reportedly takes part in regular amphibious-training programs (海训), as well as other transregional training events.[22] The 5th Brigade received ZBD-09 and ZTL-11 wheeled vehicles for its medium mechanized infantry battalion sometime in 2020, and it has established its reconnaissance battalion. However, it is unclear whether the 5th Brigade has created amphibious mechanized infantry battalions.[23] These two brigades likely conduct much of their amphibious training in the amphibious training area in Ganjingzi District of Dalian, Liaoning Province.[24]

The 7th Aviation Brigade is a significant addition to the PLANMC, which previously relied on PLAN helicopters to provide aerial mobility. Described by the 7th Aviation Brigade political commissar as a "leading force for advancing from the sea to shore in depth" and "a force for strategic maneuver," the aviation forces are expected to conduct vertical-landing operations into the adversary's depth.[25] When the brigade was established in 2017, it lacked training grounds, support forces, and pilots.[26] The brigade's deputy chief of staff frankly told reporters in 2020 that it lacked flight equipment and flight instructors who could teach and who understood command; "everything was started from scratch."[27] It appears that a number of PLAGF helicopter pilots were transferred and retrained for shipboard operations. Other pilots in the brigade were PLANMC cadets who graduated from the Army Aviation College in 2020.[28] The PLANMC has been equipped with

a limited number of Z-8C and Z-9 helicopters (likely transferred from the PLAN), in which air-assault units have begun training.[29] Other helicopter types could be added to the force in the future. These may include the Z-20 medium-lift helicopter, to provide a flexible, multimission platform, and the Z-10, for close air support; however, these have not been observed yet.[30] The brigade currently contains at least two flight squadrons (飞行大队) and an aircraft-maintenance group (机务大队), but these elements will grow in size gradually as more helicopters are delivered and pilots assigned.[31] Flight teams train to operate with PLAN landing ships. Public reports show PLANMC pilots training with the ETN amphibious transport dock (LPD) No. 985 *(Qilianshan)* in day and night operations, including nighttime hot refueling.[32] Between 2021 and 2022, the PLAN commissioned two Type 075 amphibious assault ships (LHAs), with at least one more expected to join the fleet in the near term. PLANMC flight squadrons already are conducting coordination training with these new ships.[33] These will be essential platforms for enabling PLANMC air-assault and vertical-landing operations.[34]

In the ETN, PLAN reporting indicates that the 3rd Brigade in Fujian Province gradually is receiving equipment and regularly conducts amphibious-landing training exercises. One of the mechanized infantry companies in this brigade reportedly was the first to begin receiving amphibious armored vehicles (两栖步战车), likely receiving them sometime in 2019.[35] It is unclear whether this refers to Type 05–series vehicles or to other amphibious-capable combat vehicles, such as the ZBL-09 or ZTL-11. Training approaches are similar to those that STN marine brigade amphibious units are reported to use, covering conducting beach assaults, using breaching teams, and coordinating naval gunfire support, among other subjects.[36] One report suggests that the 3rd Brigade trains with an ETN landing ship group, practicing countermeasures to be employed in an island landing confrontation and maintaining the security of landing ships at sea.[37] The 3rd Brigade also contains a medium mechanized infantry battalion, air-assault battalion, recon battalion, and operational-support battalion, similar to the structure of the other brigades.[38] Much less information is available on the 4th Brigade in Jieyang, Guangdong Province, although it has received some equipment, such as ZBL-09 IFVs.[39]

Since the PLANMC was expanded and reforms began in 2017, the service's evolution is far from complete. The 77th Motorized Infantry Brigade's transformation into a PLANMC brigade was likely easier than the transition for the coastal-defense units that now are part of the 3rd, 4th, and 5th Brigades; the latter units came out of outdated forces under the provincial military district system instead of a group army, and they probably will require

more investment. Xi Jinping's visit to PLANMC Headquarters in October 2020 put significant emphasis on the force's development, resulting in the PLAN Party Committee releasing the "Decision on Thoroughly Implementing the Spirit of Chairman Xi's Important Speech and Strengthening the Guidance and Assistance of the Navy Marine Corps" in December of that year. This signaled increased support for PLANMC manning, equipping, training, and other measures to boost the service's development.[40] Urgency communicated from Beijing and senior PLAN leadership likely will catalyze a period of rapid strengthening of the force.

In total, the PLANMC currently could contribute to a cross-strait landing six or more amphibious mechanized infantry battalions—that is, forces equipped with vehicles that can swim to a hostile shore. The exact number of these and other battalion types will depend on the final configuration of the new brigades—in particular, those brigades transferred from former coastal-defense units. Limited reporting on the 3rd, 4th, and 5th Brigades leaves it unclear whether the PLANMC will standardize its six maneuver brigades. New battalion types, such as a "high-mobility light infantry battalion" (高机动轻型步兵营) in one of the new brigades, suggest that the brigade structures will not be completely uniform.[41] Additionally, the special-operations brigade probably can contribute several battalions of highly trained special-forces personnel.

Efforts are under way by PLANMC Headquarters to bolster amphibious-warfare capabilities, with special emphasis on new unit commanders. During the Lunar New Year in 2018, it held a ten-day collective training session for up to one hundred commanders at different levels, focusing on their war-fighting abilities. Experts were brought in from the PLAN, PLAGF, PLA Strategic Support Force, military academies, and other organizations to support this event. Commanders received training on the operational patterns of amphibious landing, island and reef capture, and special operations; tactics covering embarkation and transit, landing-craft ferrying and assault-wave formation, assault landings, and seizure of points throughout the adversary's depth; and resistance to enemy counterattacks, reconnaissance, sabotage, and vertical landings. They trained to make decisions and give combat orders to units within their landing combat organizations and to coordinate operational support. Headquarters staff gave special attention to ensuring that commanders were evaluated and given feedback on an individual basis. This crash course in amphibious warfare reportedly had participants studying and training for sixteen hours a day.[42] Additional iterations of collective training sessions likely will be necessary owing to the extremely short duration of this event.

The PLANMC's efforts to develop commanders likely are underpinned by programs launched by the former Naval Marine Academy in 2011 to develop a "theoretical system of new-type amphibious operations." This was part of an overhaul of the academy to build core institutional knowledge and amphibious-warfare excellence in the PLAN that included numerous projects on amphibious operational theory and research, equipment applications, training, and overall support to the PLANMC.[43] The academy now has been transformed into a PLANMC training base, and its doctrine-development work probably has been subsumed under that of PLANMC Headquarters.[44]

Overall, the new marine brigade structure demonstrates that the PLANMC is not optimizing itself for a traditional amphibious assault on Taiwan's coast. Compared with the PLAGF's six amphibious combined-arms brigades, the PLANMC lacks full heavy amphibious-combat units, instead opting for more-flexible and -diverse capabilities within each brigade. From an examination of the statements by senior PLANMC leaders on force development, changes to training programs over the past several years, and the new brigade structure, it is increasingly clear that the PLANMC is developing into an expeditionary force capable of operating overseas. Nevertheless, the force certainly will be a key component of the landing forces in any JILC, and its newly reorganized battalions may be more combat effective under this new structure. The next section discusses the potential roles that PLANMC brigades are likely to play.

Joint Island Landing Campaign

The JILC is the PLA's main operational concept for an invasion of Taiwan. The JILC's primary objectives are to break through Taiwan's coastal defenses and establish a beachhead to enable further offensive action to seize and occupy key targets, if not capture the entire island.[45] The JILC features multiple subcampaigns requiring intense combat conducted jointly by all the PLA service arms. The projected campaign consists of three phases; (1) preliminary operations; (2) assembly, embarkation, and transit; and (3) the assault landing and the establishment of the campaign landing site (beachhead).[46] This chapter will exclude discussion of operations to seize Taiwan's offshore islands and focus on PLANMC landing operations against Taiwan itself.

The PLANMC could fulfill multiple roles in this campaign, but it is unlikely to constitute the main force. Configured entirely for amphibious combat, the PLAGF's amphibious combined-arms brigades probably will serve as the main body of the overall landing forces.[47] The PLANMC may

coordinate with these forces or conduct other, separate or independent operations.[48]

The sections that follow will examine the potential roles of the PLANMC in each of the three campaign phases and beyond.

Preliminary Operations

Prior to the amphibious assault, the PLA likely will carry out a series of preliminary (advance) operations, the goals of which would be to "paralyze" the enemy's operational system and create favorable conditions for landing operations.[49] To this end, the joint forces will be tasked with shaping the operational environment through mine countermeasures, naval blockade, integrated firepower assaults, and so forth. For its part, the PLANMC likely will operate as part of the advance force. Specifically, it will conduct beach reconnaissance, sabotage raids, and mine clearance and obstacle destruction close to or on D-day.[50]

The PLANMC has significant manpower to apply to these activities taking place in amphibious objective areas. PLANMC recon battalions—specifically, the armed recon companies (武装侦察连), and potentially recon elements assigned to the combined-arms battalions—are trained to approach the coastline covertly and conduct these operations.[51] These forces can reconnoiter beach areas, providing information on beach gradients, depths, tide and wave states, the sea bottom, ground-traverse conditions, routes of enemy approach, defense works, and vertical-landing areas.[52]

Engineering elements in the combined-arms battalions will take part in mine and obstacle clearance prior to the assault, using amphibious breaching vehicles delivered to the PLANMC in the early 2010s and other small craft. These can use line charges to clear paths toward the beach.[53] It is unclear how the underwater-demolition companies (潜水爆破连) tasked with mine and obstacle clearance under the former engineering and chemical-defense battalions (工兵防化营) have been affected by the new brigade structure.[54]

Additionally, these operations are a core function of the special-operations brigade. These forces routinely train for covert insertion by air using rotary or fixed-wing aircraft, on the surface in small inflatable craft, and underwater by submarine and special-operations delivery vehicles. They are proficient in demolition, target reconnaissance, target designation, and sabotage raids against command-and-control hubs, ammunition depots, ports and ships, airfields, and other key targets.[55] The special-operations brigade provides a sizable addition to the advance operations of the PLANMC and may continue conducting special operations during and after landing operations.

When employing amphibious forces in advance operations, each PLA commander must weigh an imperative to assault a specific landing area against the need to maintain tactical surprise. Large-scale amphibious landings against Taiwan quickly will lose strategic surprise when forces are mobilized across the strait and the bombardment commences. However, commanders still may seek to achieve tactical surprise in their respective landing areas. Significant advance operations might risk losing this advantage—or they might help support it; the PLANMC may employ some of its forces to deceive the enemy by conducting advance operations to draw attention to false landing areas, thus hiding the true landing-objective area.[56]

Assembly, Embarkation, and Transit

This phase of operations involves movement of PLANMC brigades from their home bases into assembly areas for embarkation on assigned transport and landing ships. The limited number of landing ships the PLAN has will complicate the detailed planning that goes into the embarkation phase. It is unclear exactly how many landing ships will be available for the JILC and to which service they will be assigned. Numerous merchant vessels will have to be mobilized and modified appropriately to carry some of the landing forces, possibly including elements of the PLANMC.

PLANMC transregional training exercises conducted since 2014 have sought to improve rapid-mobilization and transport functions within the force, in coordination with service and joint military transportation departments. While these exercises have focused on transporting units over thousands of kilometers to distant training bases, they have offered significant experience and lessons in planning, preparing, and conducting force transport. The August 2015 exercises at the Malong training base in Yunnan demonstrated improvements in efficiency in moving amphibious-combat units over long distances using multiple modes of transport. Scenario elements were introduced during transit to increase complexity, such as responding to air threats and carrying out troop dispersal and concealment.[57] Repeated iterations of planning, preparation, embarkation, transit, and debarkation or transfer have provided significant data and feedback to evaluation groups assessing and optimizing the complex logistics of moving brigades and other PLAN units.[58] Improvements made to the process will apply force-wide, but certainly to the 1st and 2nd Brigades, which have the most experience with these transregional exercises.

All PLANMC brigades are located close to major ports. Both the 1st and 2nd Brigades have access to rail or roadway networks and can reach loading sites used by the STN 6th Landing Ship Flotilla in Zhanjiang, Guangdong,

with relative ease. This was demonstrated publicly during the launch of annual training in January 2018, when an amphibious mechanized infantry combined-arms battalion of the 1st PLANMC Brigade embarked on LPDs and tank landing ships (LSTs). Public accounts of this exercise showed loading operations coordinated with surface and aviation forces. However, it was not realistic for a cross-strait landing.[59] In a real operation, the PLANMC likely would attempt to conceal force concentration in multiple assembly and standby areas before proceeding to the embarkation point, at which point efforts would focus on accomplishing loading operations smoothly and rapidly to reduce exposure to adversary strikes.[60]

Units of the 3rd and 4th Brigades that are able to join the amphibious assault could be expected to embark aboard vessels of the 5th Landing Ship Flotilla in the ETN. However, the apparent lack of amphibious lift in the PLAGF's watercraft units for the six amphibious combined-arms brigades in the ground forces suggests that ETN landing ships may be reserved for those units' use, to ensure that fully formed amphibious-combat units can get ashore. A similar situation applies to the PLANMC's 5th Brigade, which may not have access to PLAN landing ships.

Simply put, existing PLAN amphibious lift is inadequate to the size of the total landing forces.[61] Therefore campaign planners will need to decide which forces they will prioritize. If the PLANMC is not the primary landing force, it may need to use alternative means to get to landing areas. Recent developments in merchant shipping may indicate efforts to address this shortcoming. For example, in July 2020 the PLANMC's 1st Brigade mobilized all personnel and equipment from Zhanjiang to conduct landing exercises off the coast of western Guangdong. Chinese reporting portrays a civilian-operated roll-on/roll-off (RO/RO) ship at one of the 6th Landing Ship Flotilla's loading berths taking on combat troops and Type 05 amphibious armor. Footage shows the ability to conduct amphibious launch from the RO/RO ship.[62] This represents an important variable in the amphibious-lift equation for the broader PLA and suggests that, with appropriate modifications, the PLANMC may have access to additional lift for assaulting forces.

PLANMC brigades will embark assault-echelon and follow-on forces on available PLAN landing ships, while nonamphibious elements likely will be transported by merchant shipping. The 6th Brigade demonstrated the feasibility of this approach during a large-scale projection exercise in July 2019, during which it embarked forces onto the NTN landing ship *dadui* and merchant RO/RO vessels using multiple RO/RO berths in Qingdao, Weihai, and Yantai. Type 05 amphibious vehicles loaded onto LSTs, while trucks, towed artillery, troops, and various other wheeled equipment went on large RO/RO ships. A total of nine ships were used to transport this brigade.[63]

This exercise appears to have been focused on logistics during maritime transport, so it may not be reflective of preparations for landing operations; however, the assignment and disposition of shipping to move this brigade offer some valuable insights. In a cross-strait landing, assault-echelon forces will form the initial waves and may depart from their vessels under combat conditions, so these elements will be given higher priority for assignment to PLAN landing ships. Nonamphibious follow-on forces, such as light, wheeled combat vehicles or towed artillery, may have to wait aboard merchant shipping for lighterage to get ashore. The exercise also highlighted the geographic dispersal of embarkation areas across multiple port areas for a single brigade.

A significant portion of PLANMC forces can load at sea and therefore do not require a port of embarkation.[64] In their amphibious-training areas, PLANMC amphibious vehicles train regularly, day and night, in well-deck launch and recovery offshore.[65] This mode could prevent congestion in port areas and mitigate some risk of loading in enclosed harbor areas that may be subject to adversary precision strikes or mining operations. Additionally, loading for the JILC could take place under the pretext of amphibious-training exercises.

The PLANMC will be vulnerable throughout the assembly, embarkation, and transit phase, especially from air threats. Air-defense battalions can help protect the force and landing ships at embarkation areas from low-flying threats, primarily by using man-portable air-defense systems (MANPADS). These battalions do not appear to field any vehicle-based radar or surface-to-air-missile systems and likely will be reliant on resources of the joint forces. An article highlighting postreform changes to the 1st Brigade describes air-defense elements conducting "joint air intelligence and early warning" (实施联合空情预警) to establish early-warning systems during a landing exercise.[66] This suggests that the 1st Brigade can tap into PLAN or joint early-warning networks, although little information is available on how this would work in practice. Air-defense battalions belonging to brigades transferred from former coastal-defense units also can be seen training with older towed antiair artillery pieces, which eventually may be replaced with more-modern equipment.[67]

During transit, PLANMC air-defense elements take part in amphibious-transport fleet air defense.[68] One PLAN report from July 2015 indicates that MANPADS units supporting fleet air defense are under amphibious task force command, which can task ship weapon mounts and PLANMC MANPADS to engage targets when within range, using ship target tracking.[69] Overall, air defense appears to be an important gap in PLANMC capabilities. However, low-altitude threat coverage may be sufficient in the JILC, given that

significant airpower and naval screens by PLA joint forces likely will be available to protect transiting forces.[70]

The exact assignment and configuration of amphibious shipping for the PLANMC in a cross-strait landing remain unclear. This is not owing just to the continued lack of landing ships for such large-scale operations but also to the lack of clarity on force objectives in the amphibious operational area. Planned operations ashore ultimately will determine PLANMC loading plans and shipping assignments.

Assault Landing and Establishment of a Beachhead

After the amphibious fleet has transited the strait safely and arrived at its objective operational areas, the assault phase of operations for the landing forces commences. This is the key phase of the JILC; its objectives are to conduct a landing assault, secure a beachhead for assault follow-on forces, overcome enemy counterattacks, and consolidate and expand landing sites.[71] Existing PLANMC forces probably can contribute just six amphibious combined-arms battalions to beach landings, indicating a more limited role among the joint landing forces. However, the new brigade force structure brings new capabilities that may entail a unique supporting role within the overall campaign.

Campaign joint command will assign PLANMC forces to landing areas as required by campaign objectives and the established landing plans. The exact locations of primary, secondary, and false landing areas are unknown. As amphibious task forces approach deployment zones and advance-force intelligence comes in, task-force and landing-force commanders will finalize specific landing sites. Prereform PLA landing-site requirements indicated that landing sections for amphibious regiments would cover a front of 2 to 4 kilometers (km) and each battalion landing point would cover 0.5 to 1 km. More-recent work by the Naval Marine Academy notes that battalion landing points now cover 1 to 2 km.[72] This would put the two amphibious combined-arms battalions of a brigade on a 2-to-4-kilometer section of beach. Indeed, one brigade's amphibious-assault landing exercises in July 2020 reportedly spanned 3 km of coast off eastern Guangdong.[73]

Prior to the assault phase, PLANMC special-operations units already may have infiltrated assigned areas and attempted sabotage operations against enemy observation posts, command-and-control facilities, airfields, and other key sites to disrupt defenders and slow down counterattacks against the landing forces.[74] These forces may have gone ashore covertly or been inserted by air; they even may have been delivered offshore by maritime militia fleets.[75]

PLANMC assault-wave formations primarily comprise relatively fast amphibious armor and assault craft. The Type 05 series of vehicles, which PLANMC brigades began receiving in 2006, are capable of reaching forty-five kilometers per hour on water and withstanding 12.7 mm rounds.[76] Assault-gun and IFV versions constitute the bulk of amphibious armor for the force, with additional command, salvage, and ambulance versions. The PLANMC's 122 mm self-propelled howitzer vehicle, the PLZ-07B, also is based on the Type 05 chassis and can swim to shore.[77] Assault-echelon units will be capable of launching from landing ships in the deployment zone and joining wave formations without significant transfer activities, thereby enhancing the speed of landings.

Battalion landing groups likely will go ashore in five to seven waves, with companies in two to three waves. Engineer elements will precede them, using rocket-propelled line charges and amphibious breaching vehicles to clear and mark landing lanes.[78] Amphibious armor, such as ZTD-05 105 mm assault guns and ZBD-05 30 mm cannon, will be in the first waves to lay fire on beach defenses and firing points, providing cover for infantry arriving on assault craft. Their amphibious armor uses Beidou satellite positioning to assist in movement and determining firing coordinates.[79] Battalion-level training activities that include live fire against shore targets during periods of rough weather and low-light conditions will help improve vehicle crew coordination and accuracy.[80] Additionally, since 2013 PLANMC infantry units have improved coordinated strikes with the individual strike guidance system (单兵引导打击系统) to direct fires against enemy positions.[81]

Recent training events indicate that the PLANMC is working to better integrate supporting elements into coordinated amphibious assaults under the new battalion structure. For example, an STN marine brigade conducting live combat-tactics training in southeast Guangdong Province in July 2020 combined multiple training subjects simultaneously to simulate an opposed landing. The assault echelon reportedly passed through "enemy barrage zones" under radio silence, while communications elements (通信分队) acquired information on enemy searches for friendly radio signals and then conducted signal jamming against the defenders. Dozens of specialties were reported to be integrated into the assault training in a seamless progression, whereas it was noted that previous practices had focused on individual and small-group training methods.[82]

To enhance combat readiness, the 1st Brigade has been analyzing data collected from drills during "sea training" (海练) conducted by all combat units to solve problems in personnel allocation, ammunition consumption, equipment support, and other areas. Problems addressed include reducing the loads that personnel carry to ensure they can continue to march and

fight, accounting for attrition rates, considering morale levels, practicing tactics in ammunition supply, and seeking a number of other solutions.[83] Service-support elements reportedly are providing greater combat support to units on the battlefield. Personnel develop multiple proficiencies—for example, being able both to drive vehicles and to work on their chassis. The performance of personnel in exercises at Zhurihe training events apparently has shown improved flexibility and breadth of support on the battlefield.[84] Keeping equipment in operating condition will be critical, since numerous breakdowns are likely to occur as equipment is stressed in combat.

The PLANMC is unable to concentrate as much force into landing areas as the PLAGF amphibious combined-arms brigades, so PLANMC brigades may conduct landing operations in support of PLAGF landings and the overall campaign's objectives. According to the *Science of Campaigns,* the JILC would combine focused assaults with landings in multiple directions, in an attempt to confuse and disperse defending forces, preventing them from concentrating force against a few landing areas.[85] So the PLAGF might concentrate forces in the primary landing areas, while the PLANMC would target secondary landing areas where brigades could be used to strike objectives or launch rapid offensive maneuvers inland. The threat of PLANMC flanking assaults and operations in depth may constitute an attempt to compel defenders to assume a passive position and to complicate their ability to mass force against the heavier landing forces in the primary landing areas.[86] In theory, this could relieve pressure on the PLAGF while the ground forces consolidate and expand beachheads and prepare for the construction of landing bases and the inflow of follow-on forces.

Coordination between PLAGF and PLANMC units will need to improve to leverage fully such joint operations. One report on changes and improvements to postreform joint landing operations by the STN in early 2018 noted previous problems with coordination. The report cited an instance of a PLAGF battalion taking heavy simulated losses during a joint exercise because it would not wait for the PLANMC battalion to complete its destruction of enemy firepower in depth before launching its own assault. Furthermore, the lack of attack helicopters in the PLANMC means it will rely heavily on the PLAGF's aviation brigades to provide rotary-wing close air support. Efforts are under way to improve the ability of PLAGF attack helicopters to operate from PLAN landing ships or civilian platforms.[87] However, efforts to better incorporate PLAGF aviation into the joint landing forces appear to be concentrated largely on army landing operations with PLAN landing ships, not in conjunction with the PLANMC.[88]

Beyond the Beachhead

The new structure of PLANMC brigades enables a more diverse set of capabilities designed for combat in a variety of environments. In a cross-strait invasion, these capabilities will allow a greater role for brigade operations outside the initial amphibious assault. The PLAN Party Committee's "Decision on Thoroughly Implementing the Spirit of Chairman Xi's Important Speech and Strengthening the Guidance and Assistance of the Navy Marine Corps" (discussed earlier) emphasizes the PLANMC's efforts to transform itself from a coastal and sea force into one that can be effective in all domains—it intends to operate from the sea and air and on land.[89] In a cross-strait landing, this would entail the PLANMC operating beyond the beaches.

The addition of air-assault battalions to brigades, the construction of additional LPDs and LHAs, and the enabling of vertical-landing capabilities by inclusion of the aviation brigade will expand the PLANMC's ability to conduct "multidimensional landing operations" (立体登陆作战).[90] Helicopter-landing zones will be used to deliver battalions of troops to locations 15 to 60 km in the adversary's depth, selected to best support the main landing operations. Each landing zone will contain multiple landing sites, each of which should be one to two square kilometers in area for a single helicopter wave, probably consisting of five to six Z-8C helicopters, to deliver company-size units.[91] The site-selection process will consider the disposition of enemy strength, suitability for landing and mounting a defense, and ease of target destruction and disruption of enemy reserve units entering the battle space.[92]

Recent 7th Aviation Brigade tactical-training subjects have highlighted operations in adversary rear areas, focusing on adaptive training during nighttime and under radio silence, using low-elevation flights to avoid detection by adversary air-defense radar. In addition to exercises covering search and rescue, door gunnery, and materials delivery, adversarial contingencies were introduced, forcing pilots to use alternate landing sites.[93] Transport helicopters are a shortcoming in the PLANMC's current order of battle, and it is unclear whether the two known flight *dadui* have received all their required aircraft. The absence of attack helicopters in the force also could leave helicopter routes unguarded. With time, the PLANMC will gain the proficiency required to conduct vertical assaults from the flight decks of PLAN ships such as the Type 075 and Type 071.

The addition of medium mechanized infantry battalions allows for greater mobility inland. While not equal to the Type 05 series in amphibious combat, ZBL-09 and ZTL-11 vehicles are amphibious capable and thus may

not have to wait for naval lighterage systems to get ashore.[94] The PLANMC's introduction of the ZTQ-15 light tank will bolster ground-warfare capabilities further, although which units are receiving this tank and in what numbers remains unclear.[95] Continuous-firepower assault exercises conducted by the 1st Brigade in the fall of 2020 indicate that the medium mechanized infantry battalions will engage the adversary farther inland. The exercises reportedly introduced training scenarios that required units to engage in rapid and continuous maneuver while facing various adversary attacks and electronic jamming, to adjust to units losing command elements, and to respond to the necessity to clear obstacles and enter minefields. Units also coordinated with air-assault battalions operating in the enemy's depth.[96] These mobile battalions can make better use of Taiwan's roadways to push through layers of defense and possibly link up with air-assault or special-operations forces. Coordinated operations from ship to shore and ship to objective by amphibious, ground-warfare, and air-assault units could seek to paralyze Taiwan's defending forces with attacks in depth.

Furthermore, if Taiwanese defenders fail to break the PLA on the coast and are forced inland, they may need to resort to urban defense as attackers seek to secure port facilities and airfields. Urban combat is a relatively new subject for the PLANMC; however, it is an important component of the PLANMC's "All-Domain Operations."[97] Urban-combat subjects have been introduced into PLANMC training, such as during cold-weather training at the Zhurihe Combined Tactics Training Base—which, notably, contains a mockup of downtown Taipei. At this training base, PLANMC units square off against opposition blue forces to improve "offensive combat by PLANMC combined-arms assault groups against a coastal city" (海军陆战队合成突击群濒海城市进攻战斗).[98]

Lacking their own close air support and given the potential limitations in naval gunfire support, PLANMC forces will need to bring their own firepower during the course of an inland push. Arriving in the follow-on forces, PLZ-07B self-propelled howitzers, a number of towed howitzers fielded by artillery battalions, and FHJ-02 62 mm multiple-rocket launchers (MRLs) (operated by chemical-defense elements) will provide a boost to forces attempting to expand landing areas farther inland.[99] The PLANMC has not been known to operate any vehicle-based MRLs; strangely, however, the amphibious-landing competition that the PLAN held in July 2018 displayed a Type 81 122 mm wheeled MRL in service with the PLANMC.[100] This may have been merely a holdover from a former coastal-defense unit; however,

the addition of MRLs to any of the brigades could enable greater firepower support for inland operations.

The PLANMC does not appear to be optimizing itself for a traditional amphibious landing against Taiwan. The force is smaller than the PLA group armies trained and equipped for a cross-strait invasion. With multiple types of battalions in each brigade, the PLANMC is not configured for large-scale opposed landing operations. Compared with the PLAGF's aviation brigades, the marine corps aviation brigade—given its singular nature, the lack of close air support, and the continuing absence of confirmation of the number of air-assault battalions—provides very limited vertical-envelopment capabilities. More importantly, the expanding missions of the PLANMC are focused overseas. Given these factors, the PLANMC on its own will not be the force that breaks Taiwan.

Nonetheless, the PLANMC will play its part if a cross-strait invasion is launched, and various force improvements will increase its utility within a JILC. Headquarters is leading an effort to revamp the abilities of battalion commanders and staff, hoping thereby to improve the coordination of battalion operations. New training programs are increasing the abilities of the force to transport over long distances and operate in various environments, including urban areas. Innovations in transport using RO/RO ships may provide additional amphibious lift for PLANMC forces, offering solutions to an enduring challenge for the overall JILC. The newly created brigades eventually will bring additional capabilities to the equation.

With the above limitations in mind, the PLANMC scheme of maneuver ashore might be focused on smaller-scale landing operations combining ship-to-shore and ship-to-objective maneuver and special operations throughout the depth of amphibious objective areas in support of the larger campaign. Operations could focus on rapid, multidimensional landings and maneuver to control vital objectives and conduct frontal and rear attacks against defenders.[101] The PLANMC is also uniquely positioned to provide ample amphibious-recon and special-operations forces for preliminary operations.

Senior members of the People's Republic of China and PLAN leadership publicly have attached great importance to the PLANMC. The first commandant of the force stated that it would "strive to become a strategic dagger that General Secretary Xi and the Central Military Commission can trust and upon which they can rely heavily."[102] With significant support for the service's development, the PLANMC will be expected to fulfill a greater role in future operations, including any large-scale amphibious landing against Taiwan.

Notes

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Lonnie D. Henley

6. Civilian Shipping and Maritime Militia

The Logistics Backbone of a Taiwan Invasion

> *Seagoing civilian cargo ships are an important component of the large-scale combat power-projection system.*
>
> *—Zhang Jian and Wu Juan, Army Military Transportation University, 2017*

Discussion of a potential Chinese military invasion of Taiwan almost always hinges on whether the People's Liberation Army (PLA) has enough lift capacity to deliver the would-be invasion forces across the Taiwan Strait and, to a lesser extent, whether it could sustain them once they are ashore on Taiwan. The argument centers on PLA Navy (PLAN) amphibious landing ships and other over-the-shore amphibious-assault assets, with most observers concluding that the PLAN has not built enough of these ships, and therefore that the PLA cannot (yet?) carry out a full-scale invasion.

This chapter argues that the PLA plans to rely heavily on mobilized maritime militia forces operating requisitioned civilian shipping as the logistical backbone of a cross-strait landing operation, including both the delivery of PLA forces onto Taiwan and logistical sustainment for the PLAN fleet at sea and ground forces ashore.[1] Moreover, the PLA regards civilian shipping not as a stopgap measure until more PLAN amphibious shipping can be built but as a central feature of its preferred approach. This chapter

will examine China's extensive system for generating and preparing this support force, the roles it will undertake in an invasion operation, and the challenges that must be overcome if the plan is to succeed.

The Scope of the Problem

Most authors looking at the Chinese military threat to Taiwan conclude that the PLA cannot land enough forces on Taiwan to make an invasion viable; that it will not reach the capability to do so until it builds many more amphibious-landing ships; and that accomplishing that will take at least several years, even if it accelerates its efforts.[2] There has been little detailed analysis to underpin that judgment, at least not in open sources, but most observers assess that the PLA would need to land three hundred thousand or more troops on Taiwan in total, and that the PLAN amphibious fleet can land only around one division, roughly twenty thousand troops, in a single lift.[3] Since these constraints seem obvious, the logical conclusion is that the PLA must judge itself not yet capable of invading Taiwan.[4]

The PLA's prospects appear even worse when one considers the rest of the logistical and operational requirements for a major landing operation, beyond the formidable challenge of getting enough troops ashore quickly in the face of determined resistance. The PLAN auxiliary fleet is inadequate to sustain large-scale combat operations, even if those operations were conducted close to China's shores, as a Taiwan conflict would be. The PLAN has enlisted hundreds of civilian vessels to perform tasks ranging from over-the-shore logistics to at-sea replenishment, emergency repair and towing, medical support, casualty evacuation, and combat search and rescue, suggesting that its own inventory of support ships falls far short of what it deems necessary for a landing campaign.[5] Skeptics will argue that this constitutes more proof that the PLA itself does not take the invasion option seriously. The contrary view presented here is that the PLA does take these requirements seriously, but that it intends to rely on maritime militia support for large-scale combat operations, and specifically for a Taiwan invasion campaign.

Over the past decade, the maritime militia (海上民兵) has attracted considerable attention, led by the efforts of Andrew Erickson and Conor Kennedy at the Naval War College, focused mainly on its role in supporting China's claims in the South China and East China Seas.[6] Kennedy and Kevin McCauley also have examined the role of civilian ships in military power projection outside East Asia.[7]

What has received much less Western attention is the maritime militia's projected role in large-scale combat operations, despite Chinese authors having written extensively on the subject since the PLA began serious consideration of a Taiwan invasion in the first decade of the twenty-first century. Nanjing Military Region Mobilization Department director Guo Suqing observed in 2004 that a cross-strait island-landing campaign would require a large number of civilian ships.[8] He noted the availability of many suitable ships, some of which already had been retrofitted for wartime use, but warned that "the traditional form of last-minute nonrigorous civilian ship mobilization can no longer meet the needs of large-scale cross-sea landing operations." Wang Hewen of the former General Logistics Department's Institute of Military Transportation noted that efforts to strengthen the retrofitting of civilian vessels for military use had accelerated in 2003, and a 2004 article from the Shanghai Transportation War Preparedness Office outlined the retrofitting work under way there.[9] In 2004, Zhou Xiaoping of the Naval Command College called for an overhaul of the mobilization system, arguing that "if the traditional administrative order–style mobilization and requisition methods were still followed, it would be difficult to ensure the implementation of civilian ship preparation and mobilization."[10] The civilian government and the PLA acted on these concerns, and over the past twenty years the maritime militia has evolved into a major force multiplier for the PLAN in large-scale combat operations.

Operational Roles for the Maritime Militia in a Taiwan Invasion

Kennedy and Erickson have written at length on the militia's peacetime mission to assert China's maritime claims, centered on fishing boats that may or may not do any actual fishing. The militia forces discussed here are very different, encompassing large-capacity commercial vessels, including containerships, general-cargo ships, bulk carriers, tankers, roll-on/roll-off (RO/RO) ferries, barges, semisubmersibles, oceangoing tugboats, passenger ships, and "engineering ships," as well as smaller vessels.[11] Authors from the Army Military Transportation University noted in 2015 that the force consisted of over five thousand ships organized into eighty-nine militia transportation units, fifty-three waterway-engineering units, and 143 units with other specializations.[12]

Unlike the U.S. Merchant Marine model, in which government officers and crews take control of leased ships, Chinese maritime militia units are

composed mostly of the regular crews of the mobilized ships—what the Central Military Commission (CMC) Militia and Reserve Bureau director called the "model of selecting militiamen according to their ship" (依船定兵模式).[13] The close correlation between requisitioned ships and militia units is essential for integration into military operations. There need to be clear command relationships with the supported PLA units, and the crews need to be trained on their operational tasks; then there is the increasingly important issue of legal rights and obligations in wartime. Local or provincial mobilization officials negotiate the requisitioning terms with the shipowners, either large shipping companies or individual owners, while the crews are inducted into militia units (by some process that is not explained very clearly in the available writings). Several articles note that some militiamen are not enthusiastic about their role.[14]

PLA sources cite a wide range of wartime functions for the maritime militia. In a Taiwan invasion scenario, they include the following:

> *Delivery of forces.* The most obvious operational role for militia units is to carry forces to the battlefield; this function is referred to as "military unit transportation and delivery" (部队运输投送). PLA sources list this as a primary role for civilian shipping, and note that it is to include participating in the assault landing phase of the operation.[15] Several delivery modes are contemplated, the most straightforward being through existing ports. A 2019 article on amphibious heavy combined-arms brigades in cross-strait island landing operations notes that as part of the first echelon ashore, one of the brigades' most important tasks would be to create the conditions for second-echelon units to land by conducting operations such as seizing ports and piers.[16] Articles published in 2014 and 2019 on amphibious-landing bases make the same point, and include rapid repair of piers among the main tasks to be undertaken to help the second echelon get ashore.[17] Other landing modes include lightering from cargo ships to shallow-draft vessels; semisubmersible vessels delivering amphibious vehicles or air-cushion landing craft; and RO/RO ships delivering amphibious forces to their launching point or directly to shore.[18]
>
> *At-sea support.* The PLAN has only a few replenishment ships—not enough to sustain the huge number of vessels that would be involved in a cross-strait invasion.[19] Given the relatively short distances to Taiwan landing sites, most PLAN ships likely would rely on shore-based support, but the service also envisions performing at-sea replenishment using militia ships, including fuel tankers and cargo

ships fitted with equipment for alongside replenishment and helipads for vertical resupply.[20] Militia ships also would provide emergency services, including towing, rapid repair, firefighting, search and rescue, technical support, and even personnel augmentation to replace casualties aboard naval ships.[21]

Over-the-shore logistical support. A published discussion of logistical support in island landing operations notes the importance of fuel tankers laying pipelines to support forces ashore.[22] The authors do not specify maritime militia with regard to this role, but, given the prominence of tankers in other discussions of militia support, it seems likely that they would take part in this activity as well. Requisitioned cargo ships also will play a major role in logistical support through captured ports or via lighters and barges to expedient floating docks.

Medical support. The PLAN's fleet of hospital ships could be overwhelmed by the casualties resulting from a major landing operation. Militia would augment this force with containerized medical modules deployed on a variety of commercial ships, as well as smaller vessels providing casualty evacuation and first aid.[23]

Obstacle emplacement and clearing. Several sources list emplacing and clearing mines and other obstacles among tasks for the maritime militia to perform in a landing operation, without providing much further detail.[24]

Engineering support. Maritime militia forces will not be waiting passively for first-echelon units to reopen damaged ports. Tugboats, barges, salvage ships, crane ships, and dredgers will join the effort to clear obstacles, open channels, and repair docks and other facilities.[25]

Reconnaissance, surveillance, and early warning. While much of this discussion focuses on large ships, the huge fleet of militia fishing boats would have a large role in a Taiwan operation as well, providing eyes and ears across the entire maritime theater.[26]

Deception and concealment. One major advantage the PLAN derives from having hundreds of militia ships in the battle space is the ability to hide its most valuable platforms among the radar clutter. Many sources list deception, camouflage, and feints among the militia's tasks. One 2018 article explains that militia ships will "use corner reflectors, false radio signals, false heat sources, etc., to set up counterfeit ships, missiles, fighters and other targets on the sea

. . . to cause the enemy to make wrong judgments and lure the enemy into attacking the false target."[27] Flooding the strait with false targets would complicate severely Blue (defenders') efforts against the invasion fleet.

Helicopter relay platform. The Taiwan Strait is relatively narrow, but a two-hundred-mile round-trip for each sortie still creates a significant strain for helicopter operations, so some militia ships will serve as "helicopter relay support platforms" (直升机中继保障平台). They will be fitted with helipads, ammunition-storage compartments, aviation fuel bladders and refueling equipment, limited repair facilities, and flight-control support systems to keep the helicopters in the fight.[28]

Maritime Militia Force Development

The NDMC System

Preparing maritime militia forces to operate civilian ships in wartime is a large, complex endeavor in which many parts of Chinese government and military systems are involved. The effort is coordinated through national defense mobilization committees (NDMCs) at the national, provincial, municipal, and county levels. The national-level body styles itself in English as the State Commission for National Defense Mobilization (国家国防动员委员会) (referred to hereafter as SCNDM, to distinguish it from NDMCs at lower levels). In 2016, Premier of the People's Republic of China Li Keqiang was its director, while its two deputy directors were Secretary General of the State Council Yang Jing and Minister of National Defense Chang Wanquan, listed in that order.[29] A long list of agencies is represented on the committee (see table 1). It seems very likely that the makeup of lower-level NDMCs reflects that of the SCNDM; certainly, the Gansu NDMC's does.[30]

The broad membership roster highlights two important facts about NDMCs. First, national-defense mobilization is primarily a civilian governmental function, not a military function. Over the past six years, CMC control over the military side of national-defense mobilization has been strengthened by several actions—notably, the promotion of the previous General Staff Department Mobilization Department to being a separate, top-level department of the CMC in 2015.[31] Some observers interpret recent changes to the National Defense Law as giving the CMC authority over the entire process, but this is a fundamental misunderstanding.[32] The PLA is the customer for mobilized resources, establishing requirements

that other departments fulfill under the leadership and authority of the government. The premier heads the SCNDM and governors or mayors head NMDCs at lower levels.[33]

Table 1. SCNDM Membership (2016)

State Commission for National Defense Mobilization (2016) Director Li Keqiang Deputy Director Yang Jing Deputy Director Chang Wanquan Secretary-General Sheng Bin	
Member Organizations	
• Relevant departments of the Central Military Commission	• Ministry of Housing and Urban-Rural Development
• CCP Central Organization Department	• Ministry of Transport
• National Development and Reform Commission	• Ministry of Commerce
• Ministry of Education	• Ministry of Culture
• Ministry of Science and Technology	• Health and Family Planning Commission
• Ministry of Industry and Information Technology	• State-Owned Assets Supervision and Administration Commission
• Ministry of Public Security	• State Administration of Press, Publications, Radio, Film, and Television
• Ministry of Civil Affairs	• State Statistics Bureau
• Ministry of Justice	• All-China Federation of Trade Unions
• Ministry of Finance	• Central Committee of the Communist Youth League
• Ministry of Human Resources and Social Security	• All-China Women's Federation
• Ministry of Land and Resources	

Source: "State Commission for National Defense Mobilization."

Second, NDMCs are coordinating bodies; they lack administrative authority of their own. An article from Hubei Province emphasizes that the provincial NDMC is responsible for organizing, guiding, and coordinating national-defense mobilization, while the people's government is responsible for implementation.[34] An article noted in 2013 that because all the agencies carrying out mobilization fall under the bureaucratic purview of the National Planning Commission system (计委系统) rather than the military system, "the military basically is not involved, and it is difficult for local governments to reflect military needs in a timely manner."[35]

For civilian ship mobilization and maritime militia training, the key structures within the NDMC coordination system are transportation war-preparedness offices (交通战备办公室) and transportation-mobilization

offices (交通动员办公室), established from national to county levels. These offices consolidate the whole range of PLA transportation requirements and, in the case of civilian shipping, work with government offices to develop overall approaches; identify specific ships to mobilize; draft plans for ship requisition, retrofitting, and conversion; advise on militia organizational structure and personnel; and develop militia training requirements.[36]

The Provincial Military District System

On the PLA side of this process, the key structures are the provincial military districts (省军区, PMDs) and their subordinate subdistricts (军分区) at the prefecture level. At the county level, the PMD system and the local government share joint authority over the people's armed forces departments (人民武装部, PAFDs). The PMD system has not received much attention from observers outside China, but it is the PLA's interface with the entire apparatus of civilian support to military operations.

The PMD system serves a wide range of functions, from recruitment to civil defense to representing PLA interests within major nondefense industries. But a subdistrict commander in Jiangsu asserted in 2018 that "national defense mobilization is the PMD system's primary responsibility" (国防动员工作, 是省军区系统的主责主业).[37] PMD mobilization departments represent the PLA in the provincial NDMCs, serving as the conduit through which operational forces articulate support requirements. The PMDs man, equip, organize, and train militia units and exercise direct command of the militia in peacetime.

Maritime Militia Training

If civilian shipping is to participate effectively in large-scale combat operations (and survive the experience), the crews must learn a range of military skills in addition to their basic navigation and shiphandling abilities. Training topics include PLA command relationships and coordination processes; marshaling, assembling, and sailing in formation; use of military communications equipment and procedures; self-defense and mutual defense; rescue and first aid; military loading and unloading techniques; basic knowledge of the operating environment from a military perspective; operation of equipment particular to assigned support tasks; knowledge about the unit supported and the assigned role in that unit's mission; knowledge about anticipated enemy threats; and topics such as "dockless unloading" (无码头卸载).[38]

In 2015, the National Transportation War Preparedness Office issued an *Outline for Training and Evaluation of National Defense Transportation*

Specialized Support Teams (《国防交通专业保障队伍训练与考核大纲》). This document specifies military training requirements for all militia-transportation support units, including highway, air, and rail as well as maritime units; however, like most such outlines, it does not appear to be available publicly.[39]

Construction, Retrofitting, and Conversion

Outfitting a civilian ship for military operations is a major task. Ships need mounts and interfaces for specialized military equipment, from radios to underway-replenishment apparatus to berthing and life support for transported soldiers. They may need stronger hulls and decks than their commercial tasks require and tie-down points for heavy military equipment. Their assigned military mission may require specialized fittings for reconnaissance and surveillance gear, medical treatment facilities, firefighting gear, and emergency-repair facilities.

The most efficient approach is to address these requirements in the design and shipbuilding process. China touted its first civilian RO/RO ship built to military specifications in 1997.[40] Second best is to identify specific ships, make contractual arrangements with the owner, and retrofit them with the equipment and interfaces they need. In 2015, the National Transportation War Preparedness Office issued regulatory guidance for the retrofit and conversion process: the *Technical Standards for Implementing National Defense Requirements in New Construction of Civilian Ships* (《新造民船贯彻国防要求技术标准》) and the *Technical Requirements for Modifying Civilian Ships for Military Transportation* (《民船军运改装技术要求》).[41] The process is managed at the local level by "civilian ship retrofitting and conversion centers" (民船加[改]装动员中心), under the joint supervision of the local maritime-affairs department and PAFD.[42]

Command and Control

In peacetime, maritime militia units fall under the command of the PMD system. In wartime, most units would transfer to the operational control of a PLA-supported unit command, a principle that one article calls "whoever uses, commands" (谁使用、谁指挥).[43] The PMD reportedly would retain command of some units performing wide-area functions such as intelligence collection, reconnaissance, and early warning.[44]

Several authors bemoan persistent problems in the PLA's ability to command mobilized ships and militia. Col. Xu Guo'an, commander of a military subdistrict in Jiangsu, complained in 2018 that the peacetime

militia suffered from an "unscientific" command structure and "weak" command functions, while the transition from peacetime to wartime command relations suffered from cumbersome communication and slow processes—incompatible with the need to mobilize forces rapidly for informatized warfare.[45] Faculty members from the Navy Logistics College noted in 2017 that the commanders of militia units themselves are militiamen—part-timers often lacking systematic military training or strong command abilities. Furthermore, they wrote, militia training conducted with the PLAN did not spend as much time as needed on vital tasks unfamiliar to civilian sailors, such as sailing in formation, dockless unloading, and military communications.[46] Such training seems to be far from routine; a 2019 article praises an exercise in which civilian ships transported a surface-to-air missile (SAM) battalion on a long movement across the Bohai Gulf, Yellow Sea, and East China Sea—noting in passing that this was the first time the SAM unit had traveled by ship.[47] A remarkably frank assessment of PLA failures in the 1949 battle of Jinmen cited abysmal command and control of civilian shipping among the major causes of the fiasco—a lesson the PLA should take to heart in future island landing operations.[48]

Challenges and Known Problems

A large share of PLA articles on this and other topics take the form of "problems and responses." While the proposed solutions at no time will be permitted to be implemented and might not work if they were, the format does provide us a ready list of problems the authors believe need to be fixed, or at least topics they think will attract attention.

> *Data management.* Maintaining current and accurate information for thousands of ships and tens of thousands of crewmen is a major chore, and PLA writers are unanimous that it is not being performed well enough. Deciding which ships to bring into the system and which ships are suited for which tasks requires extensive information on ship type, capacity, seaworthiness, fittings, and other aspects. Large commercial ships spend most of their time away from their home region, and just keeping track of whether the vessel is close enough to be mobilized is a challenge. Ships are bought, sold, leased, and transferred, and the task of notifying the home-port PAFD of the change often falls through the cracks. Crewmen gain experience, undergo training, get injured, change jobs, and retire. Each individual has to be evaluated for political reliability as well as

skill levels. Data systems are often incompatible from one locality to another, making it difficult to aggregate data at a higher level.[49]

Training quality. Keeping individual militiamen trained to the proper level is also a challenge. Like on which the ships they sail, crewmen are away from their home port much of the year. When they are home, they often seek other jobs; this is particularly true of fishermen during the annual three-month fishing moratorium. Training curricula are often inadequate—an issue the *Outline* presumably is intended to address. The quality of training equipment varies greatly, and many localities do not have adequate facilities for training on the many topics required. Militia units do not train often enough with the navy units under which they will serve or the army units they will load, transport, and unload.[50]

Finance and law. The whole mobilization system continues to grapple with China's incomplete transition from a command economy to a market economy. Creating a viable legal, regulatory, and economic foundation for mobilization in the reform era has been a two-decade effort, and it remains far from finished.[51] The most challenging issue on the financial side is that of compensation for the use of ships and crews; what entity should be compensated, at what rate, by what part of the Chinese regime? As late as 2019, authors complained that many situations were left uncovered by the body of relevant laws and regulations, that the compensation standards were not clear enough, that the compensation rates were out of date, and that the fiscal burden was not distributed appropriately among national, provincial, and local governments.[52]

Moreover, there is no mechanism for adjudicating disputes over compensation, owing to the general ban on litigation against the state under the Administrative Litigation Law.[53] The pertinent laws and regulations do not include enough cross-references. For example, as one author notes, the Military Service Law stipulates that veterans and militiamen have priority in applying for civil service positions, but the Civil Service Law does not, while the Military Service Law itself does not establish any penalties for militia personnel refusing military training.[54]

Foreign-flag ships. As is the case with the rest of the global shipping industry, an ever-growing portion of the Chinese-funded commercial fleet uses flags of convenience.[55] A 2018 article by officers from the Army Military Transportation University and the CMC

> Logistics Support Department assessed that 62.5 percent by tonnage of the shipping capacity controlled by Chinese entities in 2015 flew foreign flags. The authors were confident that China could justify requisitioning these ships in an emergency, despite the lack of any specific legal provision to do so, but they opined that registering them, getting them ready for mobilization, and getting their personnel trained properly would be a particular challenge for the NDMC and transportation mobilization department at each level.[56]

The PLA concept of operations for a cross-strait landing on Taiwan relies heavily on large numbers of civilian ships and their crews, organized into maritime militia units under the operational command of the supported force. The PLA has spent over two decades developing the bureaucratic apparatus, laws, and regulations to organize, train, and manage this force. This author finds nothing in PLA writings on this subject to suggest that this is a temporary measure intended merely to fill the gap until the PLAN expands its own fleet of transports and auxiliary ships. Rather, this seems to be how Chinese leaders, civilian and military, think the PLA should function: leveraging the enormous resources of China's civilian economy to support military operations.

Any landing operation of this scale would be immensely complicated, and the reliance on maritime militia and mobilized civilian ships adds yet another layer of complexity and uncertainty. Undoubtedly the support effort would not go as well as planners might wish, given the many problems of which they already know and the inevitable new crises that will erupt midfight. That does not mean it is doomed to fail, however. Capturing enough ports and keeping them open almost certainly will be the main challenge. If first-echelon forces succeed at that, the rest of the operation has a reasonable chance of success, at least in this author's opinion. Either way, an attempted invasion of Taiwan not only would be one of the most ambitious landing operations in history; it also undoubtedly would represent the largest-ever mobilization of civilian shipping to support military operations—far outstripping Dunkirk in the number of civilian vessels, and the Falklands War in tonnage. The militia logistics backbone is vital to the success of a Taiwan invasion.

Notes

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1. The epigraph above is from 张健 [Zhang Jian] and 吴娟 [Wu Juan], 大规模作战海上民用运输船舶动员与运用 ["Mobilization and Employment of Seagoing Civilian Cargo Ships in Large-Scale Operations"], 军事交通学院学报 [*Journal of Military Transportation University*], no. 11 (November 2017), pp. 1–5, 45.
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3. Ian Easton, *The Chinese Invasion Threat: Taiwan's Defense and American Strategy in Asia* (Manchester, U.K.: Eastbridge Books, 2017), loc. 2689, Kindle.
4. I have argued elsewhere that this does not appear to be how the Chinese assess the situation, that PLA leaders do believe the PLA is ready if called on, and that the reliance on civilian shipping is the likely basis for their assessment. See Lonnie Henley, "Testimony before the U.S.-China Economic and Security Review Commission Hearing on Cross-Strait Deterrence: PLA Operational Concepts and Centers of Gravity in a Taiwan Conflict," *U.S.-China Economic and Security Review Commission,* 18 February 2021, www.uscc.gov/hearings/deterring-prc-aggression-toward-taiwan.
5. To this author's knowledge, there has not been a rigorous assessment outside China of how many auxiliary ships of what types the PLA would require to execute and sustain an invasion of Taiwan.
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7. The PLA Navy's Amphibious Fleet

Modernizing for Missions Near and Far

China's naval amphibious fleet has evolved since the People's Liberation Army (PLA) Navy (PLAN) commissioned its first tank landing ships (LSTs) in the late 1970s and early '80s. While the pace of the modernization process initially was gradual, it accelerated midway through the first decade of the twenty-first century with the addition and growth of new global missions for the navy.

China's amphibious forces train and prepare for traditional amphibious-assault missions and conduct routine logistics operations, such as re-supplying China's naval bases and military outposts in the South China Sea. The introduction of larger amphibious combatants, such as the Yuzhao-class (Type 071) amphibious transport dock (LPD) and the Yushen-class (Type 075) landing helicopter assault (LHA) amphibious ships, greatly expands the substance and scope of the PLAN's amphibious forces and adds new capabilities for it to conduct global expeditionary missions.

Although policy statements and continued modernization efforts demonstrate China's intent to develop a strong military force, with a particular focus on capabilities suited to preventing Taiwan from pursuing independence, development trends in China's amphibious force do not indicate urgent preparations for traditional cross-strait combat operations. Even as the PLAN acquires new ships for long-distance amphibious

missions, China's navy is removing older landing ships from active service and missing opportunities to maximize its traditional naval lift capacity. Beijing is taking a balanced approach to its naval amphibious modernization to support broad strategic goals, of which modest support to cross-strait capabilities is a part.

Strategic Transitions Driving the Development of the PLAN Amphibious Force

Since the PLAN's founding in 1950, China's naval strategy has transitioned from concentrating on "near-coast defense" (近岸防御) to "near-seas defense" (近海防御), to, most recently (in 2015), "near-seas defense, far-seas protection" (近海防御、远海护卫).[1] Near-coast defense, the focus of the PLAN's first strategy, reflected the navy's role as the maritime branch of the land forces and concentrated on protecting China's mainland from foreign invasion. During the 1950s, the PLAN constructed its first-generation amphibious forces, including medium and large LSTs, but in the 1960s and early '70s the majority of its amphibious force still comprised smaller utility landing craft.[2]

In the 1980s, the PLAN's strategy transitioned from a near-coast to a near-seas concentration, which emphasized defense of China's maritime sovereignty inside the first island chain.[3] In the 1990s and early years of the following decade, to build toward a credible ability to conduct amphibious operations against Taiwan and to support small PLA footprints on offshore islands and Chinese-claimed reefs, the PLAN launched a new wave of amphibious-ship acquisition, including of large LSTs with helicopter decks and greater lift capacity.[4] In the first half of the first decade of the twenty-first century, additional waves followed that included acquisition of Yuting II–class (Type 072A) LSTs, Yunshu-class (Type 073A) medium landing ships (LSMs), and Yubei-class (Type 074A) utility landing craft (LCUs).[5]

In 2007, the PLAN commissioned its first Yuzhao-class LPD.[6] Although designed and constructed during the PLAN's "near seas" strategic period, this platform reflected newer leadership guidance, known as the New Historic Missions, and anticipated the expansion in naval strategy that was adopted officially by 2015. First articulated in a speech by former Chinese president Hu Jintao in 2004, the New Historic Missions significantly expanded the PLA's responsibilities to include safeguarding China's strategic and economic interests, protecting overseas Chinese citizens and investments,

and sustaining world peace.[7] The Yuzhao LPD and the Yushen LHA—the first of the latter class was commissioned in April 2021—are both capable of providing lift during traditional amphibious-combat operations, but are also well suited to global missions in support of China's strategic interests.[8]

The PLAN's Amphibious Force

The PLAN currently operates approximately nine amphibious-assault combatants, thirty LSTs, twenty LSMs, and several dozen smaller landing craft.[9] Over the past decade, the PLAN's amphibious modernization efforts have centered on acquiring Yuzhao LPDs and Yushen LHAs, but the service also has launched new landing craft to operate in conjunction with the large amphibious ships, as well as a small number of new LSTs and LSMs, primarily as direct replacements for older units being decommissioned.

For nearly two decades, the Yuting II LST has been the workhorse of China's amphibious fleet.[10] The PLAN currently operates fifteen hulls, constructed in two waves in 2003–2005 and 2015–16.[11] Each of these ships is capable of carrying at least ten light tanks and 250 troops.[12] Like the older Yuting I–class (Type 072III) LSTs, which were constructed primarily during the 1990s and as many as ten of which are still in operational service, the Yuting IIs have a helicopter deck to augment logistics flexibility.[13] Both Yuting I and Yuting II LSTs have estimated operational ranges of three thousand nautical miles (nm) and top sustained speeds of seventeen knots. Both classes provide an expanded lift capacity over the older Yukan-class (Type 072) LST, which does not have a helicopter deck, although the PLAN continues to operate a small number of Yukans.[14]

The PLAN's primary LSM classes are the Yuhai (Type 074/074B) and the Yunshu. Smaller than LSTs, these LSMs have a lower lift capability than and roughly half the operational range of Yuting I and II LSTs, but are very capable of supporting amphibious-combat operations. Yuhai-class LSMs were constructed in two phases, in the 1990s and in 2017–18. A total of eleven Yuhais are in service.[15] These ships have a top speed of approximately fourteen knots and can lift at least two light tanks plus additional troops.[16] Each of the slightly larger Yunshu-class LSMs, all ten of which were commissioned in 2004, can lift at least six light tanks.[17]

The Yubei-class LCUs were part of the PLAN's wave of amphibious acquisitions in the first years of this century; the service commissioned eleven in 2004–2005. These relatively large landing craft are capable of lifting at least three light tanks or up to 250 troops each.[18] The PLAN acquired

two Pomornik (Type 958) air-cushion utility landing craft (LCUAs) from Russia beginning in 2012 and built two more in China under license.[19] This large LCUA can achieve top speeds greater than sixty knots and has a range of 300 nm at more-economical speeds. The class can lift several tanks or vehicles plus troops, but has difficulty operating in high sea states and generally is thought to have low reliability and high maintenance requirements.[20] Low inventory numbers, lack of construction of additional units, and relatively infrequent press references to relevant training suggest the PLAN has not integrated this platform fully into its operations.

In addition to the larger, independently operating Yubei LCU, the Pomornik LCUA, and older, more-traditional classes of LCUs, the PLAN also operates at least twenty Yuyi-class (Type 726A) air-cushion medium landing craft (LCMAs).[21] The Yuyis are designed to operate from the well decks of Yuzhao LPDs and Yushen LHAs; the Yuzhaos can accommodate four LCMAs, the Yushens two.[22] Each Yuyi LCMA can lift approximately two amphibious-assault vehicles plus troops. Yuyis have a limited operational range of approximately 200 nm, but can transit at very high speeds of forty knots.[23]

The Yuzhao LPD class is one of the most notable additions to the PLAN's amphibious fleet; it substantively expands the amphibious force's mission capabilities. In addition to embarking Yuyi LCMAs in its well deck, the Yuzhao LPD can accommodate four medium-lift helicopters in hangars, up to eight amphibious-assault vehicles on the vehicle deck, and from six hundred to eight hundred troops.[24] Without Yuyi LCMAs embarked, a Yuzhao reportedly can carry up to twenty-four amphibious-assault vehicles in its well deck.[25] The Yuzhao can operate at higher speeds than traditional landing ships and has a range of up to 10,000 nm at economical cruising speeds, allowing it to operate seamlessly with Chinese naval-combatant task groups around the world.[26] The Yuzhao's lift and range capabilities dwarf those of the PLAN's other amphibious classes. The PLAN's eight LPDs offer a versatile, multidimensional assault capability for traditional amphibious combat, such as cross-strait operations, but more significantly the ship's lift, range, endurance, and multimission capability enable the PLAN for the first time to conduct global expeditionary operations.

The Yushen LHA offers global capabilities similar to those of the Yuzhao LPD. Even larger than Yuzhao (but smaller than the U.S. Navy's *Wasp*- and *America*-class ships), Yushen is able to embark up to thirty medium-lift helicopters and has at least six landing spots on its flight deck. Like the Yuzhao, the Yushen has a well deck to support multidimensional amphibious-assault operations. Some reports describe the Yushen as a

future maritime operations command hub that will play a critical role in dispatching amphibious forces during assault missions, and possibly will transform the PLAN's approach to future landing operations.[27] The first Yushen, *Hainan* (LHA 310), was commissioned in April 2021, and two additional hulls currently are under construction or in sea trials.[28] Like the Yuzhao, the Yushen provides additional lift capacity to contribute to traditional amphibious operations but also offers valuable options for global expeditionary operations.

Mixed Messages: Trends That Reduce the PLAN's Cross-Strait Capabilities

Even as the PLAN is acquiring new landing ships and craft, it also is removing amphibious ships from active service, thereby reducing the net increase in lift that the new platforms provide. China's inconsistent approach to the size of its naval amphibious force suggests that significantly increasing its traditional naval amphibious-lift capability is not currently, or abidingly, a priority. In the past decade, the PLAN has reduced its amphibious lift in three different ways: decommissioning, transfer to nonmilitary services, and allocation for experimental activities.

From 2019 to 2021, the PLAN decommissioned at least five landing ships. It decommissioned two Yukan-class LSTs in July 2020.[29] These platforms were constructed in the late 1970s and early '80s and each served for approximately forty years. This is a typical service life for ships in modern navies; for example, the U.S. Navy expects most classes of its naval ships to serve for thirty to forty years.[30] For reasons that are less understandable, the PLAN in 2019 decommissioned three Yuhai-class LSMs.[31] The Yuhai class became operational in 1995, meaning that the decommissioned ships had served for less than twenty-five years when taken out of naval service. It is possible, however, that these ships will be transferred to other government organizations or sold to other countries. In the 1980s, China built several classes of LSMs, including the Yudao and Yuliang classes, all of which have been removed from active service in the amphibious fleet.[32] The condition of these Chinese amphibious ships at the time of their decommissioning is unknown; however, if maximizing naval lift were a priority, the ships likely could have been overhauled or preserved to contribute to future large-scale operations.

By 2015, the PLAN had transferred three Yukan-class LSTs temporarily to the China Coast Guard, which probably used them to further

island-construction logistics in the South China Sea. Two of these ships reportedly were returned with modifications, including installation of a crane. This reduced the ships' ability to support amphibious lift but increased their flexibility to support logistics. Overall, the transfers away from the PLAN and the modifications to the returned ships reduced the PLAN's order of battle and lift capacity.[33]

In 2018, the PLAN heavily modified one Yuting I LST, likely fitting it with a developmental electromagnetic naval rail gun weapon and welding the bow doors shut.[34] The weapons-testing function is a necessary one for a navy to modernize, but performing this support role prevents the platform involved from participating in routine amphibious operational training and reduces its ability to provide lift during any combat operation occurring in the near term.

Diplomatic and political sensitivities also may put pressure on acquisition planning. Beijing is frequently explicit about its intention to unify Taiwan with the mainland, publicly stating its firm resolve to protect its claimed territorial sovereignty and reiterating that China and Taiwan "must and will be" unified. Notwithstanding this intent, China's top leaders have many reasons not to invest in a large, single-use force—particularly given that Beijing prefers a "peaceful reunification" over the use of force.[35] A surge in single-use ship construction risks drawing international attention to Beijing's activities. During an increase in amphibious-ship construction in 2003–2005, numerous organizations noted the significance of the force's growth.[36]

Additionally, any naval force requires routine maintenance, consumable supplies, personnel to operate its ships, and pier space for berthing. All these factors come with significant long-term costs that any modern navy must consider prudently when making budget and force-planning decisions. Operational value and strategic need justify these costs for many naval platforms, but if additional amphibious-lift ships in the PLAN are useful only for limited military purposes—such as a cross-strait operation—the costs could become burdensome or detract from fulfilling other, emerging mission requirements.

Opportunities to Bolster Amphibious Lift

If Beijing musters the political will and intent to invade Taiwan, the PLA has several options to bolster its traditional naval lift and increase its capabilities to move troops, vehicles, and supplies during a cross-strait amphibious operation. First, China could surge production of amphibious

vessels, as it has a significant advantage in the capacity (in size and capability) of its shipbuilding industry. China is the largest ship-producing nation by tonnage, and it is home to the world's largest shipbuilder as measured by production capacity: the state-owned China Shipbuilding Group.[37] Although the PLAN once purchased foreign ships and submarines to augment its order of battle, China currently produces all classes of naval ships, including almost all weapons and naval sensors. Furthermore, China already has demonstrated its ability to use its shipyards to surge production of amphibious ships; from 2003 to 2005, the PLAN commissioned approximately thirty amphibious ships and craft.[38] Nearly two decades later, China's domestic, state-owned shipyards clearly have the capacity, skills, and experience to increase significantly the PLAN's traditional naval lift in a relatively short time.

Second, the PLAN can augment its traditional naval lift by requisitioning civilian logistics and transportation ships. This is a key focus of the PLA, as discussed in the chapters by Michael Dahm and Lonnie Henley. In June 2020, for example, the twenty-thousand-ton, civilian, roll-on/roll-off (RO/RO), car-carrier ship *Changdalong* participated in an exercise that centered on loading and off-loading a PLA ground forces (heavy) combined-arms brigade. At 140.5 meters long and 24.4 meters wide, the ship can carry approximately two thousand cars on eight decks. *Changdalong* has taken part in ten of these exercises over the past few years.[39]

In 2015, the government issued new technical guidelines requiring that all civilian shipbuilders ensure that their ships were suitable for military uses during an emergency. The guidelines cover five ship categories, including container, RO/RO, multipurpose, and bulk. Use of these ships would enhance the PLA's strategic projection capabilities during a military crisis.[40]

Even before these guidelines were issued, China was working to improve its "ships taken up from trade" capability. In 2012, China launched a 36,000-ton RO/RO ferry—the largest of its kind at the time of building. The Military Transportation District of the former Jinan Military Area Command coordinated with the shipbuilder on the ship's requirements.[41] Although the vessel's primary purpose is to ferry passengers for commercial use, it is also a strategic-lift platform able to transport two thousand troops and three hundred vehicles, and to land helicopters.[42]

Using these types of large merchant vessels and passenger ferries can increase significantly the PLAN's capacity to transport and deliver large volumes of personnel, vehicles, and supplies. However, these deep-draft, civilian ships require suitable ports for unloading, and therefore they cannot be used for amphibious assaults.

PLAN Amphibious Training, Operations, and Support to Exercises

Chinese TV commentators have noted that military conflict may be the only way to "resolve" China's relationship with Taiwan, and in such an event the skill-set associated with amphibious landings will be the military's most important capability.[43] Most publicized training takes place at dedicated sites along the Chinese coast, in the Eastern and Southern Theaters, often near the Taiwan Strait, demonstrating the priority the PLA places on preparation for amphibious-assault operations.

Each year, forces from PLAN naval-landing-ship flotillas, PLAN Marine Corps units, and selected units from the PLA ground forces' amphibious combined-arms brigades conduct amphibious training. Increasingly that training focuses on integrated joint maneuvers that include theater-command army, navy, air force, rocket force, and strategic support force elements exploring tactics and operational methods.[44] Training scenarios typically involve beach assaults by amphibious armored vehicles swimming off LSTs and LSMs standing offshore.[45] The drills routinely incorporate executing formations, at-sea maneuvers, live-fire drills, clearing of obstacles, and loading/unloading operations from LSTs and LSMs.[46] Press reports on recent exercises describe the order of amphibious-assault mission phases, from preassault reconnaissance to opening artillery strikes, and from obstacle clearing to opening safe sea-lanes for multidimensional assault waves to enable beach landing and seizure.[47] The training simulates cross-strait landings, with reference to three-dimensional images of Taiwan that have been observed occasionally in unit-training camps.[48]

Like the LSTs and LSMs, the PLAN's larger amphibious combatants participate in coastal training and simulated amphibious assaults, frequently deploying embarked Yuyi-class LCMAs to ferry troops ashore in island-seizure training exercises. In March 2021, a Yuzhao-class LPD practiced loading, unloading, and landing operations in a simulated island seizure with several Yuyi LCMAs in the South China Sea.[49] In January 2021 in the South China Sea, two Yuzhao LPDs, *Changbaishan* (LPD 989) and *Wuzhishan* (LPD 987), participated in a series of drills that included live-fire beach-assault, air-defense, LCMA loading/unloading, and landing-ashore functions.[50] In mid-November 2020, three LPDs (*Changbaishan, Wuzhishan,* and *Kunlunshan* [LPD 998]) participated in a landing-ship-flotilla exercise in the South China Sea under the PLA Southern Theater Command, during which LCMAs conducted landing and disembarking missions, as well as vessel board, search-and-seizure, and live-fire operations.[51]

LSTs also are identified frequently in the Spratly Islands.[52] According to *Jane's Defence Weekly,* some amphibious ships are used mainly to provide logistics support to naval detachments.[53] It is likely that augmenting logistics support to naval bases and outposts—the farthest of which are completely reliant on mainland China for food, water, and supplies—is recognized as a secondary mission responsibility for LSTs and LSMs; however, while conducting naval base logistics support contributes to the PLA's overall combat readiness, carrying out this routine logistics mission may reduce the LST/LSM force's readiness for amphibious-assault missions.

In addition to amphibious exercises emphasizing landing operations, Yuzhao LPDs routinely participate in long-distance deployments to conduct real-world training, often in the Pacific and Indian Oceans. These missions focus on preparing for a range of expeditionary and combat missions, not narrowly for a cross-strait operation. In February 2021, *Wuzhishan* participated in a PLAN task group that transited over 8,000 nm and remained at sea for more than thirty days. *Wuzhishan*'s participation in this deployment followed a pattern of similar LPD task group deployments in 2018 and 2019, when *Jinggangshan* (LPD 999) and *Changbaishan,* respectively, participated in far-seas operations that included joint drills.[54] According to press releases from China's military, the 2021 task-group training themes included air and missile defense, antiterrorism and antipiracy operations, and joint search-and-rescue (SAR) operations.[55] In a slight departure from some past deployments, on its return in late February the 2021 task group—augmented by other Southern Theater units, including *Changbaishan*—participated in complex joint-service amphibious-landing and -assault drills with Southern Theater army and PLAN Marine Corps units.[56] During the training, *Wuzhishan* deployed at least two LCMAs and also participated in gunnery exercises.[57] Conducted as part of the blue-water deployment, these amphibious operations demonstrated the PLAN's growing expeditionary capabilities.

The Future of Amphibious Missions: Global Expeditionary Operations

The PLAN's current naval strategy highlights Beijing's intent to operate globally to safeguard China's interests. China's 2019 defense white paper identified worldwide threats that included regional turmoil, terrorism, and piracy, noting the risks these pose to China's investments and personnel

overseas. Beijing uses these threats to justify its requirement to develop a global, quick-reaction, expeditionary force. In part to better support and augment its national priorities to protect overseas interests, Beijing seeks an active voice in the reform and execution of global governance and wishes to demonstrate its status as a stakeholder and contributor to peace on the high seas.[58] As a result, the PLAN participates in UN-sponsored vessel-protection operations, provides international humanitarian assistance and disaster relief, and jointly maintains the security of international passages. Increasingly, the PLAN's large amphibious combatants play a role in accomplishing these global missions. The endurance and operational flexibility of the PLAN's expeditionary forces provide Beijing with the tools to justify and implement its global-security-policy preferences.

In 2010, the PLAN first began deploying its Yuzhao-class LPDs on operational missions to support China's counterpiracy naval-escort task force in the Gulf of Aden.[59] As part of the sixth task force, *Kunlunshan* deployed for approximately six months, escorting 588 ships through the Gulf of Aden, and conducting several goodwill visits during its return transit, including to Bahrain and Indonesia.[60] *Kunlunshan*'s participation in the counterpiracy mission allowed China to experiment with new naval-escort models that integrated ships, aircraft, and landing craft.[61] Since 2010, Yuzhao-class LPDs have participated in three more escort-task-force deployments in the Gulf of Aden and conducted goodwill visits in Africa, Europe, Asia, and Australia.[62] In April 2014, two PLAN Yuzhao-class LPDs demonstrated their ability to support ad hoc, real-world missions when *Jinggangshan* and *Kunlunshan* joined in SAR operations for a missing aircraft, Malaysia Airlines flight 370.[63] *Changbaishan*'s participation in this mission demonstrated both the LPD force's readiness and its operational flexibility.

The PLAN also increasingly is using its Yuzhao-class LPDs to support naval-diplomacy missions and engage foreign partners during bilateral and multilateral exercises. *Changbaishan* participated in the Joint Sea 2015 Chinese and Russian military exercise in the Sea of Japan, near Vladivostok. This iteration of the recurring bilateral exercise was noteworthy for its inclusion of the PLAN's first landing operations outside China, demonstrating Beijing's interest in developing its expeditionary capabilities and its intent to do so. During the exercise, *Changbaishan* launched ten amphibious armored vehicles and helicopters to fast-rope marines ashore. *Yunwushan* (LST 997) also took part in this joint-landing exercise.[64] Also in 2015, *Jinggangshan* participated in the ASEAN Regional Forum's disaster-relief exercise in Malaysia. Held every two years, this multilateral

exercise typically incorporates a combination of tabletop exercises and at-sea SAR drills, accompanied by additional forums to promote information sharing and cooperation.[65] In 2016, *Changbaishan* joined the Royal Thai Navy in Exercise Blue Strike 2016, a three-dimensional humanitarian-rescue training operation.[66]

Large amphibious combatants also most likely will provide logistics support to China's fledgling overseas military-support network. Currently China operates one external base, in Djibouti, and it probably is planning to construct a second, in Cambodia.[67] China's 2019 defense white paper calls for the PLA to develop overseas logistical-support facilities to address deficiencies in Beijing's ability to protect its overseas interests.[68] As the PLA builds and operates these overseas facilities, it probably will use the PLAN's large amphibious combatants to ferry troops, weapons, and military equipment between China and these locations. Just as the PLA historically has used its amphibious-vessel fleet to support its operations on PLA-manned outposts in the South China Sea, these vessels will provide similar logistical-support capabilities farther abroad.

The PLAN's amphibious developments and acquisitions to date do not indicate a sense of urgency in relation to traditional amphibious cross-strait operations. According to the U.S. Defense Department's 2020 report on China's military power, as of 2020 the PLA was not capable of conducting a "full-scale" invasion of Taiwan, but it could support amphibious operations against smaller Taiwan-held islands in or near the Taiwan Strait. The report concludes that, absent evidence of a significant buildup of large and medium-size landing ships, the PLA likely is not planning a direct beach assault against Taiwan.[69]

Instead, trends suggest that China's navy has adopted a balanced approach. The force's maintenance (or lack thereof) of traditional naval lift and its acquisition of large amphibious combatants support Beijing's emerging goals to develop a modern navy capable of furthering China's global interests. At the same time, the PLAN's amphibious development also provides modest value to potential cross-strait operations. The PLAN operates an amphibious force that is sufficient to support routine training needs, conduct small-scale amphibious-assault missions, and participate in global operational deployments.

China's balanced approach to its amphibious force modernization suggests two different potentially controversial and debatable considerations for the application of China's traditional amphibious lift in a notional cross-strait operation, and it may challenge some long-held assumptions

among analysts who closely study cross-strait tensions and diplomatic relations. First, the size and composition of the force indicate that China's approach to cross-strait operations will not rely as heavily on direct beach assault and traditional lift as once was assumed, although the precise ratio of naval lift versus other forms of amphibious lift is unknown. Alternatively, the current amount of naval amphibious lift suggests that Beijing's desire for unification has a long timeline, and that the regime does not yet require the acquisition of larger amounts of naval lift. These two considerations are not necessarily mutually exclusive.

The most significant takeaway from examining the composition of the PLAN's amphibious force is the service's transition toward blue-water capabilities, as manifested in its acquisition patterns, operations, and strategic guidance. The PLAN is developing a multimission force, and nowhere has this been more evident than in the development of its Yuzhao LPDs and Yushen LHAs. Looking ahead, reports indicate that this expeditionary amphibious-assault force will continue to expand with the advent of the even more capable Type 076 amphibious-assault ship, which is likely a follow-on to the Yushen and may be fitted with systems to accommodate unmanned combat aerial vehicles.[70] Although Beijing continues to invest heavily in capabilities necessary for a cross-strait operation—refusing to renounce the use of force and reserving the option to take all necessary measures to safeguard the country's claimed territorial integrity—the PLAN's high-endurance, multimission acquisitions and global missions point to Beijing's long-term ambition to ensure worldwide security for China's interests on the high seas.

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PART III

Enablers of Amphibious Warfare

Cristina Garafola

8. The PLA Airborne Corps in a Joint Island Landing Campaign

In May 2018, the People's Liberation Army (PLA) announced a major new milestone for its Airborne Corps (空降兵). Chinese paratroopers made their inaugural jump from the Y-20, the country's first indigenously built aircraft in its strategic-airlift fleet. In the same exercise, the corps, which is part of the PLA Air Force (PLAAF), completed its first heavy-equipment drop from the new aircraft, marking another important achievement in the corps's modernization.[1]

Despite these developments and other recent modernization efforts under way within the airborne forces, the Airborne Corps's potential role in a cross-strait invasion has received relatively little attention compared with that paid to the development of key ground and naval invasion forces.[2] A past lack of focus on the capability of airborne units may have stemmed from the extreme capacity limitations of the PLA's strategic-airlift forces, which restricted the PLA's ability to deploy significant numbers of airborne troops across the strait. However, the 2018 exercise and other recent milestones presage a potentially much more active and significant role for the Airborne Corps in future cross-strait operations.

In recent years, the PLA Airborne Corps has undergone significant reorganization and modernization to improve capabilities relevant to cross-strait operations. The corps also appears to be increasing its training on complex

topics, including in combined-arms and joint contexts. However, like the PLA writ large and the PLAAF in particular, the Airborne Corps suffers from a lack of combat experience. It has not conducted combat operations abroad but rather has been tasked to support the regime during periods of domestic turmoil or for domestic humanitarian-assistance and disaster-relief (HA/DR) operations. Key questions also remain regarding the corps's ability to integrate with other PLA units and conduct operations in complex or degraded environments, as well as the PLAAF's broader ability to secure the command of the air needed to enable airborne troops to land on Taiwan.

This chapter chronicles the changing capabilities of the PLA Airborne Corps over the past decade and provides a foundation for assessing the corps's role in a cross-strait invasion. It comprises four main sections. Section 1 briefly summarizes the force structure of the corps. Section 2 reviews the Airborne Corps's stated roles and missions in a joint island landing campaign (JILC). Section 3 examines recent efforts to strengthen the corps's ability to conduct operations relevant to a cross-strait invasion. Section 4 discusses ongoing challenges that the PLA Airborne Corps must overcome to perform large-scale operations of this kind effectively. The chapter concludes with a summary of its main findings and a road map for future research on this topic.

History and Force Structure

Unlike in the U.S. armed forces, China's Airborne Corps always has been subordinate to the PLAAF rather than the PLA ground forces. The corps traces its roots to 1950, with the Central Military Commission's establishment of an air force marine brigade. The unit underwent several changes over the subsequent decade, successively becoming the Air Force Marine First Division, the Paratroops Division, and the Airborne Division, until finally it was restructured into a corps-level organization. Table 1 lists key organizational and operational milestones in the corps's development.

Today, the corps includes the following known units:

- Six airborne combined-arms brigades (空降兵旅), consisting of three light motorized brigades, two mechanized brigades, and one air-assault brigade[3]
- One transport aviation brigade (运输航空兵旅), which may include the prereorganization helicopter regiment[4]
- One special-operations brigade (特种作战旅)
- One combat-support brigade (作战支援旅)

Table 1. Key Events in the Airborne Corps's Development

Year(s)	Event
1950	The Central Military Commission establishes an air force marine brigade.
1961	Now known as the PLAAF 15th Airborne Corps, the unit's headquarters is located in Xiaogan, Hubei Province.
1967	The corps deploys to Wuhan to subdue an uprising during the Cultural Revolution.
Mid-1970s	The Airborne Corps consists of three airborne divisions.
Mid-1980s	The corps's three divisions are reduced to three brigades.
1989	The corps deploys to Beijing during the Tiananmen Square crisis and military crackdown.
1992	The Airborne Corps is officially designated a lead unit within the PLA's rapid-reaction force (快速反应部队), even though it already had been training in that role.
1993	The airborne brigades are upgraded to three divisions of about ten thousand troops each.
Mid-1990s	For the first time, the Airborne Force commander is selected as one of the PLAAF's four deputy commanders (1993), possibly reflecting increased leadership attention on the role of airborne forces. The PLAAF also receives its first Il-76 transports.
2008	Airborne forces support earthquake relief efforts in Sichuan.
2017–18	As part of broader PLA reforms, the corps is renamed from the PLAAF 15th Airborne Corps to the PLA Airborne Corps, but remains part of the PLAAF. Its three division headquarters are abolished and its six regiments are converted into brigades.
2020	The Airborne Corps supports COVID relief efforts in Wuhan.

Note: For more on the development of rapid-reaction units and forces, see Blasko, *The Chinese Army Today,* pp. 84–85, 104, 175.

Source: Adapted from Allen and Garafola, *70 Years of the PLA Air Force,* p. 140.

- One training base (训练基地)
- One new training brigade (训练旅)[5]

Table 2 lists major equipment types in the PLA Airborne Corps's order of battle. Table 3 provides the PLAAF transport aircraft available to the force.

Table 2. PLA Airborne Corps Aircraft and Other Equipment

TRANSPORT AIRCRAFT: 40
Medium: 6 Y-8
Light: 34 (20 Y-5; 2 Y-7; 12 Y-12D)

HELICOPTERS:
8 WZ-10k attack helicopters
8 Z-8KA combat search-and-rescue helicopters
12 Z-9WZ multirole helicopters

ARMORED FIGHTING VEHICLES:
180 ZBD-03 airborne-combat vehicles
4 ZZZ-03 armored personnel carriers (command posts)
Modified CS/VN3 armored utility vehicles

ANTITANK/ANTI-INFRASTRUCTURE:
Some self-propelled HJ-9

ARTILLERY: 162+
122 mm towed: est. 54 PL-96 (D-30)
107 mm multiple-rocket launchers: est. 54 PH-63
54+ mortars: some 82 mm; 54 100 mm

AIR DEFENSE:
Point-defense surface-to-air missiles: QW-1 (CH-SA-7)
25 mm towed guns: 54 PG-87

Source: Adapted from IISS, *The Military Balance (2022),* pp. 260–63.

Table 3. PLAAF Transport Units and Aircraft

Units	Aircraft
1 regiment with Il-76MD/TD Candid 1 regiment with Il-76MD Candid; Il-78 Midas 1 regiment with Y-7 2 regiments with Y-9 2 regiments with Y-20/Y-20U	**TRANSPORT AIRCRAFT:** 247+ **Heavy:** 51+ (20 Il-76MD/TD Candid; 31+ Y-20) **Medium:** 55+ (30 Y-8C; 25+ Y-9) **Light:** 111 (70 Y-5; 41 Y-7/Y-7H)

Note: Table 3 excludes VIP transport units operating personnel aircraft. The Y-8Cs listed in the aircraft count were described previously as part of a mixed Y-8C/Y-20 regiment, but this is now listed as a Y-20-only unit. *Military Balance (2022)* lists the new Y-20Us as tanker/transport aircraft, with three in inventory for 2022.

Source: Adapted from IISS, *The Military Balance (2022),* p. 261.

One additional element of note in the corps's force structure is the CH-802 small drones operated by the airborne brigades.[6]

The Role of the PLA Airborne Corps in a Cross-Strait Invasion

The 2006 *Science of Campaigns* summarizes the role of the Airborne Corps as follows: "Through air mobility, the airborne force carries out operational activities in the enemy's depth in order to achieve specific strategic and campaign goals." In the context of a cross-strait invasion, the corps's key role would be to support a PLA JILC.[7] *Science of Campaigns* cites three main phases in a JILC: (1) preliminary operations; (2) assembly, embarkation, and transit; and (3) the assault landing and the establishment of the campaign landing site (beachhead). Airborne forces likely would participate in the first and third phases. During the preliminary phase, forces would be inserted via airborne operations to conduct "sabotage raids" behind enemy lines to help the PLA seize command of the air. Described as "elite special operations units," these forces would target key enemy airfield, radar, command-and-control, and munitions infrastructure.[8]

The Airborne Corps also likely would play a supporting role during the assault landing phase, during which the elements of the first echelon of the invasion, including both amphibious-assault and vertical-landing forces, would maneuver toward their objective areas. In *Science of Campaigns,* the corps's part of the operation is described as an airborne landing combined "with [a] frontal assault onto land . . . to assist and complement landing force operations with active actions." Airborne forces then would "immediately initiate attacks against predetermined targets, taking advantage of the situation when the enemy's state is unclear and they cannot organize effective resistance in time and the counter–airborne landing units have not arrived, to quickly seize and occupy objectives, actively complement landing force operations, and accelerate the speed of the assault onto land, ensuring that the assault onto land succeeds in one stroke." Airborne forces also are expected to support the resistance against any counterattacks that enemy forces undertake against the PLA's lodgment.[9]

Science of Campaigns sheds light on how the PLAAF likely would approach a major airborne campaign. It highlights four main elements. First, the PLA would need to seize information superiority (制信息权) and command of the air (制空权). The text describes these as "preconditions" (前提条件) for a successful airborne campaign. Second, the PLA would conduct

preparatory fires (火力准备). Third, the airborne troops would be transported, in this case across the Taiwan Strait, and would conduct paradrops or landings in selected locations. Once the troops had landed, they would begin the campaign's fourth phase: ground operations (地面作战). In this phase, they would capture landing sites, set up PLA operations at the sites for follow-on landings, carry out ground offensives, and transition to defensive operations as needed.[10]

As this sequence suggests, PLAAF aviation forces are a key enabler for the airborne campaign, encompassing not only the transport units themselves but also aircraft that can seize command of the air, target enemy forces in the landing area, and defend vulnerable cargo aircraft. Information is also a key enabler of airborne operations—information regarding not only the enemy's whereabouts but also the locations of other PLAAF and PLA unit movements, to enable timing airborne operations for maximum effect. Maintaining that situational awareness becomes challenging once airborne units land, and sustaining their combat power (which is relatively limited compared with that of regular ground forces) is also difficult.[11]

Science of Campaigns details other attributes of airborne campaigns worth noting. First, it highlights the use of deception during transport to confuse the adversary. Second, it calls for leveraging night and poor weather for operations. Third, it recommends that airborne forces "strive to [move] . . . to the target area using one single flight." Last, it prescribes that, once troops have been dropped or landed, attention should turn to taking out vital links or targets, including suppressing enemy attacks.[12]

Building New Capabilities Relevant for a Cross-Strait Invasion

The PLA Airborne Corps is building capabilities directly relevant to the roles it likely would play in a cross-strait invasion. It is undergoing significant reorganizational efforts to bolster its capability to conduct mechanized maneuver and assault, benefiting from growth in the PLA's airlift capacity, increasing the complexity of its training, and learning from foreign outreach and training abroad.

Reorganizing to Improve Capability for Mechanized Maneuver and Assault

Over roughly the past decade, the Airborne Corps's force structure for mechanized maneuver and assault has grown. A 2011 PLA-linked source

described the corps circa 2005–10 as operating in "a lightly armed mode of 'one person, one parachute, one gun,' and light weapons with mortar."[13] One U.S. Department of Defense (DoD) assessment likewise found that the pre-2018-reform Airborne Corps was a "traditional motorized force" that emphasized parachute operations.[14]

The corps's mechanized force structure developed during this period, with one of its three divisions featuring a mechanized company that later was expanded to a battalion. This unit consisted of infantry fighting vehicles capable of being dropped by parachute. Another division had a special-operations group and a small helicopter group (大队).[15] This helicopter unit was established in 2005 and later expanded to a regiment in 2012.[16] Some reports indicate that the corps's special-operations group also had become a regiment prior to the reforms.[17] These airborne special-operations forces were expected to conduct reconnaissance operations, raids, sabotage, harassing attacks, and special technical attacks.[18]

Following the broader trend of "brigadization" for PLA ground forces and some PLAAF units (begun in 2015 and implemented in 2016), the corps was reorganized in 2018 to integrate combined-arms units at the brigade level, thereby increasing the corps's overall combat capability after it arrived on the battlefield. At least one brigade also has been outfitted with the ZBD-03 infantry fighting vehicle. Mechanized equipment helps improve units' combat power and maneuverability once on the ground, potentially alleviating some of the challenges of postlanding operations that are identified in PLA strategy texts.[19]

Leveraging Growing Airlift Capacity

Airlift capacity is highlighted repeatedly as a constraint facing the PLAAF, both in terms of enabling activities such as PLA-wide operational maneuver and as "an important mark of a strategic air force more broadly," especially in fielding high-capacity, long-range transport aircraft. The 2013 *Science of Military Strategy* states that "the PLA should . . . do everything possible to see that strategic air transport capability realizes historic leaps within a short time span and ensures peacetime and wartime ability to conduct long-range, rapid, large-scale air-projection maneuver."[20] The 2020 *Science of Military Strategy* similarly calls on the PLAAF to continue to improve its airlift and airborne capabilities.[21]

Consisting of small and medium transport aircraft, the PLA Airborne Corps's organic aviation brigade by itself cannot support the corps's mobility adequately. Therefore, the force must rely on other PLAAF medium and heavy transport capabilities (and, potentially, search-and-rescue units)

to support large-scale operations.[22] The numbers of such aircraft have increased dramatically in recent years, directly benefiting the corps's ability to deploy rapidly in a variety of scenarios.

DoD assesses that a related objective in the restructuring of the corps "was to create a responsive and streamlined airborne corps capable of air-delivering modular combat units—including aerial drop of mechanized infantry forces."[23] These drops are accomplished most effectively with large transport aircraft, which until the past few years have constituted a significant capacity gap for the PLAAF. A 2017 RAND study found that the small number of heavy transport aircraft available prior to 2016—probably no more than two dozen aging Il-76 aircraft in total—likely constrained the PLAAF's capacity to deploy units rapidly across the country, limiting it to carrying only one airborne division at a time—only a third of the corps's operational strength.[24] However, the Y-20 indigenous transport aircraft was delivered officially to operational units beginning in 2016, and its inventories have grown rapidly since then. Total PLAAF inventories of heavy transport aircraft have more than doubled in the past five years, with at least thirty-one new Y-20s outnumbering the twenty older Il-76s as of 2022.[25] If China continues to build and field Y-20s at similar rates over the next few years, this long-standing capacity constraint on rapid deployment of the corps could be effectively mitigated.

Improving the Sophistication of Training at Home

The Airborne Corps has made steady progress in improving its training over the past twenty years, with particular focus since 2018 on sophistication and realism. The corps has incorporated more-complex topics into its training regimen, including training for nighttime operations; with greater numbers of aircraft, troops, and equipment; in complex geographic and weather conditions; and with other PLA and PLAAF forces. Some of these efforts are of long standing; the list below summarizes select training activities conducted within China's borders from 2001 to 2010.

- 2001: Liberation 1 (解放一号), a joint exercise, involved three operational phases and nearly a hundred thousand troops. The training site was selected for its resemblance to Taiwan. Following an information war, the second phase included a nighttime airborne landing in support of a joint ocean crossing and amphibious-landing exercise.[26]
- 2008: Airborne forces reportedly performed their first "integrated parachuting" of both troops and heavy equipment.[27]
- 2009: Airborne Movement (空降机动) 2009 saw elements of all three airborne divisions participate in a twenty-day exercise, in what

one Chinese source calls "the largest ever Chinese airborne force trans-regional campaign mobility comprehensive training exercise."[28]

- 2009: The Vanguard (前锋) 2009 joint exercise focused on ground and air force unit training, featuring an exercise headquarters staffed by both ground and air force officers. Along with the participation of airborne troops, helicopters and fixed-wing aircraft supported ground operations during the exercises.[29]
- 2010: Paratroopers from the corps conducted the PLA's "first organic and large-scale parachute drill" on the Tibetan Plateau, with over six hundred troops dropped.[30]

More-recent exercises continue this emphasis on increasing the complexity of training topics. Following a 2014 adjustment to the PLA's top military strategic guidance that placed increasing emphasis on war fighting in the maritime domain, air force leaders have pushed for a greater PLAAF role in overseas operations, including for the Airborne Corps.[31] In 2017, an air-transport brigade from the airborne forces conducted "low-altitude, penetration tactical training" over an unfamiliar area of open sea, which one China Aerospace Studies Institute report assessed to be one of multiple recent training activities to practice island airdrop operations.[32]

As mentioned in the introduction, in 2018 airborne troops completed their first jumps from the Y-20, and the new transport aircraft completed its first heavy-equipment drop.[33] DoD also has noted that during that year the corps undertook training that leveraged "long-range raid and airborne operations based on actual war plans," as well as focusing on combat realism and staffs' ability to conduct command and control. One of these 2018 exercises included the corps's participation for the first time in Red Sword (红剑), one of the PLAAF's premier training "brands"; conducted annually, it emphasizes force-on-force confrontation.[34] In 2019, a seminar the PLA held in Beijing focused on integrating the corps into joint operations and improving other airborne-training topics.[35] Exercises in 2020 and 2021 saw the corps perform a number of training events with Y-20 aircraft, including Y-20s dropping equipment and paratroopers, in August 2020; moving elements of a brigade, along with Il-76 and Y-9 aircraft, in September 2020; and conducting day and night airborne training, in April 2021.[36] In 2020, the corps also operated with a PLA Navy (PLAN) unit in a maritime environment, conducted opposition-force training with PLA ground forces units, and leveraged military and civilian logistics for rapid, long-distance mobility.[37] Many of these latest training milestones reflect a focus on capabilities relevant to supporting a future JILC.

Learning from Foreign Militaries

Airborne troops have trained with other militaries in China since 2005, and since 2011 Chinese airborne troops have conducted exercises overseas with other militaries. These exercises likely have been intended both to support China's diplomacy and to gain a better understanding of counterparts' tactics, techniques, and procedures. The list below summarizes select training events that have occurred during multilateral and bilateral engagements:

- 2005: For the first time, China's airborne troops participated in an international exercise, Peace Mission, although their paradrops took place in China. Russia also took part.[38]
- 2007: Airborne troops jumped with Russian counterparts in Peace Mission in China.[39]
- 2011: Airborne troops traveled to Belarus for their first overseas exercise, Divine Eagle.[40]
- 2011: Airborne troops conducted a counterterrorism exercise, Cooperation, with Venezuela.[41]
- 2013 and 2014: Airborne troops conducted two iterations of the Sharp Knife airborne series with Indonesian counterparts.[42]
- 2014: Chinese airborne troops again joined the Peace Mission exercise in China.[43]
- 2015: Airborne troops returned to Belarus for a second counterterrorism exercise.[44]
- 2016 and 2017: A Chinese airborne platoon participated in a competition during the International Army Games in 2016 (Russia) and 2017 (China). The platoon conducted jumps with a helicopter.[45]
- 2017: During the Shaheen VI China-Pakistan air force combined-training event, Chinese airborne special-forces troops and PLAAF and PLAN aircraft and ground units participated alongside Pakistani counterparts.[46]
- 2018: Il-76 and Y-9 transport aircraft conducted low-altitude drops of troops and equipment during the Aviadarts portion of the International Army Games in Russia.[47]
- 2019: Airborne troops represented the PLA for the first time in the small-scale survival exercise Kowari, a trilateral exercise with the United States and Australia.[48]
- 2019: Units from a corps brigade joined Tsentr, a Russian-led multilateral exercise in Russia. They reportedly performed paradrops

and "airborne landing operations" with Russian counterparts, although the degree to which these combined operations truly were integrated is not known.[49]

- 2020: Airborne troops participated in Airborne Platoon, a contest part of the International Army Games in Russia, and operated using Russian infantry vehicles for the first time.[50]
- 2021: Airborne troops joined the Zapad/Western-Joint (西部·联合) exercise with Russia that took place in China. One commentary stated that the PLA forces conducted "low-altitude parachute landing of airborne troops at multiple altitudes, and mixed delivery of both personnel and equipment for the army aviation and special operations forces" for the first time.[51]

Some international exercises involving the PLA have provided significant learning opportunities for Chinese airborne troops, or at least they are portrayed so in PLA media. One 2017 article provides this anecdote summarized by Western analysts: "One infantry fighting vehicle company commander in the PLA airborne forces noted . . . that foreign forces strongly emphasized various forms of night training. The commander compiled his knowledge and led his entire company in subject-based night training upon his return to China" to improve the unit's skills.[52]

Key Questions regarding Capabilities Needed for a Cross-Strait Invasion

Although advancements in Airborne Corps mechanization, airlift capacity, and training indicate that the force is improving its overall capabilities, key questions remain regarding the extent to which the corps has mastered the significant operational complexities required to support a cross-strait invasion effectively. While a detailed examination into these topics is beyond the scope of this chapter, key issue areas are summarized below.

Unity of Effort? Integrating Operations by Similar Units

To operate most effectively, the PLA Airborne Corps must develop the ability to integrate its operations with those of the PLA's other airborne forces. The PLA ground forces and PLAN Marine Corps (PLANMC) are developing their own air-assault units.[53] The 2020 *Science of Military Strategy* calls on the PLA ground forces to continue developing air-landing and paradrop capabilities to help realize a three-dimensional army, along with army aviation forces, to form the backbone of the army's aerial-assault strength.[54]

Ground-force air-assault brigades equipped with helicopters can undertake "force projection and air insertion missions," and DoD notes that these PLA ground-force air-assault brigades can augment the Airborne Corps's brigades for some types of operations.[55]

Recent training suggests that some level of PLAAF fixed-wing airlift support to PLA ground-force aviation and other units is occurring already. In summer 2021, Y-20 transport aircraft began training with the PLA ground forces, including helicopter and special-operations units. One 2021 joint exercise involving a Xinjiang-based PLA ground-force aviation brigade, PLAAF units, special-operations forces, and electronic-countermeasure troops saw the transport aircraft moving ground-based support elements to the exercise and undertaking other unspecified operations.[56]

In the maritime domain, PLAAF leaders are pursuing a growing array of overwater missions for air force units, including "vertical amphibious landings" for the corps, but the PLANMC also has this capability.[57] There is additional potential overlap between the Airborne Corps's special-operations brigade and airborne-qualified personnel in ground-force special-operations and reconnaissance units.[58] Like the PLA ground forces aviation brigades, ground-force special-operations units began conducting paradrop training from the new Y-20 aircraft in 2021.[59]

Overall, it is likely that both PLA ground forces air-assault and special-operations forces, along with PLANMC units, have unique missions in support of combined-arms operations within the ground and naval forces. However, the extent to which airborne forces and sister units in other services are able to coordinate directly or via higher headquarters in the event of a contingency is not clear. Future research on this issue could survey the extent to which joint training occurs among these units, as well as whether detailed reporting on their overall training activities can provide more information on areas of mission overlap.

Operating in Complex or Degraded Conditions

Reporting on airborne forces' training activities suggests that the corps is working to improve its operational capabilities under complex or degraded conditions. PLA discussion of this topic tends to focus on carrying out training in poor weather or harsh climates or at night. During Peace Mission 2007, transport aircraft from China and Russia carried out paradrops and equipment drops during a storm.[60] In 2018, an airborne brigade air-defense unit undertook a monthlong opposition-force training drill in the mountains of Gansu Province, including nighttime training.[61]

Other airborne-training discussions note an emphasis on precise timing and understanding of aircraft flight routes, airdrop trajectories, and other information, such as for troop and equipment drops conducted as part of the Peace Mission 2014 exercise.[62]

But whether airborne troops can adapt to degraded or missing information is another question; the article on the 2014 exercise merely quoted a pilot as saying that lacking precise information about those elements would lead to "mission failure."[63] Future research on this training topic could examine the extent to which airborne forces are training under complex electromagnetic or other conditions resulting in degraded information, as well as the extent to which they encounter these training topics during opposition-force training.

Lack of Relevant Experience

A third area of concern relates to the corps's lack of large-scale combat experience. The PLA writ large engaged in its last major combat operations during the 1979 invasion of Vietnam, and the corps's sister branch, the PLAAF aviation forces, last fought during the second Taiwan Strait crisis, in 1958. However, all historical employment of China's airborne forces has consisted of domestic deployments during periods of internal upheaval in China. In 1967, during the Cultural Revolution, airborne forces helped put down a regional uprising in Wuhan, and they also deployed to Beijing in 1989 during the Tiananmen Square crisis and military crackdown.[64]

In addition to the corps being untested in combat, conducting domestic missions may detract from maintenance of its combat capabilities. One China Aerospace Studies Institute assessment finds that responsibility to fulfill a regime-preservation role may limit other deployments to only a portion of the corps's end strength. "[I]t is unlikely that more than four airborne brigades augmented" by special-operations and combat-support elements "would participate in a single operation because of the requirement to have brigades available to defend the regime."[65]

In recent years, internal HA/DR missions also have resulted in deployments of airborne troops. Following the 2008 earthquake in Wenchuan, Il-76 aircraft conducted airdrops from low altitude, while troops parachuted into the area to set up communication channels.[66] In 2020, airborne forces conducted COVID-19-related missions in Wuhan.[67] While major internal disaster-relief missions may not occur frequently enough to detract from the corps's readiness and combat capabilities, future research could explore the extent to which the corps supports additional, smaller-scale domestic missions, and whether PLA analysts assess trade-offs against preparing for wartime missions.

Heavily Reliant on Support from Another Service Arm—Aviation Forces

Finally, as a RAND review of PLAAF employment concepts noted, sufficient air support is a requirement for successful airborne operations. Specifically, the PLAAF must suppress enemy air defenses so that transport aircraft can ferry troops close to the landing zone.[68] It also must achieve command of the air. Once on the ground, airborne forces likely still would benefit from some form of support from PLAAF aircraft as well as PLA logistics units, even if their organic fires, mobility, and defensive capabilities are becoming more robust.[69]

Future research examining this problem set more closely would need to assess the PLAAF's ability to defend airborne packages in contested environments, as well as its ability to surge and maintain high operational tempos to support the specific windows required to execute cross-strait airborne operations.

The Airborne Corps is expected to support a cross-strait invasion by penetrating behind enemy lines. During a JILC, the corps's role would be to conduct paradrops or landing operations onto Taiwan, facilitated by PLAAF aircraft. Once on the island, airborne forces are expected to seize and hold terrain and conduct a variety of operations to support the broader invasion. In recent years, the corps has reorganized to improve its capability for mechanized maneuver and assault, leveraging the PLAAF's larger inventories of transport aircraft, particularly the Y-20; has improved the sophistication of its training at home; and has gleaned insights from abroad via training with foreign militaries while also supporting the Communist Party's and the PLA's broader diplomacy efforts.

That being said, key questions remain regarding the extent to which the corps has solved potential challenges to its ability to conduct airborne operations successfully. These include effectively integrating with similar ground-force and marine units, which have overlapping roles; carrying out operations in complex or degraded environments; overcoming the corps's lack of relevant combat experience; and delivering sufficient air support and successfully suppressing enemy fires to escort vulnerable transport aircraft behind enemy lines.

To address these gaps, future research can identify the combined-arms and joint exercises in which the corps participates and assess the frequency and complexity of those exercises. Changes to the types of aircraft or helicopter forces from which they operate may provide indications of evolving operational concepts. Also, overseas exchanges and training may offer

additional insights into the corps's evolving capabilities and focus areas for improvement.

Finally, while this chapter has reviewed substantial evidence that the PLA expects its airborne forces to support cross-strait operations, some caution may be warranted.[70] Historically, large-scale airborne operations in highly contested environments have resulted in significant casualties to airborne units. Risks to airborne forces in modern warfare only have grown; capable opponents today can pose a wide array of threats to airborne forces, as well as to the transport aircraft supporting them.[71] The opportunity costs of deploying airborne forces into high-end conflict scenarios—particularly if air-dropped—therefore may be significant, especially considering that transport aircraft can perform an array of other valuable missions.

While there is no indication that the PLA is rethinking radically the roles for the Airborne Corps, a 2020 commentary by a PLAAF Command Academy researcher took an expansive view of the corps's future roles, describing the PLA's airborne force as "strategic fists" that not only can support major conflicts central to a country's national security but also can "defend national interests and expand [the country's] national security space on a global scale."[72] It is possible that the PLA increasingly will seek to leverage airborne forces for a broader array of operations farther afield and in less-contested environments.

Notes

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2. A notable exception is Roderick Lee, *The PLA Airborne Corps in a Taiwan Scenario* (Washington, DC: National Defense Univ. Press, forthcoming). On ground and naval forces' role in an invasion, see, for example, Eric Heginbotham et al., *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power, 1996–2017,* RR-392-AF (Santa Monica, CA: RAND, 2015), available at www.rand.org/pubs/research_reports/RR392.html.
3. U.S. Defense Dept., *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2021* (Washington, DC: Office of the Secretary of Defense, November 2021), p. 58 [volumes of this annual report hereafter cited as *Annual Report to Congress: China (year)*]. The report notes that each of these six brigades "typically commands four combined arms

battalions (identified as either mechanized, motorized, or assault), an artillery battalion, a reconnaissance and pathfinder battalion, an operations support battalion, a service support battalion, and possibly a transportation battalion."

4. Roderick Lee finds that one of the combined-arms brigades has a helicopter regiment. Lee, *The PLA Airborne Corps in a Taiwan Scenario.*
5. *Annual Report to Congress: China (2019),* p. 40; Lawrence Trevethan, "*Brigadization*" *of the PLA Air Force* (Montgomery, AL: China Aerospace Studies Institute, 2018), pp. 6–7; *Annual Report to Congress: China (2020),* p. 53; Kenneth W. Allen and Cristina L. Garafola, *70 Years of the PLA Air Force* (Montgomery, AL: China Aerospace Studies Institute, 2021), pp. 140–41, available at www.airuniversity.af.edu/Portals/10/CASI/documents/Research/PLAAF/2021-04-12%20CASI_70%20Years%20of%20the%20PLAAF_FINAL%20ALL.pdf; *Annual Report to Congress: China (2021),* p. 58. For a detailed review of the Airborne Corps's organizational structure, see Lee, *The PLA Airborne Corps in a Taiwan Scenario.*
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8. It is not clear whether these references are to airborne-force-specific or special-operations forces units in general. Ibid., pp. 319–20.
9. Ibid., pp. 327–29.
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11. Ibid., pp. 593–94.
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13. Ian Burns McCaslin and Andrew S. Erickson, *Selling a Maritime Air Force: The PLAAF's Campaign for a Bigger Maritime Role* (Montgomery, AL: China Aerospace Studies Institute, February 2019), pp. 19, 52 note 72, available at www.airuniversity.af.edu/Portals/10/CASI/Books/CASI_Maritime_CAF_Web_Version.pdf.
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16. *PLA Aerospace Power,* p. 25.
17. Xi Zhigang and Jiang Long, "In-Depth: A Close Look at Chinese Airborne Troops," *China Military Online,* 30 August 2017, eng.chinamil.com.cn/view/2017-08/30/content_7736996.htm. This link is now broken, but the article is available at china-defense.blogspot.com/2017/09/in-depth-close-look-at-chinese-airborne.html.
18. Blasko, *The Chinese Army Today,* p. 132.
19. For a detailed examination of the Airborne Corps's mechanized forces, see Lee, *The PLA Airborne Corps in a Taiwan Scenario.*

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21. 肖天亮 [Xiao Tianliang], ed., 战略学 [*Science of Military Strategy*] (Beijing: National Defense Univ. Press, 2020), pp. 374–77.
22. Trevethan, *"Brigadization" of the PLA Air Force,* p. 26. The International Institute for Strategic Studies states that the corps's transport brigade has Y-5, Y-7, Y-8, and Y-12 aircraft. International Institute for Strategic Studies [IISS], *The Military Balance* (London: IISS, 2022), p. 261 [volumes of this annual publication hereafter cited as IISS, *The Military Balance (year)*]. See also Lee, *The PLA Airborne Corps in a Taiwan Scenario.*
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Tom Fox

9. The PLA Ground Forces' New Helicopters

An "Easy Button" for Crossing the Taiwan Strait?

China watchers long have paid close attention to the modernization efforts that the People's Liberation Army (PLA) has carried on more or less continuously since Deng Xiaoping included them as one of his Four Modernizations. While much academic and media coverage of this process understandably has focused on high-dollar and high-technology platforms such as fighter jets, submarines, and aircraft carriers, the PLA also has made significant investments in updating its rotary-wing capabilities. The PLA not only has developed and acquired different types of advanced helicopters; it also has bought more of them, modified their organizational structure, and trained their pilots and aircrews to feature these capabilities more prominently. Because of the historical centrality of Taiwan "reunification" and recently increased cross-strait tensions, these developments raise the big question: How might these new helicopters help the PLA invade Taiwan?

This chapter seeks to answer that question, while focusing specifically on the rotary-wing capabilities of the PLA ground forces (PLAGF). The chapter proceeds in four parts. The first part explores the new rotary-wing capabilities by analyzing the helicopters themselves, the organizations fielding them, and the training and doctrine for their employment. The second part focuses on scenario development. It presents two possible approaches

that the PLAGF might use to leverage these new capabilities in a Taiwan invasion. The third part assesses the PLAGF's current readiness to play the roles envisioned in the two scenarios. The fourth part turns to Taiwan's options for responding to these developments and how best to counter the PLA's increased capabilities.

This chapter also highlights changes within the PLAGF's aviation corps. While rotary-wing capability development also has improved PLA Navy (PLAN) options for antisubmarine warfare and amphibious operations, the bulk of significant change has occurred within the PLAGF. With these new capabilities, a massive cross-strait air assault may look like an "easy button" to help the PLA avoid the notorious difficulty of amphibious operations.[1] This chapter argues that the PLAGF currently lacks the capabilities needed to serve this function in a cross-strait invasion scenario.

The PLAGF's Helicopters, Aviation Units, and New Air-Assault Capabilities

In the past ten years, the PLA quickly has developed a very robust helicopter force. The table below compares growth numbers in 2011, 2012, 2020, and 2021 of the PLA's helicopter force.

These numbers suggest that the PLAGF's aviation forces are still very much in development. The rapid fielding of new helicopters—the Z-10, Z-19, and, most notably, Z-20—means that baseline proficiency for pilots

Table 1. Recent Growth in the PLA's Helicopter Force

Helicopter	2011	2012	2020	2021
Attack/Recon				
Z-10	10	16	150	150
Z-19	0	0	120	120
Z-9	126	226	234	234
Lift				
Heavy: Z-8	7	17	105	111
Medium: Mi-17	200	200	278	278
Medium: Z-20	0	0	12+	24+

Source: International Institute for Strategic Studies, *The Military Balance,* respective years noted, available at www.iiss.org/publications/the-military-balance/archive.

and units will take time to achieve, putting operational capability even further down the road. This table also captures some degree of uncertainty about where the overall fielded helicopter force is going, particularly with the introduction of the Z-20. It is unclear what total number of Z-20s the PLA has ordered and whether these new "homegrown" Chinese helicopters will replace Mi-17s and Z-9s fully in combat formations. It is possible that this current, initial fielding of Z-20s is a test run of their reliability before the scaling up of full production for them to replace older platforms. A December 2020 article in *China Military Online* implied that the Z-20s eventually would replace the Mi-17s completely, stating, "[T]his reflects the general trend that the Z-20 is replacing the Mi-17 series."[2] Given the relatively slow rate of fielding shown in the *Military Balance* numbers (from 12+ to 24+) in the last two years, it is reasonable to expect a correspondingly slow training period to retrain former Mi-17 and Z-9 pilots and train new pilots to fly the Z-20.[3] Later in this chapter, I discuss the downstream effects of that on operational capabilities.

How do these helicopters stack up qualitatively against their U.S. equivalents? While it might be tempting to run through charts of maximum airspeeds, gross weights, and other technical minutiae, that type of analysis could miss the forest for the trees. Helicopters have technical limitations that come down to the basic physics and aerodynamics of rotary-wing aviation. This current generation of Chinese platforms likely compares favorably with its U.S. counterparts, which should come as no surprise, given the latecomer catch-up advantage and the proliferation of technological expertise.[4] Therefore, the more relevant analysis focuses on operational capabilities, not technical capabilities.

The recent reorganization of the PLAGF has overhauled significantly how aviation fits into the operational scheme, making army aviation brigades an essential part of all thirteen group armies.[5] This aligns with overall PLA efforts to prepare for modern warfare and generally mirrors how the U.S. Army includes a combat-aviation brigade (CAB) in each of its divisions. In addition to those thirteen Chinese brigades, aviation brigades are assigned to both the Tibet and Xinjiang military districts.

PLAGF aviation brigades generally follow the same organizational structure. Each brigade includes four transport battalions, two attack battalions, one reconnaissance squadron, a headquarters element, and a maintenance-and-support battalion.[6]

The two specially designated air-assault brigades assigned to the Seventy-Fifth and Eighty-Third Group Armies are exceptions to this rule. These air-assault brigades differ from the standard aviation brigade because

they have two or three permanently assigned infantry battalions.[7] This arrangement enables them to focus narrowly on training for air-assault operations and to increase their proficiency in that specific mission set.[8]

Owing to the massive growth of the PLA's helicopter fleet over the last decade and the significant turnover in types of helicopters, it remains difficult to ascertain the exact numbers of helicopters per battalion in each of these brigades. Using the International Institute for Strategic Studies numbers, Dennis Blasko estimates about eighty helicopters per brigade, but he recognizes that the brigades may not be at full strength yet.[9] By comparison, sources suggest that the U.S. Army's active CABs have 110 helicopters apiece.[10] These American CABs belong to divisions that typically have ten to fifteen thousand soldiers.[11] Since Blasko assesses that PLA group armies typically are manned at fifty to sixty thousand personnel, this is clearly not an apples-to-apples comparison.[12] The U.S. Army currently has a much higher ratio of helicopters to soldiers; however, the PLA may be building up to a more robust ratio to meet the demands of modern combat.

Helicopters provide unmatched mobility and flexibility, and it appears that the PLAGF recognizes this and is changing its tactics and organizations accordingly. The clearest statement of this sentiment appeared in a 2018 *PLA Daily* article by PLAGF staff member Yuan Ziliang, entitled "Winning the Ground War from the Air."[13] This detailed rundown of the development of air-assault capabilities provides an invaluable window into recent PLA thinking about why helicopters matter on the modern battlefield, and it gives an assessment of current progress in implementing changes to support these new capabilities.

Yuan specifically cites the lessons learned from air-assault operations in Vietnam, the Persian Gulf, Iraq, and Afghanistan to argue how essential these capabilities are for fighting modern wars. He goes on to introduce six types of air-assault operations: attack-in-depth operations (超越攻击作战), leapfrog-combat operations (蛙跳合击作战), vertical-landing operations (垂直登陆作战), point-seizure operations (要点夺控作战), special-air-raid operations (特种空突作战), and crisis-control operations (危机管控行动). These are listed here in approximate descending order of size and complexity.

All six types of air-assault operations could be used in Taiwan scenarios, but the first three are most relevant to a large-scale amphibious invasion. They are the most robust capabilities, so they have the highest chance of being decisive. It is reasonable to expect that all six might be used to varying degrees, but the most dangerous (from the perspective of Taiwan's defense) are attack-in-depth, leapfrog-combat, and vertical-landing operations.

PLAGF views on air assault and vertical envelopment likely share similarities with U.S. Army doctrine. A 2019 *PLA Daily* article quotes a deputy brigade commander, Shi Lei, who described air assault as "not just army aviation carrying infantry, but a new combat force combining the two."[14] This description is remarkably similar to the way the U.S. Army regards air-assault operations. For example, the 2010 edition of the *Gold Book,* the 101st Airborne's unofficial guide to executing air-assault operations, describes air assault as a "combined arms mobile strike," exploding the myth that air assaults are merely "air movements of rifle companies."[15] The similarity between the ways PLA leaders and U.S. Army leaders view this capability is almost certainly not coincidental. The PLA is a learning organization, and the U.S. Army has by far the most experience in air-assault operations on which to draw, so it is unsurprising to see the PLA mirroring U.S. Army doctrinal thinking.

Chinese media coverage of PLA air-assault brigades offers some insights into the scale and quality of training. It is common to see reports on exercises with "several dozen helicopters."[16] Reports on China Central Television Channel 7 (CCTV7), the official state channel devoted to PLA issues, show runways full of helicopters with the blades turning accompanied by a follow-on shot of numerous airborne aircraft headed off for the mission. One such shot showed thirty-seven helicopters, which is no small feat given the notorious difficulty of helicopter maintenance. Involving over three thousand troops and one hundred helicopters, Assault-2013 was reportedly the largest airmobile exercise PLAGF aviation forces ever have conducted.[17]

Nonetheless, being able to put a large number of helicopters into the air for a long-planned exercise is not necessarily indicative of overall readiness or operational capacity. While these reports show that PLAGF aviation units are able to get their helicopters into the air simultaneously, it does not say much about the ability of these units to fly tight formations at low altitudes for long distances—the critical factors for a crossing of the Taiwan Strait. Indeed, most of the CCTV7 helicopter coverage shows very loose formations at relatively high altitudes. Both of those factors would contribute to easier detection by Taiwanese forces defending the island. Perhaps more importantly, the absence of media reports showing off the capabilities needed for a Taiwan invasion suggests that these aviation units are not yet at that proficiency level.

It is exceedingly difficult to assess the training level of a unit from these videos alone, but an April 2021 video of the Eighty-Third Group Army's air-assault brigade is instructive for what it lacks.[18] While it does a nice job showing off the new Z-20 helicopter and exciting rappelling troop-delivery

techniques, it does not demonstrate that the ground forces can communicate effectively with the armed Z-10 helicopters to direct fires. A good portion of the segment focuses on this capability, but the training appears stilted and staged—which does not bode well for the unit's ability to accomplish the same task successfully in the more demanding mode of combat operations. Air-ground integration is difficult, and it seems the Eighty-Third Group Army's air-assault brigade has a long way to go yet.

To be clear, this is only the first step of air-ground integration, as it is within the organic unit's capabilities set. Derek Solen's recent paper about the PLA's development of close air support details how far off the PLAGF and PLA Air Force (PLAAF) remain from being able to integrate their platforms and units to achieve effects on the battlefield.[19] While they have the necessary technologies to accomplish this, the units seem to be at the very basic level of demonstrating that they can talk to each other, connect their weapons-designation and -delivery systems, and get rounds downrange. This is a far cry from the high-level integration that would be required to synchronize joint fires and air support to set the conditions for a cross-strait air assault, let alone the level of integration that ground forces would want to support their continued offensive operations following a successful landing. These are not capabilities that units can develop rapidly, as they are highly resource intensive and demand that each participating unit be proficient in its own missions before combining forces to execute effective joint training.

An April 2021 report on the Eightieth Group Army aviation brigade shows how its training is increasingly complex. The report focused on the element of controlling helicopters far forward on the battlefield.[20] This coverage showed progress in terms of building institutional knowledge to develop aircrew proficiency while simultaneously demonstrating a tactical preference to retain control at the unit headquarters. There are significant trade-offs in terms of initiative and flexibility with that type of control. Moreover, this approach relies on constant communication and shared situational awareness, which could be degraded by the distances across the strait and Taiwan's active efforts to contest PLA forces in the electromagnetic spectrum. When coupled with the difficulty of integrating joint fires detailed above, this report showing PLAGF aviation units taking initial steps to command and control airmobile operations suggests how far away the PLA remains from the ability to execute these operations with proficiency.

Developing Scenarios for Air Assaults across the Strait

While it is clear that the PLA follows the U.S. military's example on air-assault operations to some extent, it is essential to remember that there are significant differences between the air assaults the U.S. military has executed in its recent combat operations and the ones the PLA is developing for cross-strait operations in a Taiwan scenario. From Vietnam to Iraq to Afghanistan, the U.S. military has not had to deal with one hundred miles of water separating its air bases from its targets. This certainly increases the degree of difficulty for the PLA as it considers how best to employ air-assault capabilities in support of an amphibious assault across the strait.

This section offers two plausible scenarios for a Taiwan invasion, one conventional and one unconventional. Both of these possibilities reflect the recent development of helicopters as a "main force in cross-sea operations," as noted in December 2020 *Global Times* reporting.[21] Instead of using helicopter landings as a component in support of a large amphibious assault, the scenarios discussed below imagine helicopter landings as the decisive operation to achieve a victory for the PLA in taking Taiwan. These scenarios draw on the conclusions of Daniel Taylor and Benjamin Frohman in their analysis of retired PLA lieutenant general Wang Hongguang's bold assessment that the PLA can seize Taiwan successfully in three days.[22] They find that the PLA is not outfitting itself for a full-on Normandy-style landing and that Wang's argument for a multidimensional attack tracks with both the PLA's technological acquisitions and its development of new training and doctrine.

In both scenarios, the large-scale air assaults would be nested within a larger joint scheme of maneuver that also would include a massive preparatory bombardment by air and missile forces, followed by a significant amphibious assault. The primary goal of that amphibious assault would be to present the Taiwanese armed forces with multiple dilemmas, thereby stretching Taiwan's resources and diverting attention away from the inland landing zones where the PLA aims to achieve overmatch and secure its victory. Key inland landing zones might include existing airfields and other infrastructure that would allow follow-on forces to flow into Taiwan and control the island.

The main difference between the conventional and unconventional scenarios presented here is a strategic assumption about how quickly the PLA could compel Taiwan's political leadership to surrender. The conventional scenario assumes that rapid dominance moves this process along very quickly, with the focal point at Taiwan's presidential office building.

The unconventional scenario assumes that the PLA anticipates a more drawn-out fight in which it could achieve relatively quick overmatch of the Taiwanese armed forces, but that it also would have to transition into complex and difficult stability operations before getting Taiwan's leaders to the negotiating table. To prepare for that counterinsurgency in this unconventional scenario, the PLA would have to hold some of its best assets in reserve during the initial assault.

Both scenarios assume a moderately robust defense of Taiwan, primarily by the Taiwanese armed forces; they do not account for U.S. military assistance, because of the rapidity of the operations. This is a "best-case" scenario for the PLA, giving it the benefit of the doubt in achieving some level of strategic surprise by hiding China's intentions, probably under the guise of exercises, training, or other normal military movements. While this may be highly unlikely, given the deep mutual intelligence penetration on both sides of the strait, making these scenarios "worst-case" for Taiwan clarifies how its leaders best could prepare and demonstrates how difficult it would be for the PLA to pull them off even with such helpful assumptions.[23]

Scenario 1: Conventional Air-Assault Overmatch for Rapid Victory

The first scenario is a massive air-assault operation that attempts to maximize the number of soldiers on the ground within the shortest amount of time. This is a "put all your eggs in one basket" approach. In this scenario, the PLAGF would use nearly all its rotary-wing inventory to overwhelm Taiwan's defenses and convince Taiwan's political leadership that resistance is futile and surrender is preferable. This scenario imagines PLAN amphibious assaults as feints to pull resources away from the airfields and population centers that are decisive for the PLA. Further, it requires that the PLAAF maintain air superiority over Taiwan for the twenty-four hours of near-constant air assaults spread throughout the island. The PLA Rocket Force (PLARF) would need to play a significant role in suppressing Taiwanese air defenses and launching preparatory fires on key targets and landing zones. This is a highly complex scenario requiring significant joint integration originating from the highest levels of command and control but necessary all the way down to the tactical level of unit coordination, deconfliction, and synchronization. While the PLA has made great strides in achieving "jointness," its own assessment is that it still has a long way to go on these fronts.[24]

A brief rundown of the complexity of this scenario helps in assessing its plausibility. Given the objective of maximizing PLA personnel on the ground in Taiwan in the shortest amount of time, this scenario revolves

around securing airfields and ports to ensure that massive numbers of reinforcements could flow in rapidly following the initial invasion. The two specially designated air-assault brigades of the Seventy-Fifth and Eighty-Third Group Armies would be tasked with securing the crown jewels: Taipei Songshan Airport and Kaohsiung Airport and Harbor. Other army aviation brigades would assault other important targets, including Taoyuan Airport, Taichung Airport, military bases, and key terrain in support of the amphibious landings. The PLA likely would leave some assets in reserve to preserve flexibility and retain the ability to reinforce itself, as well as to maintain vigilance on other fronts in case a neighboring force took advantage of Beijing's preoccupation with Taiwan. Except for the Tibet and Xinjiang brigades, a plausible number of brigades in reserve is three, leaving ten full brigades to participate in the scenario.

To pre-position the required helicopters, personnel, and ammunition within range of their destinations across the strait, the PLAGF would have to move five out-of-area brigades into assembly areas closer to the coast. While the helicopters likely would fly there despite some risk of detection, the troops and matériel probably would move overland via rail and road. It would be nearly impossible for the PLA to move this much muscle without raising eyebrows in the foreign intelligence community, not to mention the possibility of local populations sharing pictures of so many helicopters flying overhead via social media. In the very best case, this type of movement would take multiple days—and more likely over a week—to iron out maintenance kinks that arose in the initial deployment and to set up refueling and rearming operations.

Assuming a successful initial deployment, the next big hurdle is getting across the strait. While spreading out target destinations geographically makes the problem set a bit easier, it still would be a tall task to manage the airspace to sequence hundreds of helicopters fully loaded with troops supported by helicopter gunships securing their landings and subsequent maneuver. The distance involved to cross the strait from suitable mainland staging areas does not allow much room for error in deconflicting the airspace. Each brigade-level air assault demands its own unique entry and exit routes, and prudence dictates planning at least one alternate route, if not a second alternate as well, depending on resistance encountered at the shoreline or elsewhere. Helicopter pilots generally prefer remaining closer to the ground to avoid radar detection and threats, but successful suppression of that threat would open up other flight profiles for these PLA helicopters.

One advantage for the PLA in this planning is that the terrain is static. It can conduct thorough reconnaissance of the target terrain over time via multiple methods, ranging from technologically advanced geospatial

intelligence to simple, seemingly innocuous tourism. Detailed reconnaissance allows for better planning, and these benefits multiply when coupled with high-quality simulation capabilities.[25] The PLA is sure to exploit opportunities for rehearsals in accurately constructed virtual-training environments—likely for years leading up to an actual attempt to secure "reunification" by force.

Another aspect of the extremely crowded airspace is that the attack helicopters likely would be tasked with conducting independent attacks in addition to securing the air assaults. That increases the demand for air corridors and further complicates airspace management. Once again, for this planning process to succeed it would need to be deeply joint, as both the PLAAF and PLARF simultaneously would put significant demands on the airspace to achieve their desired effects on the battlefield.

Even though air assaults are the decisive operations in this scenario's scheme of maneuver, it is reasonable to expect that there also would be several airborne operations as well, since paratroopers could overwhelm other targets and present the Taiwanese armed forces with more dilemmas. The PLA special-operations forces might be air-dropped from PLAGF aviation brigades' small planes, which are capable of inserting teams of eight to twelve soldiers, while the larger airborne operations would rely on PLAAF transport planes (Y-20, Il-76, Y-9, and Y-8) carrying larger loads of over one hundred paratroopers.[26] These airborne operations require more airspace deconfliction and would place even greater demands on the rotary-wing attack-aviation assets in support of ground maneuver.

While the PLA has increased joint exercises and is working up to greater planning and execution integration, the difference in scale between those exercises and this operation is massive.[27] The PLA has significant work to do in this area before it can feel confident in its ability to manage this high level of complexity for the airspace alone. This discussion omits another major challenge: planning and sequencing of fire-support missions. Suffice it to say that coordinating rocket and missile fires across the strait in support of the PLAGF's missions while deconflicting with the simultaneous PLAN amphibious assault would be difficult. It is also worth a reminder here that the rosy assumption about achieving some strategic surprise is very rosy indeed.

This scenario also calls for a direct assault on the presidential office building by PLA special-operations forces in an effort to seize control of the governmental decision-making apparatus, physically to capture Taiwan's political leaders, and to deal a devastating psychological blow to both the military and the civilian populace. The well-documented mock-up of

this key building at Zhurihe demonstrates the PLA's focus on it as a target and allows for hyperrealistic training.[28] The psychological effects of seeing one's seat of government captured in military training exercises certainly are not lost on PLA planners. However, the difficulty of this portion of the operation cannot be overstated, mostly because Taiwan knows it is coming. This allows for thorough contingency planning to keep Taiwan's political leaders safe.

In this scenario, the full employment of the PLAGF's rotary-wing aviation capabilities would aim for the rapid seizure of ten key targets in the initial wave. This assumes one target each for ten aviation brigades, with three held in reserve and the Xinjiang and Tibet brigades remaining committed to their military districts. Subsequent waves either could reinforce those positions or could secure lower-priority targets. Planners would have to assume some attrition of helicopters in each sortie, but optimistically they could plan for four total cross-strait insertions in the first twenty-four hours, assuming that the units are fully manned, are able to execute a midday crew swap, and can keep the helicopters flying all day.[29] Sorties later in the day likely would be planned for smaller units and targets, given the anticipated combat attrition and demands of helicopter maintenance. Returning to the planning assumption of rapid victory, we can see that these numerous and long flight hours are unsustainable for anything but the briefest of operational windows. This scenario anticipates rapid war termination that mirrors the bold assumptions made by Lieutenant General Wang in his version of a successful invasion.

Scenario 2: Unconventional Air Assault for the Long Haul

The second scenario differs from the first because of its driving assumption that securing a political end to armed conflict will take much more time. If the PLA accepts this planning assumption, it could consider innovative approaches, such as taking advantage of its reported pending replacement of Mi-17s with Z-20s.[30] While the PLA theoretically could mothball this fleet or sell these excess Mi-17s to foreign militaries to recoup some of its investment, it also could use them for a one-way trip across the Taiwan Strait as the initial assault force for a planned occupation of the island.[31] This would allow the PLA to assume greater risk with these helicopters, as they would be unnecessary for the long-term design of the PLA.

This scenario offers some significant advantages for the PLAGF's aviation forces when compared with the more conventional first scenario. Chief among these advantages is an increased ability to achieve some degree of strategic surprise. Because this approach would not employ the

entire helicopter inventory, there is a greater chance that it could be concealed under the guise of divestment of the Mi-17 inventory or some other false pretense. It also would be smaller in scale, making it more likely to escape the notice of watchful intelligence analysts in Taiwan, Japan, and the United States. Finally, the one-way-trip aspect of this operation would allow for more-distant staging of these forces, thus enabling better concealment of preparations. Depending on the loading and use of auxiliary fuel tanks, assault elements could stage as far away as one thousand kilometers, well beyond the mainland coastal areas typically associated with cross-strait operations.

The general theory of this scenario would be to accept a high level of risk with the initial air-assault force by attacking a similar target set to that of the first scenario, but without the full support of attack helicopters and with less joint support by preparatory fires. This unconventional initial assault then would allow for a follow-on mission that looks more like the conventional first scenario. However, the follow-on mission would be much easier, because opening with the unconventional wave would force Taiwan to expend its antiair resources and show its hand. Because the PLA would accept the higher losses of Mi-17s and expect that most, if not all, of them would not return to the mainland, this would alleviate much of the complexity in airspace management for the second wave.

Another significant benefit of this approach is the diminished risk for the second wave of helicopters. The PLA could expect higher survivability for those aircraft, preserving that combat power for the transition to stability operations. Employing these newer and higher-cost platforms in this way is a particularly attractive option if the PLA expects that it will have to sustain a fighting force on Taiwan for prolonged operations to force Taiwan's leaders to the negotiating table. Once airfields and ports are secured, the PLA would flow huge numbers of ground forces into Taiwan, and the army aviation brigades would provide these forces with impressive mobility and flexibility to occupy key terrain all over the island.

The most significant drawback to this unconventional approach is the expected high initial attrition rate. Commanders might have a hard time motivating their pilots and ground forces to accept such a high-risk mission, especially because the overall scheme of maneuver makes quite clear that this is a one-way trip for most and acknowledges that much of the mission's tactical utility stems from forcing Taiwan to expend its defensive antiair resources. While the ideological fervor of PLA forces may be robust—particularly with regard to the sacrosanct mission of "national reunification"—PLA leaders probably would have to oversell the expected survivability of

these forces to the participants themselves. Some of that success in convincing the participants might depend on the broader political context at the time, as certain circumstances could encourage greater volunteerism for a mission that borders on martyrdom.

Assessing PLA Readiness for Cross-Strait Air Assaults

In both these scenarios, the PLA would mass its rotary-wing capabilities to achieve dominance via a series of complex cross-strait air assaults. The significant buildup of helicopters within the PLAGF and its accompanying training and doctrinal updates make these kinds of operations possible for future Taiwan contingencies. On the basis of the evidence currently available, the PLAGF is at best a decade away from being able to mount an operation on this scale with the requisite joint integration to give it a fighting chance for success.[32] This assessment is derived primarily from the observed exercises as reported by Chinese media sources, in which the key weaknesses in both scale and jointness are readily apparent. To be fair, the PLA acknowledges that these advanced capabilities remain aspirational and in development. PLAGF expert Yuan Ziliang (discussed above) set the time horizon at twenty to thirty years before reaching operational proficiency in line with the demands of the modern battlefield.[33]

Observers should continue to watch these joint exercises and the PLA's professional publications for developments as the PLA builds this capacity.[34] Key indicators of progress would include the scale, complexity, and frequency of the exercises. Media reports consistently emphasize scale, but there has been little in the way of multibrigade rotary-wing participation. For complexity, it is worth noting how many different types of units are involved in these exercises and how many different mission tasks are trained over the course of a large-scale exercise. Until there is evidence of operations that include the PLAGF, PLAAF, and PLARF synchronizing their efforts to achieve effects, foreign observers should be highly skeptical that they can accomplish the necessary coordination to get across the strait and into desired key target areas to land helicopters and dismount maneuver forces. Exercise frequency is another critical signal. Prior coordination of such exercises is extremely difficult. When the PLA develops habitual relationships across its joint force, it will be able to conduct more-frequent exercises.

One word of caution about relying on exercises for this analysis: soldiers tend to dislike "dog and pony shows." In our media-driven world,

there is growing demand for photos and videos to prove something happened. With military training, the best photos and videos do not necessarily demonstrate the greatest degree of proficiency or readiness. What makes for a great video might not be tactically sound. Moreover, getting a hundred helicopters into the air simultaneously for the photo opportunity might come at the cost of training something more complex and tactically useful.

Further assessment demands a discussion of the key risks the PLA faces in an attempted cross-strait air assault. From a rotary-wing perspective, this is all about the surface-to-air threat, which includes surface-to-air missiles (SAMs), man-portable air-defense systems (MANPADS), and good, old-fashioned guns. Technological developments in these systems favor the defense.[35] Most analyses of these antiair capabilities focus on their effects against fighter, bomber, and command-and-control capabilities because the battle among those platforms determines air superiority.

Helicopter pilots tend to conceptualize this threat a bit differently, for two reasons. First, helicopters are lower-priority targets, so in a resource-constrained environment (an island defense, for example) they are less likely to draw fire from the most-advanced platforms. Second, attempting to evade the radar threat turns any and every gun into an antiaircraft gun.[36] Well-planned battle positions with interlocking fields of fire present a real threat to low-flying helicopters, even if the adversary only has light machine guns. While the PLA has some countermeasures for the SAM and MANPADS threats, there are not a lot of effective ways to remain safe from flying lead except speed, stealth, and counterfire.[37] Taiwan has a significant advantage here as it prepares defenses for an anticipated PLA air assault. Terrain restricts the suitability of landing areas while also dictating preferred air corridors; thus, there is ample time to plan defenses of key terrain and increase the degree of difficulty for PLA helicopters.

One way the PLA could overcome this need for landing space is insertion via fast-roping.[38] Fast-roping allows for insertion into restrictive terrain, and jungle and urban environments are most relevant for this analysis. The technique's most significant advantage is that it does not require the helicopter to land; if executed aggressively, it shortens the time required on location at an objective. It does, however, require the helicopter to perform a stationary hover as the ground troops dismount—making it extremely vulnerable to the full range of surface-to-air threats. The primary mitigation of risk comes from the speed of the fast-roping. While this is an impressive special capability, its tactical utility diminishes at scale and is not likely to be used for such a massive operation as a cross-strait air assault.

Appreciation of how dangerous and difficult such an air assault would be raises the questions: How does the PLA interpret these risks, and to what extent are its Chinese Communist Party (CCP) leaders willing to accept that risk and its accompanying low probability of success? This opens the door to a much broader analysis of Chinese military strategy and decision-making that is beyond the scope of this chapter. However, the PLA's doctrinal preference for caution suggests that such a high-risk and low-certainty operation does not match the clear objectives of managed risk and high certainty embraced by the PLA.[39] Still, air-assault operations do present new opportunities for the PLA as it considers its options for future Taiwan scenarios. Given the notorious difficulty of amphibious operations, the PLA is making a prudent investment by developing more-robust air-assault capabilities.

Takeaways for Taiwan

Taiwan can take steps to make the challenges described above even more insuperable for the PLAGF. While some might advocate for high-cost platforms and high-technology sensors in the face of a threat from the air, a low-cost, high-volume approach that focuses on the procurement of mobile high-caliber machine guns and significant ammunition stores would provide greater flexibility and resilience to face the air-assault threat. The Taiwanese also could pursue the development of antihelicopter mines, especially to harden known targets and to exploit the advantages of terrain.[40] These recommendations could help the Taiwanese military inflict casualties quickly and retain its own freedom of maneuver in the face of potentially overwhelming numbers coming from the mainland.

Taiwan could bolster its ability to deter and defend against a PLAGF air assault further by preparing for this specific scenario more explicitly and exercising its response. Such exercises would be clear signals to the PLA and CCP that Taiwan is thinking through its defense plan thoroughly and considering the specific risks presented by rotary-wing capabilities. Including a segment of the civilian population in a response drill would communicate further resolve to counter the threats presented by the PLA's development of these new capabilities. While there are risks of overinflating the threat and creating unnecessary fear in the civilian populace by exercising a large-scale response, they may be worth taking if they heighten the average Taiwanese citizen's awareness about how the PLA thinks about its role in a future invasion. As noted, PLA observer Lonnie Henley made clear in recent testimony to the U.S.-China Economic

and Security Review Commission's hearing on cross-strait deterrence, "Taiwan's will to resist is vital but unknowable."[41] Such exercises simultaneously could test and build this critical will to resist while signaling resolve to both the PRC and Taiwan's international partners.

Not an "Easy Button"—Yet

The PLAGF has developed significant rotary-wing capabilities in the last decade, and it appears poised to make even greater gains in the next decade, judging by its continued fielding of new helicopters and its commitment to training for the complexity of modern battlefields. While it takes a long time to build pilot, aircrew, and unit proficiency and even longer to integrate that capability with ground brethren and the joint force, PLA watchers should continue to follow developments in this space closely. In theory, they eventually could become a game changer for the military balance across the strait, but they are not there yet. The PLA might decide to test these new capabilities on a softer target such as the Kinmen (Quemoy) or Matsu (Mazu) Islands, although that comes with significant political risk, the discussion of which is beyond the scope of this analysis.[42] Solely from a military perspective, those islands are much harder for Taiwan to defend, owing to the extremely favorable geography (small size and proximity to the mainland) for the PLA.

In the final analysis, all cross-strait military scenarios depend significantly on the political circumstances in which they would occur. Air-assault operations to cross the Taiwan Strait represent a new development and present Taiwan with another challenge for defending the island, but not an immediately pressing one and not an undeterrable one. Nonetheless, as the PLA continues to strengthen these capabilities, the CCP will attempt to exploit additional political leverage gained by shifting the military balance further in its favor. While deterrence remains possible now and well into the future, the most important variable to watch is the risk tolerance of CCP leaders for bearing the significant casualties that would accompany any attempts to take Taiwan by force. Air assaults are not an "easy button" for the CCP, but in the next decade they will become a more realistic option with lower costs than an amphibious assault. And it could be a button that political circumstances tempt CCP leaders to press.

Notes

1. Airborne operations and air assaults are different kinds of operations. *Air assault* involves inserting ground troops via helicopter and *airborne* refers to parachuting out of an airplane.
2. Chen Lufan, "Z-20 to Play More Roles in China's Military," *China Military Online,* 19 December 2020, english.chinamil.com.cn/view/2020-12/19/content_9955018.htm.
3. See, e.g., International Institute for Strategic Studies, *The Military Balance 2022* (Abingdon, U.K.: Routledge, 2022).
4. Much of the technological expertise likely was stolen, but those gains being ill-gotten is largely irrelevant to the analysis here. The Z-20 is a near copy of the American Black Hawk. The PLA was able to reverse engineer much of the technology from its purchase of S-70s in the 1980s. See Kyle Mizokami, "Meet China's Blackhawk Helicopter, the 'Copyhawk,'" *Popular Mechanics,* 9 November 2017, www.popularmechanics.com/military/aviation/a28956/china-blackhawk-helicopter-copyhawk/.
5. Dennis J. Blasko, "The PLA Army after 'Below the Neck' Reforms: Contributing to China's Joint Warfighting, Deterrence, and MOOTW Posture," *Journal of Strategic Studies* 44, no. 2 (2021), p. 165.
6. U.S. Army Dept. Headquarters, *Chinese Tactics,* ATP 7-100.3 (Washington, DC: 9 August 2021), p. 43, available at armypubs.army.mil/epubs/DR_pubs/DR_a/ARN34236-ATP_7-100.3-001-WEB-3.pdf.
7. Blasko, "The PLA Army after 'Below the Neck' Reforms," p. 164.
8. For a detailed account of the initial training of these units, see 林乘东 [Lin Chengdong], 钱晓虎 [Qian Xiaohu], and 蔡鹏程 [Cai Pengcheng], 突击: 朝着中国陆军腾飞的方向 ["Assault: The PLA Takes Off in a New Direction"], 解放军报 [*PLA Daily*], 21 January 2019, www.81.cn/jmtt/2019-01/21/content_9409406.htm.
9. Blasko, "The PLA Army after 'Below the Neck' Reforms," p. 167.
10. U.S. Government Accountability Office, "Force Structure: Army's Analyses of Aviation Alternatives" (briefing for congressional defense committees, 26 February 2015, updated 27 April 2015), enclosure 1 in John H. Pendleton, *Force Structure: Army's Analyses of Aviation Alternatives,* GAO-15-430R (Washington, DC: U.S. Government Accountability Office, 27 April 2015), p. 11.
11. "Division," in "Military Units: Army," *U.S. Department of Defense,* 19 April 2021, www.defense.gov/Experience/Military-Units/Army/#army.
12. Blasko, "The PLA Army after 'Below the Neck' Reforms," p. 164.
13. 袁自亮 [Yuan Ziliang], 从空中打赢地面战争 ["Winning the Ground War from the Air"], 解放军报 [*PLA Daily*], 12 July 2018, www.81.cn/jfjbmap/content/2018-07/12/content_210771.htm.
14. Lin, Qian, and Cai, "Assault: The PLA Takes Off in a New Direction."
15. U.S. Army 101st Airborne Division, *Gold Book* (Fort Campbell, KY: 2010), pp. 2–4. This manual is available for purchase in various editions. It is not "authoritative doctrine," as it makes clear (p. 2), but both its existence and its size speak to the complexity of air-assault operations. At over three hundred pages, it culls numerous best practices from doctrine and experience.

16. Among other similar reports in the *PLA Daily* from the last few years, see 冯凯旋 [Feng Kaixuan] and 周朝荣 [Zhou Chaorong], 全景式记录习主席视察79集团军 ["Record of Xi Jinping's Inspection of the 79th Army"], 中国军网 [*China Military Online*], 18 October 2018, photo.81.cn/pla/2018-10/18/content_9316355_13.htm; 吴世科 [Wu Shike] and 张亮亮 [Zhang Liangliang], 气温超40℃大漠深处有战鹰出没 ["Temperature Exceeds 40°C War Eagles in the Depth of the Desert"], 中国军网 [*China Military Online*], 17 July 2017, photo.81.cn/pla/2017-07/17/content_7678379.htm; and 王宁 [Wang Ning], 朝阳伴我去飞行某陆航旅数十架直升机进行战术演练 ["The Morning Sun Accompanies Me in Flying: Dozens of Helicopters From a Certain Army Aviation Brigade Conduct Tactical Exercises"], 中国军网 [*China Military Online*], 5 December 2014, photo.81.cn/pla/2014-12/05/content_6256229.htm.
17. 特大动作: 解放军100余架直升机集结练攻击 ["Extraordinary Action: Over 100 PLA Helicopters Gather for Attack"], 中国新闻 [*China News*], 27 August 2013, www.chinanews.com/mil/hd2011/2013/08-27/239515.shtml. The troop number referenced likely includes all servicemembers involved in the exercise, so it should not be understood as representing the total of troops carried or moved, as it includes pilots, maintainers, support elements, and others.
18. 插上"翅膀"的步兵 ["Infantry with Wings"], 国防故事 [*National Defense Story*], *CCTV7,* 22 April 2021, tv.cctv.com/2021/04/22/VIDEKiiZWfO9mhWgcYPlndxu210422.shtml?spm=C28340.PbtJD1QH3ct0.ET7FuMZSfFtz.6.
19. Derek Solen, "The Improvement of the PLA's Close Air Support Capability," *Air University,* 17 December 2020, www.airuniversity.af.edu/Portals/10/CASI/documents/Research/CASI%20Articles/2020-12-17%20PLA's%20improving%20Close%20Air%20Support%20capability.pdf?ver=5Jah3h28qsohyD4SkMYz-g%3d%3d.
20. 张硕 [Zhang Shuo], 为飞行员"私人订制"训练计划, "指标清单"里有什么? ["What Is the 'List of Indicators' for a Pilot's 'Personalized' Training Program?"], 人民陆军微信公众号 [*PLA WeChat Official Account*], 28 April 2021, www.81.cn/lj/2021-04/28/content_10030019.htm.
21. Liu Xuanzun, "PLA Army Helicopters Switch Role from Support to Main Force in Cross-Sea Operations," *Global Times,* 23 December 2020, www.globaltimes.cn/content/1210819.shtml.
22. Daniel Taylor and Benjamin Frohman, "Economic Integration Is Not Enough: Policy and Planning for Taiwan in the Xi Jinping Era," in *Securing the China Dream: The PLA's Role in a Time of Reform and Change,* ed. Roy Kamphausen, David Lai, and Tiffany Ma (Washington, DC: National Bureau of Asian Research, 2020), pp. 68–74.
23. Tanner Greer cites Ian Easton's assessment that Taiwanese, American, and Japanese intelligence will have relatively high confidence of an invasion sixty days prior and know for sure at least thirty days prior. See Tanner Greer, "Taiwan Can Win a War with China," *Foreign Policy,* 25 September 2018, foreignpolicy.com/2018/09/25/taiwan-can-win-a-war-with-china/.
24. Joel Wuthnow, "'A Brave New World for Chinese Joint Operations,'" *Journal of Strategic Studies* 40, nos. 1–2 (2017), pp. 169–95; Dennis J. Blasko, "The Chinese Military Speaks to Itself, Revealing Doubts," *War on the Rocks,* 18 February 2019, warontherocks.com/2019/02/the-chinese-military-speaks-to-itself-revealing-doubts/.

25. 奋进"十四五"开启新征程 运用"科技+"为战斗力赋能 ["Forge Ahead in the 14th Five-Year Plan, Start a New Journey, Use 'Tech+' to Empower Combat"], 军事报道 [*Military Report*], *CCTV7,* 20 April 2021, tv.cctv.com/2021/04/20/VIDEFU33XMUYsu76Ad0UHgWs210420.shtml?spm=C52346.PPajx7cbYDEB.S60782.19. Because the People's Armed Police unit depicted seems well equipped with robust simulation capabilities, PLA aviation units likely would have similar facilities, and they might have even better ones.
26. Blasko, "The PLA Army after 'Below the Neck' Reforms," p. 167. The PLAGF has its own Y-9s, so it too could develop organic options here and not necessarily rely on its sister services. For a media report on this, see Li Jiayao, "Transport Planes Boost PLA Abilities," *Air University,* 20 December 2017, www.airuniversity.af.edu/CASI/Display/Article/1401088/transport-planes-boost-pla-abilities/, originally posted at english.chinamil.com.cn/. For a thorough discussion of the PLAAF's development of these capabilities, see Cristina L. Garafola and Timothy R. Heath, *The Chinese Air Force's First Steps toward Becoming an Expeditionary Air Force* (Santa Monica, CA: RAND, 2017), available at www.rand.org/pubs/research_reports/RR2056.html.
27. Leng Shumei and Liu Xuanzun, "Joint PLA Combat Exercises to Be Normalized amid Intensifying Situation in Taiwan Straits and SCS," *Global Times,* 14 November 2020, www.globaltimes.cn/content/1206802.shtml.
28. For a detailed look at China's premier training facility with a full mock-up of Taiwan's presidential office building, see Joseph Trevithick, "China's Largest Base Has Replicas of Taiwan's Presidential Building, Eiffel Tower," *The Drive: The War Zone,* 27 May 2020, www.thedrive.com/the-war-zone/33591/chinas-biggest-base-has-huge-replicas-of-taiwans-presidential-building-and-the-eiffel-tower.
29. It is nearly impossible to overstate how significant a maintenance demand flying for twenty hours in a single day is for helicopters. In a series of admittedly rosy assumptions, this may be the rosiest yet.
30. Chen, "Z-20 to Play More Roles in China's Military."
31. Both are unlikely scenarios, especially because the PLA is in the process of increasing its helicopter-to-solider ratio, as previously mentioned. A more likely role for these helicopters is to remain as legacy platforms for as long as they are still useful.
32. This assessment is highly contingent on how accepting CCP and PLA leaders would be of risk, both military and political. How decision makers determine what exactly a "fighting chance for success" is depends on the goals they set and the losses they are willing to accept to achieve them.
33. Yuan, "Winning the Ground War from the Air."
34. For a good example of the currently limited scope and scale of these joint exercises, see Liu Xuanzun, "PLA Army's Attack Helicopters Conduct Sea-Crossing Assault Drills on Navy Warship," *Global Times,* 5 August 2020, www.globaltimes.cn/content/1196799.shtml.
35. For a brief review of how the U.S. Air Force is thinking about these developments, see Kyle Rempfer, "Here's How Improving Enemy Anti-aircraft Threats Put Pilots and Crews at Risk," *Air Force Times,* 6 May 2019, www.airforcetimes.com/news/your-air-force/2019/05/07/heres-how-improving-enemy-anti-aircraft-threats-put-pilots-and-crews-at-risk/.

36. Not a pistol or other handgun, but pretty much everything else.
37. Evidence abounds for this in CCTV7 broadcasts and other media reports. For a particularly striking photo, see Feng and Zhou, "Record of Xi Jinping's Inspection of the 79th Army." Here, "stealth" refers to "avoiding detection" broadly without regard for technological capabilities.
38. Chen, "Z-20 to Play More Roles in China's Military."
39. This preference for caution is embodied in the concept of "effective control" (有效控制). See Academy of Military Science Military Strategy Studies Department, *Science of Military Strategy* (2013), trans. China Aerospace Studies Institute and Project Everest, In Their Own Words: Foreign Military Thought (Montgomery, AL: China Aerospace Studies Institute, 8 February 2021), pp. 135–43, available at www.airuniversity.af.edu/CASI/Display/Article/2485204/plas-science-of-military-strategy-2013/. For a thorough dive into this literature and its implications for defense and strategic planners, see Burgess Laird, *War Control: Chinese Writings on the Control of Escalation in Crisis and Conflict* (Washington, DC: Center for a New American Security, April 2017), s3.us-east-1.amazonaws.com/files.cnas.org/documents/CNASReport-Chinese-Descalation-Final.pdf.
40. For a brief introduction to this relatively underexplored technology and the dilemmas it presents, see Michael Peck, "The U.S. Army Fears Russia's (and Others[']) 'Helicopter-Killer' Mines," *The Buzz* (blog), *National Interest,* 3 January 2017, nationalinterest.org/blog/the-buzz/the-us-army-fears-russias-others-helicopter-killer-mines-18925.
41. Lonnie Henley, "Testimony before the U.S.-China Economic and Security Review Commission Hearing on Cross-Strait Deterrence: PLA Operational Concepts and Centers of Gravity in a Taiwan Conflict," *U.S.-China Economic and Security Review Commission,* 18 February 2021, www.uscc.gov/sites/default/files/2021-02/Lonnie_Henley_Testimony.pdf.
42. The 2020 China military power report assesses that the PLA is capable of invading one of these islands now. This assessment seems correct, but Taiwan could make it a very costly operation if it chose to defend the islands. See U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China 2020: Annual Report to Congress* (Washington, DC: Office of the Secretary of Defense, 2020), p. 114, available at media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF.

John Chen and Joel Wuthnow

10. PLA Special-Operations Forces

Force Multipliers in the Joint Island Landing Campaign

One important but sometimes overlooked factor that will influence the success of any People's Liberation Army (PLA) attempt to seize Taiwan is special-operations forces (SOF) support to the main assault force.[1] Special operations have contributed to amphibious assaults in several modern campaigns, including Normandy (1944), the Falkland Islands (1982), and Grenada (1983). U.S. joint doctrine for amphibious operations continues to assign SOF multiple roles, including military information support, civil-military operations, foreign humanitarian assistance, special reconnaissance, direct action, and preparation of the environment.[2] During the preparatory and primary landing phases of a Taiwan invasion, and even during a potential mop-up campaign against resistance fighters, the PLA likely would use SOF for similar purposes.[3] Depending on their performance, these forces either could enable or could frustrate the operations of conventional PLA units, or perhaps have no effect at all.

This chapter addresses the potential role of PLA SOF in a Taiwan campaign from three perspectives.[4] The first is doctrine. By analyzing authoritative PLA publications, including *Lectures on the Science of Special Operations,* we find that PLA SOF are assigned three roles: a primary role in special reconnaissance and secondary roles in strikes/raids on key targets and in

information operations. The second is force structure and capabilities. The PLA Navy (PLAN), PLA Air Force (PLAAF), PLA ground forces (PLAGF), and People's Armed Police (PAP) all possess SOF relevant to a Taiwan contingency, including some forces that have expanded in recent years. The PLA also has acquired special-mission equipment relevant to amphibious missions, such as underwater personnel-delivery systems. The third is training. On the basis of PLA print and television media reports, it appears that PLA SOF have focused on squad-level and individual skills training, but there is also evidence of SOF involvement in larger combined-arms exercises. However, we found that joint training is limited, and there is almost no open-source evidence of SOF actively preparing for information operations.

The PLA has worked steadily over the last decade to ready SOF for an island landing scenario by refining doctrine, bolstering capabilities, and improving training. However, there are several variables that will influence these units' performance, including the following:

- Their technical proficiency and potential greater use of unmanned systems; the latter could replace humans in some roles, but they also increase technical-proficiency requirements
- Their degree of jointness, including the need for larger and more-frequent exercises with non-SOF units and continued reforms to joint command structures at and below the theater level
- The degree to which commanders try to micromanage SOF activities on the battlefield, which could lead to suboptimal results if those forces hesitate to act without explicit approval

The Taiwan and U.S. defense establishments should work to evaluate these challenges and weaknesses and determine whether plans for Taiwan's defense adequately consider PLA SOF.

Doctrine

PLA sources increasingly have noted the importance of special operations in modern warfare.[5] Both the 2013 Academy of Military Science (AMS) *Science of Military Strategy* and the 2020 National Defense University (NDU) *Science of Military Strategy* place SOF alongside other specialized capabilities—for instance, electronic warfare, aviation, missiles and missile defense, and information warfare—that the military needs to prevail in future wars.[6] Other volumes describe SOF as integral to military operations other than war, including overseas counterterrorism missions.[7] The 2020 NDU *Science*

of Military Strategy describes SOF as practitioners of a form of "asymmetric warfare" that involves reconnaissance, sabotage, strikes, and "psychological operations involving all types of technologies and means." The text encourages the PLA to build SOF capabilities in the areas of reconnaissance, strike, and survival behind enemy lines.[8]

SOF roles in an island landing scenario are discussed in various campaign-level PLA texts. The 2006 NDU *Science of Campaigns* assesses that special operations will be conducted in island landings to "isolate, split up, and collapse the enemy," "weaken the enemy's operational capabilities," and "decrease the intensity of the enemy's resistance."[9] A 2013 AMS teaching volume, *Lectures on Joint Battles* notes that SOF would infiltrate behind enemy lines, destroy key targets, guide fire assaults, and capture key enemy personnel.[10] The most-detailed descriptions are contained in another 2013 AMS teaching volume, *Lectures on the Science of Special Operations*. The authors begin their analysis of special operations in an island landing by sketching the role that British SOF played in the 1982 Falkland Islands campaign; those forces assisted the main landing force by gathering intelligence and conducting raids to "confuse and disrupt" Argentine forces, allowing the marines to land "with little resistance."[11]

In Chinese operational concepts, SOF can play several distinct roles in an island landing. First, and likely most prominent, is reconnaissance and targeting.[12] This includes monitoring weather and hydrological conditions; scouting enemy positions and movements, as well as enemy obstructions in the main landing approaches; tracking high-value enemy targets; identifying and illuminating targets for conventional precision-guided missile strikes; and conducting battle-damage assessments.[13] *Lectures on the Science of Special Operations* observes that British SOF landed on East Falkland Island three weeks prior to the main assault, during which time they kept track of hydrological conditions, monitored enemy troop movements, and evaluated enemy fortifications to "ensure the smooth landing of the Marines and paratroopers."[14]

The second role is to conduct strikes and raids. *Science of Campaigns* describes SOF raids—for instance, sabotaging airfields, naval port facilities and ships, radar stations, command posts, ammunition depots, and coastal-observation posts—as an enabler of both air and sea dominance during the initial phases of an island landing. During the landing phase, SOF would attempt to "pin down and scatter the enemy's operational forces," reducing their ability to concentrate on opposing the main assault.[15] *Lectures on the Science of Special Operations* also discusses raids against enemy political and civilian targets.[16] The authors attribute the rapid U.S. success during

the 1983 Grenada campaign to special operations that secured the governor general's residence, government offices, television-broadcast facilities, and key roads and other infrastructure in the capital of Saint George's.[17] The volume describes raids to rescue captured air and naval personnel in a section on blockade operations, but this mission also would apply to an island landing.[18]

The third role is psychological-warfare operations.[19] *Science of Campaigns* assigns to SOF the function of "disintegrating enemy resolve" through disinformation; it also describes a category of "special technical warfare" that includes infiltrating enemy networks or using enemy radio and television stations to disseminate one's own propaganda.[20] *Lectures on the Science of Special Operations* similarly asserts that SOF will help to shape the information battlefield during an island landing in at least two ways: seizure or destruction of enemy communications and broadcast networks; and psychological campaigns, such as distributing propaganda materials in enemy-occupied areas, setting up wireless transmitters and receivers, and facilitating the broadcast of propaganda to weaken enemy resolve.[21]

Notably, Chinese sources tend not to discuss the role of SOF in phases of an island landing beyond the initial assault. *Science of Campaigns* and other texts contain little analysis of the role that the military, including SOF units, would play in defeating a protracted counterinsurgency, perhaps indicating a conviction that enemy resistance would collapse following a successful decapitation strike.[22] Nevertheless, given their expertise in counterterrorism and similar operations garnered in restive locations such as Xinjiang, it is possible that either PLA or PAP SOF could be used against resistance fighters following a Taiwan invasion campaign.

According to Chinese writings, one of the key requirements of success is a high degree of integration between SOF and other forces during the run-up to and execution of an island landing. *Lectures on Joint Battles* describes special combat forces as one of six landing groups under a common joint headquarters; the others are landing (ground), maritime, air, missile, and information groups.[23] *Lectures on the Science of Special Operations* describes the need to achieve close coordination among these forces: "[S]pecial operations must work closely with other operations and pursue them in a unified manner. This puts high demands on the coordination of planning organizations and battlefield control."[24] For instance, SOF would need to coordinate with air and missile forces in targeting, and with Strategic Support Force (SSF) psychological-warfare and technical-reconnaissance units in information operations.

The previous command structure, in which the PLAAF, PLAN, and other forces were integrated only poorly into the theaters, was not suited to a doctrine that calls for close coordination. However, reforms undertaken during the Xi Jinping era alleviated this challenge by granting theater commanders authority over a wider range of forces, including PLAN SOF, and encouraging them to concentrate on joint training.[25] A 2018 *China Military Science* article by two staff officers from the Southern Theater Command confirms that theater commanders are responsible for planning and operational coordination for SOF, while the Central Military Commission's responsibility is limited to providing overall guidance.[26]

Nevertheless, the lack of recent campaign texts renders it difficult to evaluate how the system will operate at the tactical and operational levels. It is also worth noting that, in practice, the reforms did not create standing joint task forces that would encourage stronger peacetime coordination across the different services.[27] Moreover, as discussed below, the shift to a theater structure has not necessarily resulted in closer integration of SOF into joint training, and some SOF, including those under the PAP and Airborne Corps, remain outside theater purview.

Force Structure and Capabilities

Most PLA SOF are organized into brigades and assigned to the five theater commands.[28] According to both authoritative and nonauthoritative Chinese sources, each of the PLAGF's thirteen group armies has a SOF brigade, and the PLAAF Airborne Corps, PLAN Marine Corps (PLANMC), and PLA Rocket Force each have one SOF brigade.[29] Some of these SOF brigades are relatively new formations converted from conventional forces as part of an attempted expansion of SOF capabilities, and they are probably more similar in mission and force structure to the U.S. Army Rangers than to the elite Delta Force.[30] These formations and their approximate geographic locations are depicted in the figure. Judging by location, the units most likely to support an amphibious assault on Taiwan are the five SOF brigades of the Eastern and Southern Theater Commands, along with the PLANMC's Sea Dragons brigade (蛟龙突击队), based in Hainan, and possibly the PLAAF's Thunder Gods brigade (雷神突击队), located near the eastern seaboard in Hubei Province. In addition, reconnaissance battalions assigned to the PLAGF group armies and PLANMC brigades are not designated explicitly as SOF, but they also may carry out special-warfare missions in a Taiwan scenario.[31]

Figure 1. PLA Special-Operations Forces Units and Locations

Source: Peter Wood (@PeterWood_PDW), "New map—PLA Special Forces," Twitter (now X), 5 January 2020, 6:36 PM, twitter.com/peterwood_pdw/status/1213967625849434112?lang=en. Used with the permission of Peter Wood.

Most relevant to a large-scale island landing are the PLAGF's SOF brigades. While their mission is distinct, their internal structure resembles that of other PLAGF brigades in some respects. For instance, SOF brigades follow a standard "brigade-battalion-company-team" (旅-营-连-队组) hierarchy, and their field-command arrangements include basic, reserve, and rear command posts.[32] This structure resembles more closely that of the U.S. Army Rangers than of the Delta Force or SEALs, which delegate more authority to the team commander.

Like army combined-arms brigades, SOF brigades aspire to operate independently on the battlefield. This requires organic support capabilities such as unmanned aerial vehicle (UAV) reconnaissance battalions (无人机侦察营) and fire-support companies (火力支援连) with truck-mounted cannon, heavy mortars, and shoulder-fired surface-to-air missiles.[33] However, a 2018 *China Military Science* article suggests that more staff officers responsible for operations, intelligence, and coordination with other branches are needed for those battalions to be able to operate independently.[34]

SOF brigades reportedly emphasize a "centralized command style" (集中式指挥) more common in conventional units rather than a flexible, "task-oriented command style" (任务式指挥). Centralized command is facilitated primarily by radio and satellite communications, which conventional units also might employ. However, SOF brigades apparently suffer from some of the same command-and-control problems that conventional PLA units of the same size are known to encounter. For instance, two scholars at the PLAGF Command College noted in 2019 that down-echelon voice communications were difficult to maintain using comparatively slow, single-function, limited-bandwidth radios and satellite-communication terminals. This meant that brigade, battalion, and company commanders did not have data links with each other, and SOF battalions, companies, and platoons did not have consistent access to the integrated command platform or its command-automation capabilities.[35]

There is some evidence that SOF brigades have instituted arrangements to facilitate tactical and operational coordination with other services and branches. According to two PLA scholars, PLAGF SOF brigades reportedly integrate personnel from other services by including liaison officers from relevant PLAN, PLAAF, PLAGF aviation, and artillery units in the basic command post. A SOF brigade basic command post is "authorized to give priority to the support of intelligence, firepower, and other forces," and fire support from naval, air force, and long-range artillery units can be guided through liaison officers in accordance with target-detection and position information.[36] This structure is consistent with the emphasis that Chinese theorists place on close coordination between SOF and supported units in reconnaissance, strike, and psychological-warfare missions during an island landing campaign.

PLA SOF likely have priority access to modern equipment, such as individual-soldier communications systems and night-vision equipment. They also are likely to have access to special-mission equipment that would be vital in an amphibious assault on Taiwan.[37] For instance, SOF have fielded UAVs of varying sizes, from hand-launched UAVs and microcopters at the squad level to medium-altitude BZK-005 vehicles as part of larger formations. In some instances, SOF units use commercially available, off-the-shelf micro-UAVs to perform intelligence, surveillance, and reconnaissance functions ahead of assault drills.[38] As noted above, there also are dedicated UAV battalions in some army SOF brigades; these field larger UAVs.[39] PLA SOF also claim to use various ground-based battlefield sensors and instruments. Recent Chinese media reports show

members of one Eastern Theater Command Army SOF brigade using laser designators, and troops from a reconnaissance company in a different theater setting up reconnaissance instruments and ground-based sensors.[40] PLA writings stress that SOF should gather technical signature intelligence using battlefield sensors, but little information on this hardware was available at the time of writing.[41]

The most-advanced equipment available to PLA SOF likely is used in clandestine maritime operations. This equipment includes undersea sensors, diver-propulsion vehicles, and undersea personnel-delivery systems, although the deployment and operational status of this equipment are unclear from open sources. For instance, undated screen grabs of official China Central Television *Military Report* episodes show PLAN frogmen training with diver-propulsion systems and a larger diver-delivery submersible, and an unofficial source from 2015 posted pictures of PLAN frogmen using small diver-propulsion vehicles and training to exit a submarine using torpedo tubes.[42] Chinese defense-industry researchers have developed diver navigation aids, radios, and handheld direction-finding sonars for special operations in low-visibility underwater environments, although it is unclear which models have reached the force and in what numbers.[43] Such equipment would be critical in both reconnaissance and sabotage operations in the initial phases of an island landing.

Beyond the PLA, China's paramilitary force also has SOF capabilities that could be relevant during a Taiwan contingency. While the PAP maintains SWAT-like forces in each province that perform law-enforcement functions on a local scale, it also has a few elite commando units that can be employed in more-demanding circumstances farther from their home bases. Under a recent restructuring, these units were assigned to two national-level "mobile contingents" (机动总队) that do not have fixed geographic areas of operations.[44] Both are large rapid-reaction forces with mixed capabilities that can be deployed in major contingencies. Most relevant to a Taiwan scenario is the 2nd Mobile Contingent, whose headquarters is in Fuzhou but whose subordinate units are scattered across southern China. This organization has two SOF detachments, one of which is believed to be the Snow Leopards commando unit (雪豹突击队). Founded in 2002, the Snow Leopards were based in Beijing but moved to Guangzhou as part of the restructuring.[45] The unit focuses on counterterrorism and hostage rescue, and includes assault, reconnaissance, explosive-ordnance-disposal, and sniper teams.[46] Its members possess standard equipment for "close-range fire strikes," including pistols and assault rifles, while some also operate crossbows, submachine guns, and

heavy machine guns.[47] The unit's location, internal composition, and equipment would make it useful for some aspects of a Taiwan contingency, including protecting critical infrastructure within China from sabotage and even conducting "political rendition"–type operations on Taiwan.[48]

Training

SOF units practice a variety of skills relevant to an island landing, although Chinese sources describe difficulties that could diminish those forces' readiness for a Taiwan campaign. Army SOF, for example, practice obstacle clearing, stealthy marches, survival behind enemy lines, direction finding, nighttime reconnaissance, observational reporting, blocking maneuvers, and battlefield first aid.[49] The PLANMC Sea Dragons commandos reportedly spend more than a year learning parachuting, rappelling, direction finding, special vehicle driving, search and seizure, demolition, and hand-to-hand combat skills, as well as reconnaissance skills including map identification, photo taking and video recording, and encryption protocols for transmitting intelligence.[50] The PLAAF Airborne Corps Thunder Gods SOF brigade trains for high-altitude/high-opening and high-altitude/low-opening parachute jumps, among other skills.[51] SOF personnel also train to capture high-value targets for intelligence purposes (捕俘) for a variety of campaigns, including an island landing scenario.[52]

Official Chinese media routinely refer to SOF units as "triphibious" (三栖) or "quadphibious" (四栖), reflecting the forces' ability to operate in air, land, sea, and underwater environments.[53] Army SOF units from the Eastern Theater Command practice combat swimming, paddling in small rubber boats, shooting from moving watercraft, and scuba diving.[54] In a 2016 exercise, troops from a Southern Theater Command Army SOF brigade fast-roped from helicopters at twenty meters above water, then traveled five kilometers to a beach using surface and subsurface methods.[55] The Sea Dragons practice deploying rubber boats and fast-roping frogmen from helicopters into the water.[56] Likewise, the Thunder Gods held large training events in 2019 and 2020 in which personnel practiced using steerable parachutes, parachuting into water, and extricating themselves from parachute harnesses.[57]

SOF units also have demonstrated rapid-extraction capabilities across multiple domains. In 2017 footage, PLANMC frogmen practiced a diver-extraction method in which they boarded a passing motorized rigid inflatable boat from the water, while a 2020 image showed the Thunder Gods

apparently practicing a rapid extraction using a helicopter rope-suspension technique.[58] Other extraction training undertaken during combat search-and-rescue drills focuses on coordination among fire-support elements to cover forces exfiltrating by truck.[59]

Like those of their PLA SOF comrades, elite PAP SOF units aim to improve readiness through rigorous selection and training. The Snow Leopards, for instance, profess adherence to stringent selection standards, with 40–50 percent of recruits failing to pass initial screening. Nevertheless, a senior officer described retention as a problem, with fewer long-serving members than comparable units in other countries.[60] The Snow Leopards' annual "Devil Week" training simulates operations in "actual combat environments," including desert, jungle, sea, air, and urban environments. Most of this training focuses on counterterrorism assignments, including the water-to-shore training featured in the 2020 Devil Week.[61] The Snow Leopards and other PAP units also have participated regularly in international exercises and competitions, mostly focused on counterterrorism.[62]

PLA training instructors stress that special operations are mostly squad-size maneuvers, involving only one to two personnel at a time, six to twelve at most (similar to the size and scale of U.S. Green Beret detachments or some Navy SEAL teams). Having personnel with multiple skills is considered critical to survival and success in small-unit operations.[63] Small-unit maneuvers provide SOF with low-risk opportunities to practice skills relevant to an amphibious assault. In August 2020, for instance, members of a 72nd Group Army SOF brigade landed on a small, uninhabited, and unfamiliar island in the East China Sea by disembarking from small motorboats and swimming to the island to achieve surprise. Once ashore, they scaled cliffs and stormed a simulated rear command post (后备指挥所), quickly collected and processed intelligence through document exploitation, and used special communication protocols to report the information up echelon.[64]

Beyond individual and small-unit drills, PLA SOF units also train in larger, more-complex, combined-arms formations that showcase likely SOF missions during an amphibious landing on Taiwan. In December 2020, PLANMC SOF participated in a combined-arms island landing and seizure exercise involving squad-size (班组) mechanized infantry units. In the opening phase, SOF used mine-clearing line charges to destroy landing obstacles while sniper teams simultaneously seized optimal sniping positions and began to execute ambushes at critical points on the enemy's front line. Shortly thereafter, SOF troops fast-roped from helicopters onto high ground and began infiltration and attacks ahead of the main landing

force. Assault vehicles then deployed smoke screens to cover infantry fighting vehicles carrying out suppressing fire, while SOF proceeded to destroy vital enemy targets one by one.[65] SOF also have trained at the national training range at Zhurihe, where satellite imagery has identified a mockup of Taiwan's presidential building. However, it is unclear how much they focus on preparing for a decapitation strike.[66]

Some field exercises involving larger SOF units combine tactical and operational experimentation with validation of combat capabilities in a landing scenario. One complex three-day exercise in September 2020 paired Z-10 attack and Mil Mi-17 transport helicopters of a 73rd Group Army aviation brigade with troops from a 73rd Group Army SOF brigade. The helicopters evaded air-defense radars and antiaircraft fire, then proceeded to the landing zones, and the aviation brigade conducted low-altitude reconnaissance, then landed SOF troops.[67] For its part, the SOF brigade experimented with up to eight fast-ropes from a single Mi-17, purportedly reducing disembarkation time by up to 50 percent.[68]

Other, larger SOF exercises closely resemble conventional combat operations involving organized command decision-making and coordination of fire support from artillery and aircraft. During a September 2020 exercise, personnel from a Southern Theater Command SOF brigade arrived in an unfamiliar area, set up a command post and corresponding communications, and rehearsed operational planning. Other troops proceeded to carry out different training activities in all weather conditions against simulated opposing "Blue Team" forces, including hostage extraction, nighttime reconnaissance, and target designation for fire support.[69]

Coordination between SOF and non-SOF forces mostly involves technologies and platforms that are not organic to PLA SOF units. The most frequently depicted examples show the use of army and navy rotary-wing aircraft for parachute jump training and troop transport.[70] In a few publicly reported instances, army SOF personnel have trained with attack helicopters from army aviation brigades, with those platforms scouting landing zones.[71] In recent exercises, there also likely has been direct integration of SOF reconnaissance elements with higher-echelon intelligence authorities. For instance, one winter 2020 exercise featured troops from a SOF brigade of the 82nd Group Army using Beidou positioning, navigation, and timing transmitters issued by the former General Staff Department Survey and Navigation Bureau to relay targeting information to a command post.[72]

Despite apparent progress in training, SOF face several deficiencies in preparing for island landing operations. First, reports suggest that SOF have struggled with special-mission equipment that would be vital for

successful prelanding operations. A 2015 article by special-warfare researchers at the Naval Submarine Academy published in an Army Special Forces Academy journal remarked that the limited oxygen supply, heavy weight, excessive cavitation, and complex battery charging and assembly of the main Chinese-built diver-delivery vehicle meant that for safety reasons the training programs for those vehicles should be carried out only in waters precleared of obstacles and debris, with no explosives allowed within three nautical miles of the training area.[73] It is unclear whether more-recent exercises have led to a removal of those restrictions.

Second is inadequate attention to technical reconnaissance. Two PLAGF Command College scholars argue that SOF personnel are poorly trained to obtain and handle the intelligence collected by technical equipment, noting that SOF brigades have "focused on armed reconnaissance training at the expense of technical reconnaissance," resulting in "comparatively infrequent use of unmanned vehicles and battlefield television reconnaissance" and "low reconnaissance efficiency." A heavy emphasis on armed reconnaissance training also reportedly had resulted in reduced attention to specialized skills such as aerial imagery interpretation and target recognition and indication. As a result, "SOF officers and personnel have comparatively weak ability to obtain and handle intelligence."[74]

Third, PLA SOF do not appear to train for missions that could support offensive information warfare, including psychological operations or unconventional warfare. There is no public mention of any training with special-mission aircraft or broadcast equipment or with nonmilitary assets or of interaction with local populations that could support offensive psychological operations. As a result, the role of PLA SOF in information operations likely would be limited to kinetic operations against critical information infrastructure such as network-management or data centers, computer server farms, or even undersea communications cables.[75] This also might involve simple operations to plug in devices on broadcasting antennae that would allow information-operations personnel to access and exploit them.

Fourth is limited cross-service integration. There is little open-source evidence of SOF units from different services training together or with non-SOF units from different services, except for the occasional provision of PLAAF aircraft for army SOF parachute jump training.[76] There is also no evidence that the Snow Leopards or other PAP SOF units have participated in joint exercises with PLA forces. Theater commanders have no de facto authority over PAP units, which report through their own headquarters; this reduces the ability of theater leadership to incorporate PAP units

into joint training and supervise them in a contingency.[77] Absent stronger coordination, it is unlikely that PAP SOF would be part of the initial landing, although these units could be called on once major operations are complete to assist in hunting down political figures.[78]

PLA SOF likely would play important supporting roles in an amphibious assault on Taiwan. Their capabilities and training are geared toward several missions that would be undertaken during the preparatory and main-assault phases of the landing, including infiltration via special-mission craft and helicopters, reconnaissance and targeting, obstacle clearance, strikes and raids, and extractions. While Chinese doctrinal sources do not discuss such a scenario, it also is likely that PAP or other special forces would remain on Taiwan following a successful landing to conduct counterinsurgency-type missions. One area in which doctrine still may be ahead of practice is information operations. It is unclear from open-source reports whether SOF are preparing for on-island propaganda work or are training with other relevant PLA units, including the SSF, for this mission.

While PLA SOF have made progress in recent years, several variables would influence their performance in an island landing. One is whether SOF can field and better integrate special-mission equipment for complex and dangerous missions. While China's defense industry undoubtedly continues to improve manned special-mission equipment for SOF, researchers also have stressed the utility of unmanned undersea and aerial vehicles for dangerous special operations such as mine and obstacle clearing.[79] Coordination and effective application of unmanned systems will call for more-demanding training and recruitment requirements within PLA SOF.

Another variable is whether SOF can coordinate their operations effectively with non-SOF supporting and supported forces. How much coordination is necessary likely would vary according to unit composition and mission type. SOF units with a diverse range of organic capabilities and specialized hardware and dedicated support units may require less joint coordination than units tasked to accomplish special operations in which the mission rather than the unit is defined as "special." Elite commando units like the U.S. Navy's Naval Special Warfare Development Group (SEAL Team 6) with dedicated transport and intelligence support units may require little interaction with main landing forces, but others, such as brigade-size army units that would deploy alongside and directly support the main landing forces, may need to coordinate more extensively. In the latter scenario—which appears to be more likely for the

majority of PLA SOF units—the lack of permanent joint structures below the theater level could diminish the effectiveness of joint operations involving special forces, potentially leading to catastrophic results similar to the failed U.S. hostage-rescue attempt in Iran during Operation Eagle Claw.[80] Moreover, some relevant units, including from the SSF, PAP, and Airborne Corps, reside outside the theater structure, leading to questions about joint command even at that level. Evidence that these potential shortcomings are being addressed would be inclusion of Airborne Corps and PAP SOF in theater command–led exercises; the establishment of permanent, lower-level joint commands or liaison arrangements; and real-world operations, perhaps in counterterrorism missions within China and farther from home, that would require SOF to learn lessons and adapt.

Chinese special operations also would have to reconcile the imperative to conduct small, clandestine operations behind enemy lines with a desire to maintain unified command under the joint command construct. Generally, there is a tension between the Leninist emphasis on centralization and the need to grant autonomy to lower-level PLA commanders. This could be especially problematic in special operations; centralized command could lead to poor performance if small units fail to act because of a lack of explicit authorization, or if they are forced to maintain radio communications and thus reveal their positions to the enemy. Evidence from training or updated doctrine could offer signs of whether SOF teams are given adequate autonomy in the field.

Nevertheless, even partly effective special operations could hamper Taiwan's defenses and thus should be addressed explicitly in defensive concepts. Taiwan's articulation of a more "asymmetric and innovative" way of defeating an island landing, which has been discussed in recent years under the "overall defense concept" label, should acknowledge explicitly the threat posed by Chinese SOF preceding and during all phases of an island landing and determine whether additional changes to tactics and capabilities are needed.[81] Those approaches also should identify PLA weaknesses, such as a lack of technical proficiency, limited jointness, and potential overreliance on radio communications for command and control, and tailor responses accordingly. It is also worth exploring whether, and how, U.S. SOF may work with their Taiwan counterparts to evaluate the dangers posed by PLA SOF, share best practices, and conduct joint training.[82]

Notes

1. The Office of the Secretary of Defense's congressionally mandated report on the Chinese military, for instance, contains only scant references to SOF. The only allusion to SOF in an island landing is the statement that SOF could "infiltrate Taiwan and conduct attacks against infrastructure or leadership targets"—an assessment too brief to capture fully the range of SOF assignments. U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China* (Washington, DC: Office of the Secretary of Defense, 2020), p. 113.
2. U.S. Defense Dept., *Amphibious Operations,* JP 3-02 (Washington, DC: Joint Chiefs of Staff, 21 January 2021), p. VI-4.
3. For a general description of PLA concepts of island landing campaigns, see Michael Casey, "Firepower Strike, Blockade, Landing: PLA Campaigns for a Cross-Strait Conflict," in *Crossing the Strait: China's Military Prepares for War with Taiwan,* ed. Joel Wuthnow et al. (Washington, DC: National Defense Univ. Press, 2022), pp. 113–37, ndupress.ndu.edu/Portals/68/Documents/Books/crossing-the-strait/crossing-the-strait.pdf.
4. While the focus of this chapter is island landings, PLA SOF also would play a role in a blockade.
5. For an earlier analysis, see Dean Cheng, "The Chinese People's Liberation Army and Special Operations," *Special Warfare,* July–September 2012, available at www.soc.mil/SWCS/SWmag/archive/SW2503/SW2503TheChinesePeoplesLiberationArmy.html.
6. The lengthiest discussions are in sections on army strategy, but air and naval SOF also are noted. 军事科学院军事战略研究部 [Academy of Military Science Military Strategy Studies Department], 战略学 [*Science of Military Strategy*] (Beijing: Military Science, 2013), pp. 205–206; 肖天亮 [Xiao Tianliang], ed., 战略学 [*Science of Military Strategy*] (Beijing: National Defense Univ. Press, 2020), p. 265.
7. Kevin McCauley, "PLA Special Operations: Combat Missions and Operations Abroad," Jamestown Foundation *China Brief* 15, no. 17 (3 September 2015), available at jamestown.org/program/pla-special-operations-combat-missions-and-operations-abroad.
8. Xiao, *Science of Military Strategy,* p. 355.
9. 张玉良 [Zhang Yuliang], ed., 战役学 [*Science of Campaigns*] (Beijing: National Defense Univ. Press, 2006), p. 312.
10. 陈荣弟 [Chen Rongdi], 联合战斗教程 [*Lectures on Joint Battles*] (Beijing: Military Science, 2013), p. 169.
11. 郭明 [Guo Ming], ed., 特种作战学教程 [*Lectures on the Science of Special Operations*] (Beijing: Military Science, 2013), p. 181. For a broader analysis of PLA lessons from this campaign, see Christopher D. Yung, "Sinica Rules the Waves? The People's Liberation Army Navy's Power Projection and Anti-access/Area Denial Lessons from the Falklands/Malvinas Conflict," in *Chinese Lessons from Other Peoples' Wars,* ed. Andrew Scobell, David Lai, and Roy Kamphausen (Carlisle, PA: U.S. Army War College Strategic Studies Institute, 2011), pp. 75–114.

12. The 2011 edition of the PLA's dictionary of military terminology notes in its definition of *special operations* (特种作战) that an alternative term for these activities is *special reconnaissance operations* (特种侦察作战). See 全军军事术语管理委员会 [All-Military Terminology Management Committee], 中国人民解放军军语 [*China People's Liberation Army Military Terminology*] (Beijing: Military Science, 2011), p. 875.
13. Zhang, *Science of Campaigns,* p. 199; Guo, *Lectures on the Science of Special Operations,* p. 183; Chen, *Lectures on Joint Battles,* p. 76.
14. Guo, *Lectures on the Science of Special Operations,* p. 183.
15. Zhang, *Science of Campaigns,* pp. 316, 326.
16. Guo, *Lectures on the Science of Special Operations,* p. 183.
17. Ibid. Special operations did play a notable role in Operation Urgent Fury, but their mission was quite different from what the PLA would be expected to accomplish on Taiwan. For instance, Navy SEALs rescued the governor general, whereas the PLA would be expected to capture or eliminate key Taiwanese political figures. See Ronald H. Cole, *Operation Urgent Fury: The Planning and Execution of Joint Operations in Grenada 12 October–2 November 1983* (Washington, DC: Joint History Office, 1997), p. 29, available at www.jcs.mil/Portals/36/Documents/History/Monographs/Urgent_Fury.pdf.
18. Guo, *Lectures on the Science of Special Operations,* p. 188. A blockade likely would precede an island landing. SOF also could attempt to rescue Chinese personnel on land.
19. For more on information operations in a Taiwan campaign, see Fiona Cunningham, "Testimony before the U.S.-China Economic and Security Review Commission: Hearing on 'Deterring PRC Aggression towards Taiwan,'" *U.S.-China Economic and Security Review Commission,* 18 February 2021, www.uscc.gov/sites/default/files/2021-02/Fiona_Cunningham_Testimony.pdf.
20. Zhang, *Science of Campaigns,* p. 199.
21. Guo, *Lectures on the Science of Special Operations,* pp. 183–84.
22. However, PLA units have conducted urban-warfare training. For a discussion, see Sale Lilly, "'Killing Rats in a Porcelain Shop': PLA Urban Warfare in a Taiwan Campaign," in Wuthnow et al., *Crossing the Strait.*
23. Chen, *Lectures on Joint Battles,* p. 169. This mirrors the incorporation of SOF into joint constructs, as depicted in other PLA writings. See Jeffrey Engstrom, *Systems Confrontation and System Destruction Warfare* (Santa Monica, CA: RAND, 2018), p. 35.
24. Guo, *Lectures on the Science of Special Operations,* p. 183.
25. For a general description of the new command structure, see Joel Wuthnow, "A Brave New World for Chinese Joint Operations," *Journal of Strategic Studies* 40, nos. 1–2 (2017), pp. 169–95.
26. 唐旻晖 [Tang Minhui] and 徐常 [Xu Chang], 站在新的历史起点, 加快推动我军特种部队建设转型 ["Reach a New Historical Starting Point and Accelerate the Transformation of the PLA's Special Forces"], 中国军事科学 [*China Military Science*], no. 2 (2018), p. 54.

27. The need for closer integration of forces at the tactical and operational levels is a theme of recent PLA writings on joint operations. See Xiao, *Science of Military Strategy,* pp. 264–67. Also see Derek Solen, "Chinese Views of All-Domain Operations," *Air University (AU),* 31 August 2020, www.airuniversity.af.edu/CASI/Display/Article/2310442/chinese-views-of-all-domain-operations/.
28. For a prereform assessment of Chinese SOF, see Dennis J. Blasko, "Chinese Special Operations Forces: Not like 'Back at Bragg,'" *War on the Rocks,* 1 January 2015, warontherocks.com/2015/01/chinese-special-operations-forces-not-like-back-at-bragg/.
29. For a partial listing of PLA SOF from an unofficial source, see 21支特战劲旅磨砺反恐尖刀 ["21 Special Forces Contingents, Practiced Antiterrorism Daggers"], 大公报 [*Ta Kung Pao*], 2 September 2019, www.takungpao.com/news/232108/2019/0902/343977.html; and International Institute for Strategic Studies, *The Military Balance 2021* (Abingdon, U.K.: Routledge, 2021), pp. 249–55.
30. For instance, one official source indicates that a motorized infantry brigade in the 81st Group Army (Central Theater Command) was converted to a SOF brigade in May 2017. See 军事报道 [*Military Affairs Report*], 创新人才培养, 加快新质战斗力生成 ["Innovate Personnel Training, Accelerate the Production of New Quality Combat Power"], aired 10 May 2022, on CCTV-7, available at tv.cctv.com/v/v1/VIDEbuNXXK8M9UEC2gqI34Tk200510.html.
31. 吴登峰 [Wu Dengfeng], 范旭东 [Fan Xudong], and 翟思宇 [Di Siyu], 海军陆战队某旅侦察营: 锻造特种作战的利刃尖刀 ["Marine Corps Unidentified Brigade Reconnaissance Battalion: Forging the Blades and Daggers of Special-Warfare"], 新华 [*Xinhua*], 27 December 2018, www.81.cn/jwgz/2018-12/27/content_9389652.htm.
32. 董伟 [Dong Wei] and 王本胜 [Wang Bensheng], 特种作战旅如何构建敏捷化指挥体系 ["How to Build an Agile Command System for a Special Operations Brigade"], 中国社会科学报 [*Chinese Social Sciences Today*], no. 1820 (2019), sscp.cssn.cn/xkpd/jsx_20175/201911/t20191121_5046131.html.
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79. 孙成陆 [Sun Chenglu], 特种作战中无人机侦察力量的运用 ["Application of Unmanned Reconnaissance Vehicles in Special Operations"], 四川兵工学报 [*Journal of Sichuan Ordnance*] 32, no. 1 (January 2011), p. 44.
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Concept, Explained," *The Diplomat,* 3 November 2020, thediplomat.com/2020/11/taiwans-overall-defense-concept-explained/; and *2021 Quadrennial Defense Review* (Taipei: [Taiwan] Ministry of National Defense, 2021).

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Thomas Shugart

11. Mine Warfare in a Cross-Strait Invasion

This chapter uses open-source information to attempt to answer key questions about the potential use of mine warfare (MIW) by the People's Liberation Army (PLA) in an invasion of Taiwan. In terms of scope, MIW comprises two key elements: first, mines and the means to deploy them; and second, mine countermeasures (MCM), which include destroying mines in land-based inventories, defeating minelayers and preventing them from laying their weapons, and rendering safe mines that already have been deployed for either offensive or defensive reasons. Both aspects of MIW will be considered here.

The key questions about MIW as it relates to a cross-strait invasion—those that seem likely to offer the most utility to defense thinkers and practitioners—are the following:

- What would be the objectives of Chinese employment of MIW in an invasion of Taiwan?
- Do the MIW forces of the People's Republic of China (PRC) have the appropriate capabilities to achieve these objectives?
- What MIW capabilities do Taiwan and the United States possess that might help to deter a PRC attack on Taiwan?
- What countermeasures are Taiwan, the United States, and allies/partners able to employ that might reduce the effectiveness of the PRC's MIW efforts? Would they be successful?
- What asymmetries exist between the two sides? How might we expect these asymmetries to be exploited?

After answering these questions, the chapter will conclude with recommendations for the United States and its allies to blunt the effectiveness of PRC MIW and to maximize the success of U.S. and allied MIW efforts.

Certainty in the answers to some of the questions above is difficult to achieve, as open-source information on many of the specifics of the PLA's MIW capabilities is sparse and sometimes contradictory. For example, open-source estimates of China's total naval mine inventory vary from fifty thousand to over one hundred thousand, with little clarity on what proportion of those mines is modern, and thus the most difficult to counteract. Details on the development of Chinese MCM forces are also somewhat murky; while reasonable estimates of the number of MCM vessels exist, there is little trustworthy detail to be found on their effectiveness or the subsystems they use to find and neutralize mines. Nevertheless, open-source information allows us to gain a broad understanding of the MIW capabilities of both sides and to find points of significant asymmetry.

The seminal work on China's MIW efforts—the 2009 China Maritime Studies Institute's (CMSI's) *Chinese Mine Warfare: A PLA Navy "Assassin's Mace" Capability* (coauthored by Andrew S. Erickson, Lyle J. Goldstein, and William S. Murray)—already has established a strong foundation on this topic, using countless Chinese sources to do so.[1] Rather than attempting to duplicate these efforts fourteen years later, this chapter will attempt to build on them, using in part additional perspective taken from recent translations of Chinese strategic documents. More importantly, it will attempt to take CMSI's foundational work—along with that of others—and look at it through the lens of dramatic changes to the regional military balance in the last decade or so, accounting as well for changes (and worrying setbacks) in the development of U.S. and allied MIW capabilities. In terms of framing and context, this chapter will assume—without addressing national motivations and larger geopolitical factors—a full-blown invasion of Taiwan and a maximal effort potentially involving military action against Taiwanese, U.S., and allied military forces. Because of current geopolitical trend lines, this chapter also will assume a near-term scenario (approximately 2025), as well as the involvement of Japan and Australia as cobelligerents.

The Mine Warfare Military Balance

This section provides an overview of the capabilities of China's MIW forces versus those fielded by Taiwan, the United States, and other allies, as well as related developmental and procurement trends.

China

With a combination of both a robust inventory of naval mines and a comprehensive suite of available delivery platforms, China fields what is probably the world's most potent at-scale mine-delivery capability. While estimates of China's mine inventory vary, according to a 2015 Office of Naval Intelligence (ONI) report, China fields more than fifty thousand mines, with a "large variety of mine types such as moored, bottom, drifting, rocket-propelled, and intelligent mines." China does not appear to be standing still in developing its mining capabilities, and ONI expects the PLA to "continue to develop more advanced mines in the future such as extended-range propelled-warhead mines, antihelicopter mines, and bottom-influence mines more able to counter minesweeping efforts."[2] For mining platforms, China has an impressive array of options. With delivery possible via surface ships, multiple aircraft types, dozens of submarines, and hundreds of maritime militia vessels, China has the capability to conduct large-scale mining operations either openly or clandestinely and in either benign or contested areas.[3]

China also has developed robust and modernized MCM capabilities over recent decades, with significant numbers of advanced and dedicated MCM vessels joining its fleet in recent years.[4] According to ONI, as of 2019 China possessed more than two dozen dedicated minesweepers, as well as five or more minehunting drone-control ships, which can deploy a total inventory of more than fifteen remote-controlled unmanned surface vessels (USVs).[5] China regularly and publicly exercises its MIW forces in both minelaying and minesweeping and claims that it maintains the capability to neutralize Taiwanese mines swiftly enough to support a cross-strait invasion.[6] In recent years, Chinese writers also have discussed the use of both maritime militia vessels and civilian helicopters in conducting MCM operations, although the effectiveness of such military-civil fusion minehunting efforts remains unclear.[7]

Taiwan

Recently, Taiwan has signaled an increase in its MIW efforts as a focus area of its asymmetric overall defense concept.[8] As a result, after years of relative neglect, Taiwan's MIW capabilities are of somewhat mixed quality, with nascent improvements in some areas.

In mining capability, while Taiwan recently introduced four dedicated "fast minelayers" and appears to be developing "smart mines" of its own, open-source details on the overall size and capabilities of Taiwan's mine

inventory remain sparse.[9] The minelayers discussed above appear to be the only dedicated delivery platforms, with no known submarine or air-delivery capability, although Taiwan has requested to purchase U.S.-made mines, likely including Quickstrike air-delivered versions.[10]

Given the Chinese mine threat described above, as well as Taiwan's stark reliance on seaborne trade and supply, Taiwan's naval minesweeping capabilities seem quite limited. The Taiwanese navy's MCM fleet appears to consist of only six fully operational vessels: two former U.S. *Osprey*-class minesweepers and four small, German-built coastal minehunters.[11] Taiwan's most recent effort to build a new class of minehunters ended in a fiasco of corruption and fraud—the owner of one of Taiwan's main shipbuilding companies was sentenced to twenty-five years in prison.[12]

The United States

One might expect the United States, as the world's naval superpower—and one that is particularly reliant on long, seaborne supply lines—to have the world's foremost naval capabilities in MIW; however, that does not appear to be the case. In recent years, limited U.S. investment in dedicated MIW capabilities has relegated the United States to a position in which its MCM capabilities in a high-end military conflict are likely to be inadequate, and its ability to conduct at-scale minelaying in contested environments seems to be—at least for now—limited or nonexistent.

For U.S. MCM forces, the last decade was supposed to be a period of transition, during which legacy capabilities built around the U.S. Navy's *Avenger*-class MCM ships and the U.S. Marine Corps's MH-53 minesweeping helicopters were supposed to be retired in favor of capabilities built around the modular MCM function of the littoral combat ship (LCS) program.[13] Instead, the retirement of both the Navy's minehunters and the Marine Corps's MH-53 helicopters have had to be held in abeyance because of repeated delays and testing failures during development of the MCM module program (a separately funded program from the LCS). This is to say nothing of the troubles associated with the LCS program itself, which will be truncated far short of its original predicted hull count, and whose *Freedom*-class variant has been found wanting in its basic reliability and ability to stay at sea.[14] According to Navy budget documents, the MCM module will continue developmental and initial operational testing into 2023, and capabilities will continue to be extended to testing on "vessels of opportunity" such as the Navy's expeditionary mobile base, now that the LCS program's days are numbered.[15] Clearly, when one considers the hopes of Erickson, Goldstein, and Murray in 2009 that "the commitment to LCS can be viewed as a strong commitment to MCM," things have not turned out as well as those scholars expected.

In terms of minelaying, U.S. capabilities are relatively limited—and will remain so until several current developmental programs come to fruition. The United States has not fielded a new naval mine variant for almost forty years, and as a result it has minimal capabilities for mining in contested environments. While a classified number of clandestinely delivered Mk 67 submarine-launched mobile mines (SLMMs) remain in storage in Guam, their design is quite dated, and it seems that these mines are not compatible with the Navy's current-production *Virginia*-class attack submarines. Furthermore, use of these mines in Navy exercises does not appear to have been discussed publicly since 2015.[16] The United States also fields several variants of Quickstrike air-delivered bottom mines, although all current-production versions require the operation of aircraft (all nonstealthy types) over, or near, their intended delivery location. While there are new mining capabilities in development for use in contested environments—such as the Quickstrike Extended Range (a winged variant of the smallest, five-hundred-pound Quickstrike bottom mine), the unmanned underwater vehicle (UUV)–like mining expendable delivery unmanned submarine asset (known as MEDUSA) submarine-launched mine, and the large UUV-delivered, clandestine-delivered mine (using excess former SLMM warheads)—these programs remain several years away from full-rate production.[17]

Regional Allies

Japan and Australia, the two U.S. allies that seem most likely to be ready and able to contribute meaningfully to any effort to defend Taiwan, maintain MIW capabilities of their own—specifically, in the field of MCM. Japan has a force of more than two dozen minehunters, as well as a drone-control ship and multiple MCM USVs, while Australia maintains a modest force of four *Huon*-class coastal minesweepers. What is questionable, however, is how much these MCM forces would be able to contribute to an MIW campaign in a cross-strait conflict. Japan's minesweepers may be busy keeping open the approaches to Japan's own ports and naval bases, and Australia's minesweepers may take too long transiting from the antipodes to affect the outcome of a conflict significantly.

Mine Warfare in PRC Strategic Thinking

Having described the types of MIW forces available in a cross-strait conflict, this chapter now turns to how those forces may be employed and what the objectives of MIW employment might be for the PRC.

PRC Campaign Plans in a Taiwan Invasion Scenario

A review of PLA strategic writings suggests that there is no distinct and separate campaign plan for MIW alone. Rather, the use of MIW is integrated into the broader campaign plans that would be used as the basis for the PRC's planning of a Taiwan invasion. According to Ian Easton of the Project 2049 Institute, in the course of an attack on Taiwan the PLA likely would execute four of its main joint operational plans, specifically:

- Joint firepower strike operations
- Joint blockade operations
- Joint landing operations
- Joint anti–air raid operations

These joint operations could be conducted independently, in combination, or in series—depending on the circumstances of the scenario. For example, the initiation of an anti–air raid campaign might be called for in the case of a U.S. intervention via missile strikes and air attacks on PLA forces.[18]

Similarly, the 2013 edition of the Chinese Academy of Military Science's *Science of Military Strategy* indicates that the strategic missions of the PLA Navy (PLAN) encompass conducting joint campaigns to include "information assault, fire strike, sea-air blockade, 3-D island landing, and multidimensional protection, plus countering of the powerful enemy's intervention." This document specifically highlights "various missiles" and "smart torpedoes and mines" as types of "informationized weapons," the wide-ranging use of which will become one of the fundamentals of naval warfare.[19]

Mine Warfare Doctrine in China's Joint Campaign Plans

In terms of sequencing, Easton theorizes that the first major operational phase of a Taiwan invasion would consist of blockade and bombing operations, followed by amphibious landing operations.[20] He states that PLA writings focus on the use of sea mines in blockade operations, with multiple layers of drifting, bottom, and moored mines delivered by submarines, bombers, and surface minelayers at the initiation of a conflict. The PLA's objective would be to reduce Taiwan's shipping capacity as part of a multilayered quarantine to prevent resupply of the island.[21] After blockading mines are laid, Chinese doctrine calls for close surveillance of mined areas, with forces tasked—if necessary—to "wipe out" minesweeping forces to safeguard the integrity of the mine blockade, as well as to conduct replenishment minelaying swiftly if necessary.[22]

Erickson, Goldstein, and Murray wrote in 2009 that the Chinese National Defense University's *Campaign Theory Study Guide* also advocates

deployment of mines from both submarines and aircraft as part of a blockade campaign against Taiwan, and that other Chinese writers have suggested laying mines along the first island chain to prevent the entry of U.S. nuclear submarines into the "near seas" proximate to China (the Yellow Sea, East China Sea, and South China Sea). They indicate that Chinese writings tend to focus on thirteen particular characteristics of MIW, including the following observations:[23]

- MIW development attracts relatively little attention from outsiders (one need only consider the relative oceans of ink spent writing about China's "carrier-killer" ballistic missiles).
- Mines may have strategic effects well beyond any actual combat losses they inflict (the mere suspicion that they might be present may suffice to shut down a port until proved otherwise).
- There is a strong tendency to discuss preemptive offensive use of mines to give the advantage of surprise.
- Chinese analysts focus on civil-military integration in MIW (well predating recent Western analytical focus on China's military-civil fusion concept).
- Antisubmarine-warfare (ASW) mines, properly placed in "antisubmarine mine zones," might provide mitigation for the PLAN's relatively modest ASW capabilities against U.S. nuclear submarines (although these have improved in recent years, at least for China's surface combatants).
- Satellite navigation systems may enhance the effectiveness and precision of minelaying operations significantly, as well as augment the ability to transmit the locations of minefields to friendly forces (see the recent completion by China of its own satellite navigation constellation, BeiDou).[24]

Following the establishment of a blockade of Taiwan, as cross-strait landing operations proceeded, China's MCM operations would come to the fore, with minesweepers leading the way to "clear disembarkation zones free of sea mines before the transport ships arrived to drop anchor."[25] These advance minesweeping activities also would include clearing "maneuver zones for the firepower support ships" and, if necessary, would involve covering forces to interdict enemy antiminesweeping forces and coastal-defense systems. If required, air and naval units would be tasked with striking enemy minelaying forces and would provide surveillance to ensure that cleared areas remained free of mines.[26]

In a manner quite different from how MIW normally is conceived of by U.S. and allied navies, Chinese operational doctrine calls for the use of

offensive MIW as a key operational method for gaining sea control, particularly in the "near seas." By blockading enemy ports and naval bases using a combination of maritime-strike aircraft, submarines, missile units, and minefields placed along key egress routes, China could avoid enemy "operational strengths on the sea from unfolding" and prevent their full capabilities from being brought into action.[27] If enemy naval units do manage to get to sea, Chinese doctrine also calls for *responsive* offensive mining—conducting mobile minelaying along apparent routes of travel, "so as to impede or destroy an enemy ship formation as it sails, to delay the enemy ship formation's activity, and to create favorable conditions" for follow-on strikes.[28]

China's strategic appreciation for MIW seems to be derived from observations of the outsize effects that MIW had in some of the conflicts that Chinese thinkers have studied keenly, such as the Korean War and the U.S.-led Desert Storm campaign against Iraq.[29] In both of those conflicts, MIW efforts caused outsize effects on U.S. and allied naval forces, with numerous ships damaged or sunk, and effectively neutered planned amphibious efforts at Wonsan (in Korea) and Kuwait.

U.S. Mine Warfare: Contrasting Priorities

When compared with the clear importance that MIW has in Chinese strategic thought, the relative unimportance of it in U.S. strategy and doctrine becomes readily apparent. As a specific data point, while the recently released U.S. triservice maritime strategy does mention improving U.S. undersea mine-warfare capabilities, the only other mention of mine warfare in the document is its classification as a "specialty capability"—one to be undertaken largely by allies and partners.[30] Although details of the Navy's distributed maritime operations concept remain classified, open discussion of it has involved very little discussion of MIW. The topic is similarly absent from discussions of the higher-level joint concept for access and maneuver in the global commons (known as JAM-GC). The U.S. Marine Corps Commandant's planning guidance does call for improvements to MCM capabilities but says little else about U.S. MIW efforts.

But regardless of what U.S. strategic documents say, what President Joseph R. Biden once stated—"Don't tell me what you value[;] show me your budget, and I'll tell you what you value"—remains valid. Along these lines, a detailed review of fiscal year 2021 USN budget documents indicates that, despite multiple programs touted publicly as significant improvements to U.S. MIW capabilities, the sum of spending on development and fielding of MIW programs constitutes less than 1 percent of all Navy and Marine

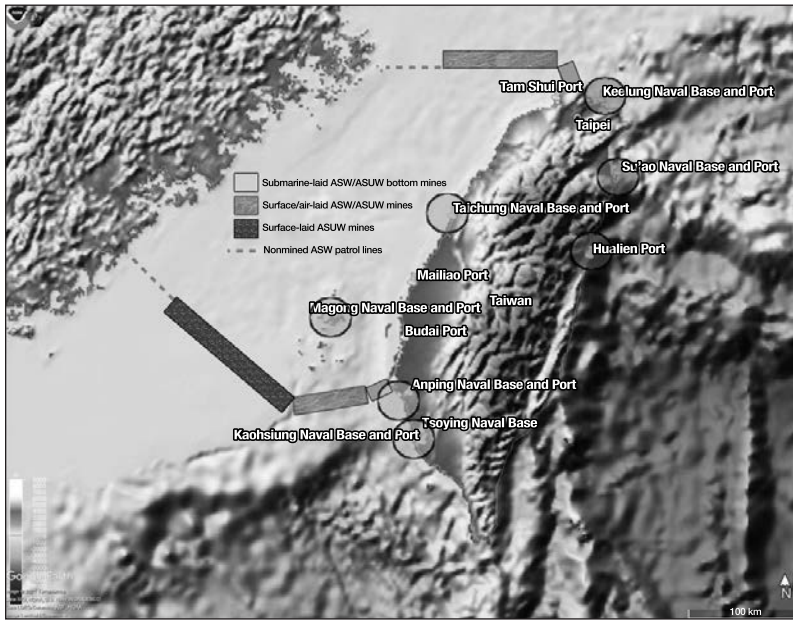
Corps spending on research and development (R&D) and procurement. Further back, in fiscal year 2020, $71 million of R&D funding for Quickstrike joint direct attack munition / extended range aerial mine variants ended up on the Navy's unfunded priorities list, although Congress did add $27.5 million on its own initiative to help push development forward.[31] Put simply, when one wonders about the fairly limited U.S. MIW capabilities described above, it is clear that the country is essentially getting what it has paid for.

PRC Execution of Mine Warfare in a Taiwan Invasion Scenario

Given the fielded MIW forces of the potential participants in a cross-strait conflict and the available information about the PLAN's MIW doctrine, how might China employ sea mines in a Taiwan invasion? For the specifics of the scenario, this analysis assumes a time frame within the next five years or so and the involvement of the United States and Japan as cobelligerents assisting in the defense of Taiwan, the United States in a comprehensive manner and Japan in a largely supporting and defensive role. This analysis also assumes that China launches the assault from an exercise posture, with a limited degree of warning, and that weapons development and fielding plans continue at their current pace and trajectory until then.

Exhibit 1, overlaid on a bathymetric representation of the region, shows a potential distribution of PRC mines in and around the Taiwan Strait. These minefields would be laid with the objectives described above in China's MIW doctrine: to isolate the Taiwan Strait from U.S. and allied forces (especially U.S. submarines); to trap Taiwan's navy within its own ports; and to blockade Taiwanese ports to pressure the populace, prevent resupply and reinforcement by allied heavy forces, and isolate Taiwan's economy. China could deploy sea mines overtly in its territorial sea and international waters before hostilities commence, but it could mine Taiwanese territorial waters either clandestinely or after hostilities commence. Along the southern entrance to the Taiwan Strait, PLAN submarines clandestinely could lay dual-capable ASW / anti–surface ship bottom mines within Taiwan's territorial waters, turning them on by remote control at the beginning of the invasion. Further west, outside Taiwanese waters but still in water deep enough for effective submarine operations, Chinese air and surface forces (including the maritime militia) could lay dual-capable bottom mines in a belt leading seaward during the days leading up to conflict. Even farther to the west, in areas too shallow for effective submarine operations, Chinese surface vessels (military and civilian) could lay another belt of

Exhibit 1. Bathymetry and Notional PRC Minefields in Vicinity of Taiwan



Notes: ASUW = antisurface warfare; ASW = antisubmarine warfare.

simpler antisurface bottom and moored mines, thereby declaring associated exclusion zones and driving traffic toward controlled, nonmined patrol zones closer to the Chinese coast. Similar minefields could be laid along the northern entrance to the strait to seal off PLA operating areas from both axes of potential approach. With traffic channeled into smaller zones closer to China's coast, focused patrol lines could be established in nonmined areas to attempt to prevent the entry of U.S. and allied submarines and warships into the strait.

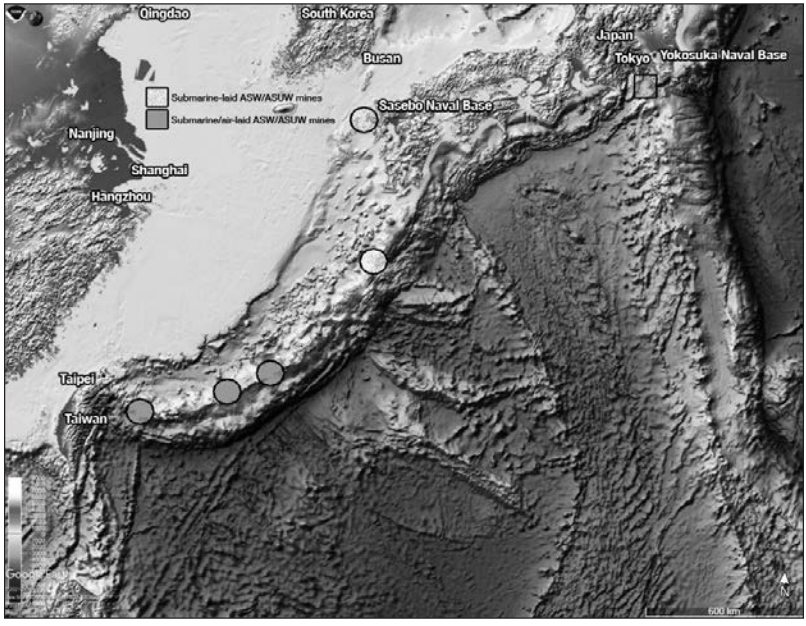
As suggested by Chinese doctrine, the PLAN could lay down layered minefields around Taiwan's major naval and commercial ports along both the east and west coasts. Submarine-laid remote-controlled mines would be first to be placed within Taiwan's territorial waters, and especially in the small minable zones along the steep drop-off on Taiwan's east coast. Since maritime militia mining operations would be more difficult along Taiwan's east coast, in that area a greater emphasis probably would be placed on aerial delivery or delivery by larger civilian vessels, whether surreptitiously or otherwise.

On the Taiwanese side, with a crisis looming one could expect Taiwan to attempt to lay mines within its territorial waters in the approaches to the most likely invasion beaches on the country's west coast. One also could

assume that efforts to lay mines in international waters likely would face stiff opposition and harassment from Chinese surface forces, the China Coast Guard (the world's largest such organization), and other government and maritime militia vessels. In the days leading up to an invasion attempt, China likely would engage in an aggressive, whole-of-society effort to keep the strait clear of anyone else's mines and open for its own transport vessels.

Exhibit 2 depicts minefields that the PLA might deploy farther afield in the region, with the objective of containing U.S. and some allied warships in port or blocking their return to port for rearming, resupply, or repair. Minefields sown before the conflict among the Japanese islands would need to be laid by submarines, with replenishment after conflict initiation conducted by sorties of minelaying aircraft in those areas that might be accessible to them. While the gaps along the Ryukyu Islands are likely to be too large to deny passage completely into the East China Sea, enough mines could be laid along the Ryukyus to at least slow and instill caution in U.S. and allied vessels planning to reposition through the various straits along the island chain. Finally, if the PLA's leaders were willing to be more aggressive in attempting to force Japan to stay neutral or to withhold support for U.S. operations from Japanese territory, the PLAN could attempt to use submarines or aircraft (or even clandestine merchant ships) to mine

Exhibit 2. Notional PRC Minefields along the First Island Chain



Notes: ASUW = antisurface warfare; ASW = antisubmarine warfare.

the approaches to Japan's major ports, attempting to use the leverage of a mine blockade of Japan's trade to extort acquiescence to PRC aggression against Taiwan.

Assessment and Asymmetries

In 2009, Erickson, Goldstein, and Murray stated, "At present, the prospects for American MCM forces rapidly countering Chinese MIW are not promising."[32] Similarly, in 2012 Scott Truver assessed that the "U.S. Navy and its allied and partner nations are ill prepared to cope with Chinese mine warfare strategies and operations," and that the "U.S. Navy is significantly hamstrung in types and numbers of mines and in its ability to deploy them in the Near Seas."[33] In the decade or so since these gloomy assessments were shared, the situation hardly has improved. Rather than evening up the balance by deploying flexible and modular capabilities at scale, the U.S. MCM transition process has been mired in developmental delays for years and tied to a now-doomed LCS program. (Although, given that the MCM module now is advertised as usable by "vessels of opportunity," one wonders why it was associated so closely and for so long with a vessel that made many compromises in the interest of high speed and low observability—which apparently are unnecessary to execute the mission.) Owing to slow development and inconsistent funding, the U.S. Navy is still years away from a current-production, offensive, advanced mine that could be delivered effectively in contested areas.

Perhaps more importantly than these programmatic challenges, the larger context within which both sides' MIW forces would attempt to conduct their missions has become highly asymmetric—and dramatically for the worse for Taiwanese, U.S., and allied and partner forces in the vicinity of Taiwan. In 2009, China's antiship ballistic missiles were merely a rumor, rather than now apparently being a fully tested weapon system that can be deployed by the hundreds. Most of China's surface ships then were crude and obsolescent types rather than the highly modern and capable frigates, destroyers, and cruisers that Chinese shipyards have churned out in recent years. A decade ago, China seemed unlikely to be able to gain the air dominance over the Taiwan Strait that it would need for its MIW forces to operate effectively and to deny the forces of Taiwan and its allies; this no longer seems to be the case, given China's much more modern air forces, as well as the punishment that missile/rocket forces might be able to deliver to allied airfields across the region. In short, the extensive counterintervention

investments that China has made in recent years seem likely to provide the umbrella that China's MIW forces would need to operate effectively, and these measures may be able to suppress or hold at arm's length those of Taiwan and its partners—making an already challenging task nearly impossible. China's unique and ever-more-capable maritime militia tips the scales further, providing huge numbers of potential minelayers as well as covering forces to harass and interfere with allied MIW forces in the run-up to a conflict.

There are few mysteries in understanding why U.S. MIW capabilities remain marginal at this point—and there are no "magic beans" available to improve them significantly without commensurate investment. In reality, suggestions and opportunities abound for how to improve U.S. and allied MIW capabilities and use them to greater effect; however, without more focus on this crucial warfare area, as well as increased and consistent funding, these ideas are unlikely to move the needle on U.S. capabilities.

In the absence of such significant changes in the capability of fielded U.S. MCM forces, Taiwan and U.S. allies probably should focus on building additional national resilience, stockpiling critical supplies, and preparing their populaces for the significant disruptions that would come with an effective Chinese mine blockade. U.S. and allied navies also should steel themselves for the damage and losses they may endure when operating in the face of an aggressive Chinese mining campaign. If they are unwilling to take such losses, they should be ready to press U.S. national leadership to lean forward aggressively in the run-up to a crisis, taking the risks necessary to deny China's MIW forces the opportunity to deploy their weapons and seize the initiative. If that, too, is infeasible, then they should be ready to accomplish their missions from a distance—largely ceding the "near seas" to PRC control—and prepare for a denial of access to their own main operating bases and major ports.

In any case, defense thinkers and practitioners should understand that the potency of mine warfare has increased dramatically in recent decades with the use of smarter mines that are much harder to fool, to find, and to remove. As the focus of national-security attention swings to great-power competition—and at that, in a theater dominated by the maritime domain, inhabited by allied nations that are dependent on seaborne trade, and with an adversary who appears to appreciate all this fully—the United States should pay greater attention to this venerable and often underappreciated means of conducting naval warfare.

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PART IV

Scenario Factors

John K. Culver

12. Battlespace Preparation for "Unification" in China's Unfinished Civil War

Recent U.S. assessments of potential China-Taiwan conflict (and U.S. military intervention) frame China's military modernization as newly threatening and destabilizing, and somehow morally intolerable.[1] Such U.S. assessments also tend to focus almost exclusively on military aspects, ignoring the significant "gray zone" and nonmilitary aspects that China's own recent actions in the South China Sea (SCS) have demonstrated. China's ongoing strategic campaign to prepare the ground for unification with Taiwan challenges typical warning paradigms, which define monitoring and response criteria for employment of military forces that assume that the starting condition is "peacetime." Decades ago, the Chinese Communist Party (CCP) decided to employ all means of state power, consistent with other strategic goals, to achieve unification with Taiwan.

For the CCP, the Chinese Civil War never ended, and the party cannot claim credit for ending the "century of humiliation" and "reunifying" the motherland until it is resolved. For China, battlespace preparation for a conflict with and over Taiwan covers many nonmilitary domains, owing to the shadow nature of its largely nonmilitary contest along the Taiwan Strait for the last seventy years. Over decades of relative peace and a massive expansion of economic, tourist, and people-to-people ties between Taiwan and the mainland, the CCP has continued the civil war. Throughout this

period, China has been conducting a "whole of regime" strategy for reunification that has remained at low-to-moderate intensity, while employing nonmilitary means because successive administrations on Taiwan, and in the United States, have not pressed the issue of Taiwan's status. Now, both Taipei and Washington seem to be pressing it, especially the administration in Washington.

China has a political strategy for unification, which has a military component. However, much U.S. analysis reverses this and frames China's options as absolute peace or war, and if war, the only military option the analysis considers is invasion.[2] This is a dangerous oversimplification. For China, the first and most important goal would not be to win quickly in a conventional military sense. Instead, the goal would be not to lose while China sets the conditions for eventual victory—a victory that the CCP will frame in political rather than strictly military terms. The CCP probably could afford to continue to be patient as it executes a series of strategic campaigns. It could be prepared for this kind of war to last for months, perhaps years, even for a decade if necessary.

Analysis of China's recent actions as indications of a more intensive—even decisive—phase of operations requires an approach tailored to these unique characteristics. The most recent and useful paradigm might be China's successful strategy to change the status quo permanently in the SCS since 2013—without firing a shot. China is applying its whole-of-regime capabilities to its "unended" civil war, which likely means that classic military warning indicators only will come late in a dangerous scenario—one in which the CCP no longer seeks to preserve the status quo and instead has made the strategic decision to pursue the conditions for reunification actively.

Correctly Framing China's View of the "Taiwan Issue"

The CCP's war with the Kuomintang (KMT, or Nationalist Party of the Republic of China) started in China in the 1920s, paused during the decade of anti-Japanese war and the Second World War, then culminated in the immediate postwar period with the CCP's victory and the remnants of the KMT fleeing to Formosa/Taiwan in 1949. For the CCP, the Chinese Civil War just shifted means, modes, and tempo and has continued to the present.

For many modern-day citizens of Taiwan, China's civil war means little. It was fought in the past by two groups of Chinese citizens on the mainland, one of which subsequently occupied the island of Formosa (Taiwan)

by force, secured its control with the massacre of 28 February 1947, and instituted a dictatorship that ruled under martial law until 1987. From this perspective, the civil war effectively ended with the death of Generalissimo Chiang Kai-shek in 1975 or with the end of KMT dictatorship in the early 1990s, when Taiwan held its first democratic elections.

From Beijing's perspective, Washington has been enmeshed in this ongoing civil war almost since the conflict's inception, through both acts and decisions not to act. The U.S. government has played a decisive role at nearly every juncture, even while professing an official position of not taking a position, other than that the two sides should work to resolve the issue peacefully. The U.S. decision not to support unpopular, deeply corrupt KMT leader Chiang Kai-shek—a Second World War ally—in his fight on the mainland hastened the CCP's victory there, but that only marked the beginning of the next phase of the Chinese Civil War.

The deployment of the U.S. Navy's Seventh Fleet to the Taiwan Strait in 1950 after the start of the Korean War effectively checked any plans China had to mount an invasion.[3] Taiwan remained a military dictatorship until 1987, when Chiang's son, Chiang Ching-kuo, lifted martial law and began the transition to vibrant, tech-led economic growth and popular elections to strengthen the island's attractiveness to nonautocrats and to counter Taiwan's growing isolation.[4] Even then, the official policy of the Republic of China (ROC) on Taiwan was to realize its goal of reunification under the KMT, not independence from China.[5]

At the height of U.S.-ROC relations, prior to President Richard M. Nixon's 1972 visit to China, the United States maintained a mutual defense treaty with the ROC. The United States stationed troops on Taiwan, kept nuclear weapons there, and sent U.S. combat troops fighting in Vietnam to Taiwan for rest and recuperation. On Henry A. Kissinger's first, secret visit to negotiate Nixon's trip to China, a key Chinese requirement was U.S. agreement to remove American nuclear weapons from Taiwan.[6] Taiwan consequently would launch the first of its repeated efforts to develop its own nuclear weapons—all uncovered and stopped by the U.S. government and the international community.[7]

Over the past several decades, in part because of the U.S. commitment neither to support Taiwan's independence nor to abandon its former ally, China shifted priorities for its war with Taiwan to building cross-strait trade; establishing economic, transportation, and "people to people" links; and strengthening the basis for stable U.S.-China relations. When tensions flared and China staged military demonstrations, its goal was to maintain this status quo. In many instances, the principal goal of the CCP threats

and military demonstrations during periods of tension (typically around a Taiwan election cycle) was to pressure the United States to constrain Taiwan rather than to act directly on Taiwan itself. And the United States frequently performed this role through, for example, public comments by presidents or senior U.S. officials that were critical of the candidate of the Democratic Progressive Party (DPP)—the party typically regarded as most sympathetic to Taiwan's independence.[8]

The primary political goal of the CCP's Taiwan policy since roughly 1979 has been to preserve the possibility of political unification at some undefined point in the future, while Beijing pursued economic reform and opening. Tellingly, China's 2005 law laying a foundation for the use of force is an "anti-secession" law, not a "unification law"—a distinction that was debated actively for the two years prior to its passage.[9]

Furthermore, since Washington switched its diplomatic recognition from the government of Taipei to that of Beijing, Taiwan has emerged as a vibrant democracy, and polling indicates that most Taiwanese do not feel very threatened; there exists little domestic pressure to increase military spending massively or return to lengthy universal conscription.[10] Most people on Taiwan are not worried about imminent attack, because forty years since U.S. derecognition of the ROC have passed without war, and because some think that Taiwan could not prevail without massive U.S. military intervention, so there is little point in building up Taiwan's own military. The Taiwanese public also continues to mistrust its military as an institution because of the ROC military's origins as a pro-KMT, mainlander-dominated stronghold.[11]

Characteristics of a Militarized "War of National Reunification"

As mentioned, over decades of relative peace and a massive expansion of economic, tourist, and people-to-people ties between Taiwan and the mainland, the CCP has continued the civil war. China has been conducting a whole-of-regime strategy for reunification that has remained at low-to-moderate intensity, while employing nonmilitary means because successive administrations on Taiwan and in the United States have not pressed the issue. China has been able to sustain its immediate goal of preventing Taiwan's independence and preserving the possibility of political compromise under a framework that it still can call "unification." Beijing determinedly has built China's composite national power and controlled the risk of war through deep economic integration with Taiwan, the United States, and the international system.

Many of the understandings, military factors, and ambiguous positions that enabled decades of peace, prosperity, and democracy on Taiwan now are eroding. This erosion is caused by China's expanding economic and military power, Taiwan's consolidating democracy led by the proautonomy DPP, and burgeoning U.S. determination to exploit the issue for leverage (i.e., play the "Taiwan card") in its strategic rivalry with China.[12] The more destabilizing factors driving the dynamic include the following three items.

The first factor is Taiwan's domestic political and identity development; even the KMT is unlikely to sustain its prior position on the "1992 consensus."[13] To avoid political oblivion, the KMT continues to transition into a fully Taiwan-centric party that must appeal to domestic sentiment, which is turning even more strongly against any form of unification under any timeline.

Second, there is the emergence of full-blown U.S.-China strategic rivalry, which increases Taiwan's attraction to both major U.S. political parties as a litmus test of "standing up to China." Contrary to the myth that the main constraint against Taiwan's independence has been the threat of Chinese military action, at least since the mid-1990s the main constraint has been pressure on Taipei by Washington. U.S. policies and actions have demonstrated this influence over the course of the proindependence (DPP) Chen Shui-bian administration (2000–2008) and the prointegration (KMT) Ma Ying-jeou administration (2008–16), which in 2015 culminated in the first meeting between the respective leaders of the CCP and the KMT since 1945.[14] The United States seems more incentivized today than at any time since 1979 to play the Taiwan card because of great-power competition, rather than because of actions by an explicitly proindependence leader in Taipei (which the president at the time of this writing, Tsai Ing-wen, is not).

The third, and perhaps most important, factor is China's own emergence as a great power with clear military dominance vis-à-vis Taiwan and seeming near parity versus the United States. The CCP no longer has the excuse of not acting violently because it is "weak," as it did after the 2001 collision near Hainan Island between a Chinese fighter aircraft and a U.S. reconnaissance airplane, or after the United States accidentally bombed the Chinese embassy in Belgrade in 1999. Chinese domestic public opinion has grown more nationalistic, reflecting Beijing's portrayal of its relative governance success compared with Washington's throughout decades of economic expansion and, more recently, the trade war and the pandemic—all of which were claimed to be Chinese achievements.[15] Yet there is little evidence that China seeks to tap this nationalism to support harsher policies toward Taiwan. Instead, the more typical case is that the CCP uses

its information and propaganda apparatus to keep public opinion docile, to block and remove inflammatory messages/memes, and to prevent major demonstrations.[16] For the CCP, the Taiwan issue traditionally has been fraught with risks, not opportunities.

As previously stated, China has a political strategy for unification, which has a military component. Much U.S. analysis reverses this and frames China's options as absolute peace or war. If war, this analysis assumes, the only possibility is invasion.[17] This is a dangerous oversimplification, both of the nature of the China-Taiwan issue and its history, and of the means, modes, and timelines of potential Chinese multidomain operations if and when Beijing acts to compel unification within a finite time frame. Such analysis also frequently frames U.S. obligations—under the Taiwan Relations Act, President Ronald W. Reagan's "six assurances," and other moral or quasi-legal imperatives—to defend Taiwan without mentioning Taiwan's defense of itself very much. The following is a recent example of this view from Elbridge Colby and Jim Mitre:

> Moreover, China has built a military specifically to force unification. Beijing's most attractive military strategy to cleanly and resolutely settle the issue would likely be an invasion, and blunting such an assault should be the United States' top priority for defending Taiwan. At the same time, the Pentagon also needs to be prepared to relieve Taiwan if China chooses a more indirect strategy, such as a blockade and/or bombardment of the island to try to coerce it into surrender.[18]

Colby and Mitre's first assertion gives insufficient credit to the transformation of the People's Liberation Army (PLA) over many decades, and especially the 2010s, not only for Taiwan contingencies but also to be the armed force of a great power with global interests. Much of what China's defense industry has built and is building, including its large new classes of amphibious-assault ships and aircraft carriers, could have less to do with Taiwan and more to do with the SCS and missions beyond East Asia, including noncombatant evacuation operations and noncombatant protection missions, and potential armed conflict in the Indian Ocean. In the event of war with the United States over Taiwan, these platforms still would be crucial, given the PLA's lack of amphibious lift, yet insufficient, unless Chinese forces gain the full air, sea, and undersea superiority necessary to sustain major amphibious operations. As conservative war planners, PLA leaders likely assume that the United States would intervene with major military force. As a result, amphibious operations across the Taiwan Strait

would be high-attrition warfare that would put at risk large, expensive naval platforms, which are also big, high-value targets.

With regard to amphibious lift, at least, what China has *not* done may be more interesting than what it has. So far, it has not built the large numbers of tank landing ships and medium landing ships that would enable an invasion of Taiwan; actually, its inventory of those more necessary and expendable vessels is smaller than it was a decade ago, according to the U.S. Department of Defense reports to Congress on the Chinese military, published annually since 2009.[19]

As former senior defense intelligence official Lonnie Henley informed the U.S.-China Commission under the heading "A Failed Landing Would Not End the War" in written testimony in February 2021:

> If ordered to compel reunification by military force, the PLA would bring every tool to bear. Among its most effective lines of operations would be a long-term air, maritime, and information blockade of Taiwan. *Such a blockade could be the main effort, eschewing an attempted landing altogether, or it could be part of a larger invasion campaign.* Most importantly, even if the landing failed, the PLA could continue the blockade indefinitely and neither US nor Taiwan forces would have much ability to overcome it.[20]

Moreover, should military conflict come to the Taiwan Strait in the next few years, the past will not serve as prologue for China's modes, means, and goals. The unfinished Chinese Civil War will reemerge as more than a military contest. And it is likely that from the moment the shooting starts the contest will cease to be solely the unfinished Chinese Civil War; rather, it will become the China-U.S. war. Taiwan would be the first battlefield of intensive combat operations between the world's two most powerful military forces in a war that quickly would become about much more than Taiwan's autonomy and prosperity or the lives of its twenty-four million people.

For the CCP, such a conflict would be about its legitimacy and survival and the return of China as the dominant power in East Asia. Failing to fight over Taiwan probably would not be an option for the CCP; indeed, China seems convinced that it has an asymmetrical interest in the outcome, compared with the United States.

For Washington, it would present a Hobson's choice: intervene in open-ended, financially ruinous conflict with another nuclear power for the first time and risk unprecedented combat losses, or be perceived as standing aside to allow an assault on a vibrant democracy and its

twenty-four million citizens. U.S. allies and partners will be torn by the cost of picking the U.S. side versus the potential ramifications of not countering Chinese aggression.

In a crisis to compel unification, the scope and intensity of China's means, modes, and measures could increase exponentially. China probably does not need to invade the island quickly and, if successful in doing so (by no means assured), then to fight a ruinous counterinsurgency for decades. As mentioned above, for China, the first and most important goal would not be to win quickly in a conventional military sense. Instead, it would be not to lose while it sets the conditions for eventual victory—a victory that the CCP will frame in political rather than strictly military terms.

The CCP probably could afford to continue to be patient as it executes a series of strategic campaigns. It could be prepared for this war to last for months, years, even a decade if necessary. In its potential long-term nature, it would be analogous to other struggles for national unification—those in Vietnam, Korea, Germany, and even the U.S. Civil War.

If the Chinese Civil War becomes a kinetic conflict, the key distinction that China will make is that East Asia is in a condition of "not peace," along with all the economic and security ramifications of that new reality. The region that has driven global economic growth for the past several decades would become a war zone—breaking global supply chains, transportation links, and financial systems.

China will insist that other countries not provide the U.S. military with access to bases, waters, and airspace, or they will risk becoming targets for multiple domains of Chinese aggression. Rather than being the "security guarantor of the Western Pacific," China will seek to portray the United States as the "insecurity guarantor" that disrupts the region's (and the world's) trade, prosperity, and peace, thereby creating doubt and gaps between the United States and its allies and partners.

For China, its adversaries' center of gravity is not purely their military capacity to blunt an invasion. Instead, it is the will of the Taiwanese people and military to fight, and the will and capacity of the United States to intervene decisively and maintain a posture to do so for a long time. Military operations almost certainly would not be binary—bluster or invade—but rather would cover a wide spectrum that could be intensified or reduced at China's choosing.

Early in a conflict, China could use long-range strikes to destroy all Taiwan's key military and leadership facilities, power generation, and telecommunications. It probably could embargo all Taiwan's oil imports and use cyberattacks to cut or compromise much of the island's high-bandwidth connectivity to the outside world, and may be able to sustain

this activity indefinitely. It can seize all Taiwan-held offshore islands, including the Penghus and Pratas. China then could proceed to use these as mobilization and embarkation bases for future landing operations on Taiwan and as choke points against U.S. intervention, while burnishing nationalist domestic support early in the conflict.

And perhaps most importantly, China can seek the right time and conditions to demonstrate to the people of Taiwan—and Japan, Australia, and the United States—that the U.S. military cannot prevent or undo Beijing's actions, and either will not put its major military assets into harm's way or, having done so, will suffer surprising and politically devastating losses. Beijing would strive to portray the U.S. position as analogous to victoryless wars in Vietnam, Iraq, and Afghanistan—albeit at far higher potential human and financial costs for Washington and its allies.

In such a scenario, the CCP would need an end to the Chinese Civil War on terms that it can call *unification*. Its best outcome would be one negotiated by Taiwan's political authorities that cannot be negated by U.S. military, economic, or diplomatic action. While Washington focuses on ensuring that it can respond to a Chinese invasion of Taiwan, it also should consider that Beijing may conclude that the most effective way to achieve a negotiated outcome is to deter or defeat the U.S. military as a primary line of operations rather than invade Taiwan. Next, China could take advantage of the psychological impact on Taiwan to press for negotiations or wear down the population's will to resist through prolonged air and sea blockade.

Chinese Preparation for Multiple Battlefields

China's continuing strategic campaign to establish conditions for Taiwan's unification with the mainland challenges typical warning paradigms, which set monitoring and response criteria for employment of military forces and assume that the starting condition is peacetime. The CCP made a decision decades ago to employ all forms of state power, as long as doing so did not conflict with other strategic goals. The military forces required to execute major phases of such a campaign are already largely in place in eastern China. During previous periods of cross-strait military tension in the 1990s and early years of the following decade, a key warning indicator was the movement of the PLA's most modern aircraft, submarines, and surface-to-air missiles (SAMs) into areas opposite Taiwan. Today, almost all the essential forces are in place, yet many disagree that China intends to attack Taiwan in the near future.

The past two decades also have brought intensive economic integration between Taiwan and China (and Hong Kong). Trade continues to grow, having reached the highest point since economic relations resumed. According to a recent Brookings Institute report, "China and Hong Kong combined now represent 34% of Taiwan's overall trade, compared with 13% with the United States and 11% with Japan. Despite [the incentives of Taipei's Look South policy], the Association of Southeast Asian Nations' (ASEAN) share of Taiwan's total trade volume has actually dropped from 16% in 2017 to 14% [in 2020]."[21] The CCP long had calculated that China's intensive economic integration would improve sentiments on Taiwan for closer political alignment with China, but polling indicates that Beijing's heavy-handed actions in Xinjiang and especially in Hong Kong and incidents of targeted economic pressure on Taiwan have blunted any such warming.[22]

China also gains advantage owing to common language, extensive family and commercial ties, and broad and deep United Front operations targeting Taiwan. Chinese media entities have expanded ownership of Taiwan's media outlets; actions have included state-run, Beijing-based media allegedly paying for placement of articles in the run-up to Taiwan's 2020 presidential elections.[23]

Unsurprisingly, Taiwan is a major target of all Chinese intelligence organizations. This targeting raises U.S. concerns about transfers of sensitive intelligence and military systems, which could be heightened in wartime when closer U.S.-Taiwan cooperation would be crucial.[24] As Peter Mattis, a leading U.S. expert on Chinese intelligence operations, has noted, "While Taiwan faces an espionage and subversion challenge from China at a scale that no modern democracy has faced, its leading political parties struggle to address the problem. . . . The stakes are not trivial spy-vs-spy games but the integrity of Taiwan's democracy, and the weakness is every bit as crippling as an ill-equipped or poorly-prepared military."[25]

In summary, a CCP political decision to shift goals—from preventing Taiwan's independence to compelling an outcome it can claim represents the decades-old dream of unification—would not take place in a vacuum. In a very real sense, China has been "preparing the battlefield" for decades, and it continues every day to do so via diverse modes and means. This preparation includes the increase of violations of Taiwan's air-defense identification zone (ADIZ)—but not Taiwan's territorial airspace—and the buildup of overwhelming military capability.[26] China also has been attempting actively to influence Taiwan's past two elections; despite the

debatable results, it is likely to ramp up unprecedented efforts for Taiwan's 2024 presidential contest.[27]

Beijing's South China Sea Model

Analysis of China's behavior for indications of a more intensive phase of operations requires an approach suited to these particular characteristics. The most recent and useful paradigm might be China's successful strategy to alter the status quo in the SCS without the use of armed force. Since 2013, China substantially has advanced its goal of gaining "effective control" not only over its seven expanded, militarized outposts but also potentially over the entire area.[28] Sometimes called *gray-zone warfare,* Beijing's tactics might better be termed "finding the seams, staying below threshold for conflict."

Active occupation and disputation of maritime claims among multiple claimants over the Spratly Islands and other features in the SCS mostly date from the 1970s, but there are aspects that make China's actions there highly relevant for Taiwan. These include the following preferred set of tools.

Lawfare Using Domestic Law

In both Taiwan and the SCS, the CCP has worked diligently to "create a veneer of legal legitimacy for its position."[29] The moral authority Beijing asserts is an important aspect of domestic messaging, and it could be used to frame a casus belli should events require it. In both the Taiwan and SCS cases, China appeals to history as its core legal justification, especially to the predations of outside powers during the "century of humiliation."

The CCP exerts significant effort to lay down legal argumentation for its policies and to employ "lawfare" as part of its tool kit. This effort has expanded significantly domestic Chinese statutes on "anti-secession," maritime law, and related national-security and sovereignty matters over the past two decades.[30]

Preponderant Military Forces, with Maritime Law Enforcement Out Front

China has built up overwhelming military capacity opposite Taiwan and at its massively expanded outposts in the Spratly and Paracel Islands. Prior to its island building and militarization in the SCS, the large and modern China Coast Guard, Maritime Safety Administration, and maritime

militia carried out both China's more routine and its sometimes aggressive actions, which enabled it to be assertive while staying below the threshold of direct military confrontation.

The 2012 confrontation between China Marine Surveillance and the Philippine navy at Scarborough Shoal, which resulted in a permanent Chinese law-enforcement presence there, which likely validated this model. China since has applied the model to many other situations.

Economic Leverage

China is a major trading partner of all the other claimants to the Spratly Islands: Vietnam, the Philippines, Malaysia, Brunei, and Taiwan. As with Taiwan, China has used targeted, temporary economic punishment to show displeasure toward other claimants and to demonstrate the costs of aggressive resistance to Beijing's preferences.

Diplomatic Isolation and Disunity

China works diligently to prevent unity among the other claimants or within the broader international community—especially ASEAN. This approach is similar to its efforts during the administration of President Tsai to isolate Taiwan further internationally. China's approach to asserting its territorial claims in the SCS includes the following elements.

Ensure National Unity to Defend China's Claims

Well before China commenced island building, dating to the 2009 deadline for submissions to the United Nations Commission on the Limits of the Continental Shelf, China sought to strengthen its relatively weak legal claims by publishing and popularizing a body of supporting evidence and pseudolegal papers.[31] These efforts reinforced in the minds of the Chinese public—and some external audiences—the legitimacy of China's claims and its subsequent actions.

When the United Nations Convention on the Law of the Sea (UNCLOS) arbitral tribunal ruled strongly in favor of the Philippines in 2016, China took all available steps to inoculate its citizens against this outcome. It refused to participate in the arbitration and organized significant foreign lobbying to support China's position. When the new Rodrigo Duterte regime in the Philippines failed to build on the favorable decision, China claimed some measure of vindication.[32]

Start Slowly, and Move Forward If No Major Resistance Is Encountered

When China began land reclamation in the Spratly Islands in late 2013 or early 2014, it started dredging and island building at what would be the

smallest of its seven expanded occupied features, and this action drew little international attention.[33] It had done similar—but less extensive—island building in the Paracels (islands also claimed by Vietnam) during the previous decade and received little international criticism, even after it permanently stationed fighter aircraft, SAMs, and antiship missile launchers there. It was not until mid-2014, when China commenced massive operations at Fiery Cross Reef using dozens of high-capacity cutter suction dredgers, that Western analysts realized that the planned expansion would be sufficient to have a full-length military runway of more than three thousand meters, and significant port and military capacity. International interest mounted, but Beijing apparently did not perceive sufficient reason to curtail its activities, and it started equally massive expansions of Subi and Mischief Reefs soon thereafter. Between 2013 and 2016, China went from being the only major claimant without an airfield in the Spratlys to having three major military airfields there, each capable of operating any aircraft in the PLA's inventory.

Divide Opponents; Isolate Weak Ones

China used its economic and diplomatic weight to prevent ASEAN unity and exploited the organization's general reluctance to involve itself in security issues and territorial disputes unsuited to its consensus-based model and economic focus. In 2012, Beijing effectively embargoed imports of Philippine bananas owing to the confrontation over Scarborough Shoal, foreshadowing its "pineapple war" with Taipei.[34] China later sought to isolate the Philippines when the latter brought its dispute to the UNCLOS arbitral tribunal in 2013. The election of President Duterte in 2016—shortly before Manila won the dispute at the UNCLOS arbitration panel—neutralized initial advantages for the Philippines and the United States when he refused to build on the results, pivoting demonstrably away from Washington and toward Beijing.

Create a "New Normal"

China's island building, enhanced military infrastructure, and expanded coast guard and maritime-security presence now appear permanent, and they have set the foundation for future island building—activities that include the construction of major tourist facilities and the influx of a significant civilian population. China has not fulfilled the more dire predictions of foreign critics yet—it has not based fighter aircraft at its new bases nor begun new land reclamation at Scarborough Shoal. Yet China has demonstrated that it could take all those steps with little warning. China also has incorporated the Spratlys into its governmental administrative hierarchy,

and it is enforcing Chinese fishing and environmental laws using law-enforcement vessels and aircraft. It increasingly is acting as the sovereign power for the disputed area.

Cumulatively, China's tactics in the SCS amount to a highly successful strategy. Beijing found key "seams" in international law, the U.S.-Philippine alliance, and the resolve of most other claimants and ASEAN, and it stretched them to achieve its goals. Technically, China's island building and militarization broke no international laws, nor has it violated the letter of the 2002 Declaration on the Conduct of Parties in the South China Sea. It seized no new islands—most of the seven expanded features were occupied first in the 1980s, the last in 1994; it expelled no other claimants; and it has not challenged overflight of the area (although it has warned foreign aircraft about directly overflying its outposts).

Beijing's SCS success also showcased the limits of U.S. power and options by not providing Washington an easy pretext to use military force, and by doing so before the relationship was defined by strategic rivalry. Washington's long-standing policy of not picking sides in maritime disputes—even most of those involving U.S. allies—and ambiguity on the extent of the U.S.-Philippines defense treaty likely gave Beijing confidence to avoid the "redlines." There is no evidence that Beijing perceives significant costs for its actions in the SCS; instead, its major gains likely reinforce the attractiveness of applying the same tool kit in other areas, including Taiwan.

Implications of the SCS Tool Kit for Taiwan

China's application of its whole-of-regime capabilities to its ongoing civil war likely means that classic military warning indicators will come only late in a dangerous scenario during which the CCP no longer seeks to preserve the status quo and instead has made the strategic decision to pursue reunification using all means, including military force.

The key event—well before shots are fired, fleets and aircraft are marshaled, or a blockade is announced—will be a political decision by the CCP Politburo Standing Committee (PBSC). There was no clear indication of when the PBSC made the decision to start island expansion in the Spratlys. But while the SCS actions of 2013–16 risked confrontation with adversaries, the prospect of major military conflict proved to be low, especially once major land reclamation was complete by the end of 2015.

For a Taiwan scenario, conservative, prudent military planning by the PLA probably would dictate that it assumes major U.S. military intervention would occur once China was prepared to initiate significant combat operations. As it did in the SCS, China would attempt first to set the conditions for its eventual success.

Ensure National Unity to Defend China's Claims

Decades of propaganda and indoctrination from Chinese primary schools onward would seem to leave little additional work to be done, but the focus of previous mass campaigns since 1979 has been on "preserving the status quo" and preventing de jure independence for Taiwan, not on compelling reunification. A key distinction would be a shift emphasizing that China's patience had reached its end, conditioning the Chinese people to be prepared for the sacrifices of wartime.

More fundamentally, Chinese official statements and authoritative media could warn domestic and foreign audiences that the "objective conditions" that enabled Deng Xiaoping in 1978 to proclaim that "peace and stability are the dominant, durable trends" no longer applied, thereby framing reunification with Taiwan as an imperative of U.S.-China strategic rivalry.[35] Monitoring and translation of open-source information will be critical to discerning trends along these lines.

Start Slowly, and Move Forward If No Major Resistance Is Encountered

Rather than a "bolt out of the red" invasion attempt, China likely would begin by testing capabilities and reactions in a variety of domains. China's large, more-regular air incursions into Taiwan's ADIZ in the first half of 2021 could serve as an example, but these would build into more flights in the north of the strait, not just in the southwest, furthest from Taiwan. China has a multitude of options to increase pressure selectively, to send signals, or to condition Taiwan and others to a "new normal." This would apply not only, or even most importantly, in the military domain but in legal, administrative, commercial, and other areas, including some as seemingly obscure as air-traffic-control administration, international standards-setting bodies, and agricultural-inspection standards.

Divide Opponents; Isolate Weak Ones

Taiwan has many friends but only one security guarantor (albeit an ambiguous one). Beijing would seek to ensure that there is no U.S.-led coalition supporting and enabling defense of Taiwan. Japan remains the key

fourth-party potential actor because U.S. access to naval and air bases there is essential to any defense of Taiwan. Beijing probably could be expected to play up the history issue—Taiwan's former status as a Japanese colony that began 126 years of political separation from the mainland—and leverage the severe economic repercussions for Japan if it were to become embroiled in a war with China. Unlike its more limited capabilities against the continental United States, China has the means to strike anywhere in Japan with conventional ballistic and cruise missiles and combat aircraft, and Japan long has lived in the shadow of China's medium-range, nuclear-armed missiles.

China also would seek to limit outside military, intelligence, or diplomatic support for U.S. intervention. It would focus on other U.S. regional allies—South Korea, Australia, the Philippines, and Thailand—to ensure that U.S. forces would not be permitted to operate from those countries against China.

Create a "New Normal"

Western analysts should focus on understanding the phases of Chinese strategy for Taiwan, instead of only endgames. In the event the PBSC shifts to "achieving reunification" as a goal for 2049, as Xi Jinping intimated in a 2017 address, China will accelerate preparations in all domains, with an initial goal of conditioning expectations in China—and on Taiwan.[36] The CCP's ultimate objective is not invasion per se but rather a process for authorities of China and Taiwan to negotiate the formal, long-term political relationship across the strait. Military, economic, information, and diplomatic coercion and inducements all would be in play, and the redline for threatened military force would shift from preventing permanent separation to responding to a refusal by Taipei to begin the political process—there is language in the 2005 antisecession law along these lines. For example, article 4 states that accomplishing "the great task of reunifying the motherland is the sacred duty of all Chinese, the Taiwan compatriots included," while article 8 warns that in the case of actions by Taiwan "separatists" that "completely exhaust" possibilities for peaceful reunification, China will employ "nonpeaceful means."[37]

If 2049 is the CCP's deadline for beginning a formal unification process, China's cross-strait policies clearly could break from the past sometime after 2030, when the PLA's massive reforms undertaken in 2016 are realized fully. China's proposals initially could be fairly lenient, not dissimilar to the CCP's 1979 letter to the Taiwan compatriots, but a key condition would be the end of the existence of any U.S.-Taiwan security framework without Beijing's explicit approval.[38]

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William Fox and Roderick Lee

13. Assessing the PLA's Confidence in Its Ability to Achieve Air and Sea Control around Taiwan

Understanding the cross-strait military balance of power among the United States, Taiwan, and the People's Republic of China (PRC) is not a new problem set. For over two decades, the U.S. Defense Department has issued annual public reports to Congress discussing modernization trends in the People's Liberation Army (PLA), with each report containing sections dedicated to discussing the balance in the context of a Taiwan invasion. This chapter takes a partly quantitative approach to help assess a key component of that balance: control of the air and sea in the vicinity of Taiwan.

Chinese military strategists recognize air and sea control as essential to any successful cross-strait invasion. Therefore, their confidence in the PLA's ability to achieve these aims is a key factor informing how and when Beijing might use force against Taiwan. This chapter seeks to gauge Chinese leaders' current confidence by evaluating PLA sensor units, operational units capable of executing fires, peacetime activity, and training.

We conclude that the PLA likely has moderate confidence in its ability to gain control of the air and high confidence in gaining control of the seas to an extent sufficient to enable an amphibious loading on the mainland, a crossing of the strait, and an unloading on Taiwan. By *control,* we mean the ability to operate within a given domain without one's adversary

prohibitively impeding one's ability to conduct operations. We use the term interchangeably with *dominance* and *superiority*.

This chapter first discusses how air and sea control fit into the larger scheme of the joint island landing campaign (JILC), as well as our methodology for determining PLA confidence levels. Next it evaluates PLA sensors and shooters as the basis of determining confidence. It then combines the discussions of available sensors and shooters with known PLA operational activity and training to reach assessed confidence levels. Finally, it concludes with a brief discussion of how the United States might prevent the PRC from achieving air and sea dominance.

Air and Maritime Control as Part of the JILC

According to the 2006 *Science of Campaigns*—a seminal, albeit dated, PLA document describing various military campaigns—operations to seize information, air, and sea dominance should occur in an early phase of the JILC.[1] Seizing dominance in these domains is essential to ensuring safety during all subsequent campaign phases.

The PLA is likely to execute a series of nested or independent campaigns to achieve this dominance, to include an air-offensive campaign and a conventional missile-assault campaign. This joint approach to seizing control in the air and maritime domains no doubt was merely an aspirational concept when the PLA first drafted the document in 2006 but likely would be the standard approach today.

Having gained control of the air and seas, especially around Taiwan, the PLA then can shift its focus toward training preparatory fires against sites that might be able to contest the amphibious landing. However, the PLA still will have to sustain continuous operations throughout the entire JILC to ensure that the adversary does not contest or regain control of either domain.

Not Just Taiwan: Air and Maritime Control in a Counterintervention Scenario

China anticipates the potential for U.S. and allied military intervention in a Taiwan invasion scenario. The PLA National Defense University's 2015 edition of *Science of Strategy* (hereafter *Science of Strategy 2015*) identifies the United States as the PLA's most dangerous threat, then instructs the

PLA to prepare for the most dangerous and complex threats in its planning.[2] Therefore, to reduce operational risk, a prudent planner would factor in the prospect of extensive outside intervention. This assumption is supported by the PLA Academy of Military Science's 2013 edition of *Science of Strategy* (hereafter *Science of Strategy 2013*), which describes executing near-seas defense and far-seas protection, in part by "countering the strong adversary's intervention."[3] *Science of Strategy 2015* explains the logic: "[T]he powerful enemy's operational system is the most complete, his weapons and equipment are the most advanced, and his operational capability is the strongest; and *after completing the operational preparations against the powerful enemy, dealing with other opponents will be accomplished with ease.*"[4]

U.S. intervention in a Taiwan scenario would change the PLA's strategic geography, because U.S. forces could hold the JILC at risk from both inside and outside the first island chain, including via precision strikes from long range—over a thousand miles away. That would compel the PLA to expand its defensive depth; increase the geographic scope of its air and sea dominance; and allocate resources to deter, degrade, or destroy the U.S. forces that hold the JILC at risk. While PLA writings on the topic focus primarily on establishing sea and air control around its main operational areas in the near seas, the PLA also gradually is developing its ability to execute offensive operations in distant seas to counter intervening forces. According to *Science of Strategy 2015,* mobile operations outside the first island chain are becoming "the foundation for integrated operations within the first island chain," and the PLA must "expand the depths of maritime defense . . . against the powerful enemy's forces . . . far from the homeland."[5] Doing so "eases pressure on the near-seas battlefield."[6]

As of 2015, the PLA assessed itself to be "the side whose actual strengths are relatively weak" operating in the far seas. This self-assessment led the PLA to prefer using asymmetric "guerrilla style" (游击) operations and surprise "sabotage" attacks (破袭) against a superior force in the far seas rather than seeking to establish absolute sea and air dominance.[7] At the same time, the PLA was in the process of building up the equipment and capabilities needed to be able to increase its defensive depth and fight more effectively outside the first island chain. Acquisitions, training patterns, and operational trends since 2015 confirm the PLA's continued progress in developing a force that can fight in distant seas.[8]

Prerequisites of Joint Force Integration and Battlefield Dominance

Notwithstanding geographic factors, the PLA believes it can win wars against a strong opponent only by operating as an integrated joint force. *Science of Strategy 2015* identifies "system attack and destruction warfare" (体系破击战) as the PLA's basic method of carrying out operational missions. The framework sees modern militaries as integrated "systems of systems" that are stronger than the sum of their parts because they operate as coherent wholes. Victory goes to the side that can preserve its own systemic integrity while "taking apart the enemy's operational system." The PLA intends for its joint campaigns to be conducted in interconnected fashion and for its service branches to operate in that manner. Ultimately, system-attack-and-destruction warfare seeks to achieve "the mutual fusion of all strengths in integrated joint operations and the integrated-whole superiority of interconnection and intercommunication of all essential factors."[9]

The PLA will use integrated joint operations to achieve "battlefield comprehensive dominance" (战场综合制权), which *Science of Strategy 2015* defines as the sum of dominating a series of mutually supporting domains. This includes air dominance and sea control. The essential point is that the PLA depends on complementary domains of dominance enabling each other, with information, space, and network dominance enabling the force to achieve and maintain air and sea control. These areas of domain dominance are therefore also dependencies, without which sea and air dominance "will last only briefly and cannot be maintained or brought into play."[10] Therefore, the PLA's confidence in its ability to achieve sea and air dominance depends on its perceived ability to dominate the domains that enable integrated joint operations.

Historically, the PLA has not been sanguine about its ability to conduct joint operations. *Science of Strategy 2013* identified structural impediments to joint operations and expressed concerns about whether its officers and troops would be able to cope with the demands of informatized warfare.[11] Internally directed PLA publications reiterated similar critiques about personnel on more than 550 occasions between 2006 and 2019, according to analysis by Dennis Blasko and Alastair Iain Johnston. One such oft-repeated critique, the "Two Inabilities" (两个能力不够), chastised the PLA for being incapable of fighting modern wars and criticized its officers as being incapable of executing command in such wars.[12] While the critical self-evaluations evolved in formulation and emphasis over the thirteen years between 2006 and 2019, the tone and general focus remained

consistent, even as the PLA underwent rapid modernization and extensive structural reforms. Critique frequency increased under Xi Jinping, even as he successfully implemented structural reforms and the PLA's relative power continued to increase.

This suggests that while critiques do reflect the real and enduring concerns of PLA leadership, primarily they are used as tools to focus military commanders' and political officers' attention toward areas of leadership priority, and they may not convey accurately changes in the PLA's assessments of its own capabilities. As David Finkelstein observes in a related analysis, the PLA's frank self-assessments of its own shortcomings "should not be misconstrued as an argument that the Chinese armed forces are not an increasingly capable, increasingly advanced, and potentially formidable force."[13]

The PLA's concerns over its ability to operate as an integrated joint force have driven several mitigation efforts that have bolstered its capabilities and gradually increased its confidence. First, the PLA's extensive military reforms, first announced in 2015, removed many of the PLA's structural impediments to joint operations. While previous efforts to reform the PLA's structure were stymied by vested interests, the current round of reforms appears to have made significant progress in transforming the PLA into an integrated joint force.[14] Second, the PLA is investing in the types of capabilities that would help it maintain at least localized information, space, and network dominance in a highly contested environment.[15] Third, the PLA is training to operate in environments in which information, space, and network dominance is challenged. Fourth, for more than a decade the PLA has conducted large-scale joint military exercises of increasing sophistication and complexity, and has achieved "substantial progress" in elements of joint operations.[16] Presumably, post-2015 joint exercises would contribute to testing and refining joint command and control in the PLA's new post-reform theater command structure.

Most of these efforts, however, are not new, and the PLA's internal critiques maintain a steady drumbeat in spite of observable progress. How then should we understand the PLA's level of confidence in its ability to achieve and maintain the domain dominances that enable air and sea control? Answering this important question fully lies beyond the scope of this chapter, but we offer a few framing principles for consideration.

First, the PLA's military capabilities are improving dramatically in most observable domains, so we would expect the PLA's force-integration capabilities, and its confidence therein, to trend in the same direction, if not to the same degree or at the same pace. Second, the PLA is addressing

its self-diagnosed weaknesses actively, which also, logically, should increase its confidence. *Science of Strategy 2013* identified the PLA's force structure as being poorly suited to joint operations, so the structural reforms announced in 2015 established joint theater commands specifically designed to facilitate command and control for forces across theaters and services.[17] Presumably, the theater commands have matured since 2015, especially after coping with challenging situations such as the border crises with India in 2017 and 2020. *Science of Strategy 2013* also highlighted PLA concerns about whether its personnel would be able to win informatized wars.[18] The PLA continues to highlight the importance of this issue in official media, confirming that senior leadership does not consider the problem to be solved. As discussed above, though, such messaging may be understood best as a leadership tool aimed at getting the PLA's political officers and military commanders at all levels to focus on improving joint capabilities, rather than as a precise barometer of the PLA's current self-assessed capabilities. Third, however, the PLA has an enduring, wary respect for the United States; it credits "the strong enemy" with the ability to disrupt adversary systems of systems.

In aggregate, the PLA's confidence in its ability to seize and maintain information, space, and network dominance is low enough that China is unlikely to initiate a war of choice. However, if the PLA is forced to act in a crisis, its conservative risk calculus could render it relatively well prepared.

Methodology

The PLA does not discuss openly its confidence in its ability to seize air or maritime superiority in the context of a JILC directed toward Taiwan. Therefore our research approach focuses on identifying mission subsets that the PLA must be able to execute to achieve air or sea control. For each mission subset, we evaluate the number of assets the PLA has at its disposal to execute the mission subset in question, as well as how the PLA describes its own training in that discipline. On the basis of those quantitative and qualitative indicators, we make an assessment of how well the PLA currently can execute each mission subset. We then use this objective assessment of capability as a proxy indicator of how confident the PLA is in its ability to execute that mission.

The PLA's JILC plans discuss the need to execute advance firepower strikes against key adversary nodes, followed by efforts to seize air and maritime control. In discussing these preparatory phases, the PLA identifies the primary targets that must be prosecuted in that phase. These

targets fall into five discrete categories: fixed land, mobile land, maritime surface, maritime subsurface, and airborne.[19] Given the PLA's emphasis on prosecuting targets both in its immediate periphery and farther out, we categorize targets geographically as well. For the five target categories, we also break down the PLA's confidence in prosecuting targets of that type within the first island chain, between the first and second island chains, and beyond the second island chain.[20]

Our methodology focuses on identifying PLA units predominantly tasked with conducting intelligence, surveillance, and reconnaissance (ISR) missions to find the targets and PLA units tasked with engaging those targets. To determine PLA confidence, we then look at total available units and the assessed competency of those units. We also consider factors such as geography, target mobility and size, and timing. To simplify our analysis, we do not count shooter-based sensors, such as those aboard surface warships or fighter aircraft, in our tally of available sensors.

Sensors

The PLA's belief that information is the most important element in modern warfare has led it to acquire a wide variety of sensors. These sensors enable the PLA to find, fix, and track targets across all war-fighting domains. This chapter identifies seventeen sensor-unit types that represent most of the PLA's high-end ISR assets. In the following sections, we discuss the five sensor categories, what the sensors can detect, and how far out they can detect targets. These capabilities inform our assessment of PLA confidence in prosecuting targets of interest. Table 1 summarizes the number of PLA sensor-unit types capable of detecting the five different categories of enemy targets inside the first island chain, inside the second island chain, and outside the second island chain. The full list of sensor-unit types and their detection capabilities appears in appendix A.

Table 1. PLA Sensor Capabilities and Geographic Coverage

Target Location	Target Type				
	Fixed Land	Mobile Land	Maritime Surface	Maritime Subsurface	Airborne
Inside first island chain	9	9	12	4	10
Inside second island chain	5	4	11	3	6
Outside second island chain	4	4	5	2	2

Ground-Based Sensors

Although the PLA has migrated to using more airborne and space-based sensors to overcome the physical limits of geography, ground-based sensors are still a crucial part of the PLA's ISR network. There are three subcategories of ground-based sensors: radar sites, passive-detection sites, and ground observers.

Ground-based sensor units constitute seven out of the seventeen identified sensor-unit types. These comprise PLA Navy (PLAN) observation and communications brigades, PLAN and PLA Air Force (PLAAF) radar brigades, the PLAAF's Skywave radar brigade, PLA Strategic Support Force (PLASSF) radar sites, PLA Rocket Force (PLARF) passive-detection units, and PLA special-operations forces (SOFs).

The PLA press describes PLAN observation and communications brigades as being able to provide early warning in the maritime and air domains, with some articles suggesting they also may operate undersea sensors.[21] We credit these units with being able to detect surface, subsurface, and airborne targets within the first island chain, and surface targets out to the second island chain using over-the-horizon (OTH) radar sites.

PLA press releases discuss how PLAN and PLAAF radar brigades provide early warning of incoming airborne targets.[22] On the basis of the types of radar systems with which these units typically are equipped and the radar horizon that limits almost all ground-based radars, we credit these units with being able to detect airborne targets out to the first island chain.

At least one PLAAF brigade operates OTH radar sites.[23] This unit operates multiple transmitter and receiver sites that provide a robust OTH capability against airborne targets out to the second island chain.[24]

The PLASSF operates several high-end radar sites, including several large phased-array radar sites.[25] Although these sites likely are intended to provide space situational awareness and strategic early warning, they probably also can detect some airborne targets out to the second island chain.

To help detect maritime surface targets, the PLARF has a regimental-level unit that operates several passive-detection sites.[26] There is no discussion about how far this unit can detect maritime surface targets. We assume it can detect some targets beyond the first island chain.

PLA SOFs represent the last type of ground-based sensors. These units frequently train to infiltrate enemy territory and act as reconnaissance elements.[27] Given that these units mostly infiltrate areas using small boats or helicopters, we credit them with being able to detect ground-based targets only inside the first island chain.

Air-Breathing Sensors

Given their large radar horizon, air-breathing sensors allow the PLA to expand its ISR coverage dramatically beyond that of land-based sensors. Four of the seventeen sensors fall under this category: PLAN and PLAAF special-mission aircraft divisions, as well as PLAN and PLAAF unmanned aerial vehicle (UAV) units.

PLA special-mission aircraft (SMA) divisions field a wide range of airborne sensors. All SMA divisions operate airborne early warning (AEW) and signals-intelligence aircraft that can operate beyond the first island chain. Therefore, we credit all SMA divisions with being able to detect some land targets as well as maritime surface and airborne targets beyond the first island chain. PLAN SMA divisions also operate the Y-8Q antisubmarine warfare (ASW) aircraft, which we credit with being able to detect subsurface targets beyond the first island chain.[28]

The PLA also operates numerous UAV units that can provide persistent overhead ISR coverage.[29] We credit all PLA UAV units with being able to detect land targets out to the first island chain and maritime surface targets beyond the first island chain.

Space-Based Sensors

The PLA also has access to a constellation of satellites that provides global ISR coverage. Three of the seventeen sensors considered in this chapter are space-based sensors: the Yaogan series; the Gaofen series; and a notional third category that includes a large number of smaller constellations or individual satellites operated by the PLASSF and other civilian systems, to which the PLA has access.

The Yaogan-series satellites appear to carry a range of electro-optical, infrared, synthetic-aperture-radar, and signals-intelligence payloads.[30] As of 2021, roughly seventy-three Yaogan satellites were operational in low earth orbit.[31] These satellites provide global coverage of virtually all points of interest and likely can detect land targets and maritime surface targets.

The Gaofen-series satellites likely carry payloads similar to those of the Yaogan series.[32] In addition, the 2015 China military power report cites that Gaofen-2 was the first submeter-resolution imagery satellite in the PRC's inventory, suggesting that these satellites can provide reasonably high-resolution imagery.[33] As of 2021, roughly thirty-four Gaofen satellites were operational in low earth orbit.[34] We credit these satellites with being able to detect the full range of land and maritime surface targets globally.

The PRC operates several other military and civilian satellites. To capture these other space-based sensors, we credit an additional sensor unit with the same capabilities as the Yaogan and Gaofen series.

Maritime Sensors

The PLAN's fleet of surveillance vessels—Dongdiao-class electronic-reconnaissance ships (AGIs) and Dongjian-class ocean surveillance ships (i.e., AGOSs)—provides a capable at-sea ISR capability.[35] In peacetime, the PLAN deploys AGIs beyond the second island chain; it is unclear whether it would do so in wartime.[36] PLAN combatants also carry a robust suite of sensors. Assuming that the PLA is willing to risk, or even sacrifice, these assets in wartime, we credit the PLAN operational-support flotillas that operate these vessels with being able to detect all maritime targets and airborne targets beyond the second island chain.

The PRC has access to a fleet of civilian vessels and maritime platforms that likely can act as ISR pickets.[37] For purposes of this analysis, we combined these systems into a single notional sensor unit that can detect maritime surface targets beyond the first island chain and maritime subsurface targets within the first island chain.

Network Sensors

The PLASSF Network Systems Department and its subordinate technical reconnaissance bases provide the PLA with a signals-intelligence capability that can help to detect targets of all types. The PLASSF also likely has other technical means of identifying targets of interest through network operations.[38] We represent these capabilities through a notional sensor capable of detecting all target categories.

Shooters

Once the PLA locates a target using its sensors, it will determine which assets should engage the target. This section discusses the various types of "shooters" that the PLA has at its disposal for prosecuting air, maritime, and land targets. In total, we identified 150 shooters that likely represent most PLA fires. We then evaluate what targets each shooter can engage, given the likely technical capabilities of the system in question, along with descriptions of what missions these units train to perform. This section subsequently informs our assessed PLA confidence in prosecuting various targets, on the basis of the total number of shooters capable of engaging the target set in question. Table 2 summarizes the number of PLA shooter units capable of detecting the five different categories of enemy targets inside the first island chain, inside the second island chain, and outside the second island chain. The full list of shooters is available in appendix B.

Table 2. PLA Shooter Capabilities and Geographic Coverage

Target Location	Target Type				
	Fixed Land	Mobile Land	Maritime Surface	Maritime Subsurface	Airborne
Inside first island chain	98	29	69	28	80
Inside second island chain	26	2	34	19	25
Outside second island chain	4	0	10	10	8

Maritime Units

The PLAN's aircraft carriers, other surface combatants, and submarines fall under the maritime-shooter category. This category contains six types: aircraft carriers with embarked air wings, destroyer flotillas, frigate flotillas, submarine flotillas, submarine bases, and fast-attack-craft squadrons.

We credit PLAN aircraft carriers, with their associated air wings, as being able to prosecute targets across all five categories within the second island chain. PLAN aircraft carrier task groups occasionally deploy beyond the first island chain, suggesting that they are somewhat capable of engaging targets within the second island chain.[39] J-15 pilots train in land-attack missions using rocket pods and bombs, thus enabling them to engage fixed and mobile land targets.[40] There is limited evidence that the PLA occasionally fits J-15s with YJ-91 antiradiation missiles.[41] The PLA press also has revealed several occurrences of J-15s launching YJ-83 antiship cruise missiles (ASCMs) and PL-12 air-to-air missiles (AAMs), indicating an antisurface warfare (ASuW) and antiair warfare (AAW) capability.[42] Lastly, helicopters embarked on an aircraft carrier provide it with an ASW capability.[43]

PLAN destroyer flotillas can engage most types of targets out beyond the second island chain. These units occasionally deploy beyond the second island chain, suggesting that they could operate in these areas in wartime.[44] PLA press outlets regularly report on these units engaging in ASuW, ASW, and AAW training.[45] The PLA occasionally discusses these units conducting "deep land attack" training, and the U.S. Defense Department's 2020 China military power report states that these assets have a land-attack cruise missile (LACM) capability.[46]

PLAN frigate flotillas are far less capable than destroyer flotillas. The former units oversee the PLAN's older and smaller frigates, which currently are able to engage maritime surface and subsurface targets only within the first island chain. In 2021, the PLAN conducted the first observed training

event involving a Jiangdao light frigate leaving the first island chain. This suggests that the PLAN is starting to build a capability for its frigate flotillas to conduct operations beyond the first island chain, but such a capability is extremely nascent.[47] Within the first island chain, these units regularly train to conduct ASuW and ASW missions.[48] However, we do not credit these units with being able to prosecute airborne targets, owing to the extremely limited range and magazine depth of the air-defense systems fitted to Jiangdaos and other older frigates.

PLAN submarine flotillas can engage maritime surface targets out to the second island chain and subsurface targets within the first island chain. The PLAN equips these units with conventional submarines that have demonstrated the ability to deploy to the Indian Ocean.[49] Therefore we credit them with being able to deploy as far as the second island chain. In addition to a robust ASuW capability, PLAN conventional submarines occasionally train for ASW operations.[50]

PLAN submarine bases operate the handful of nuclear attack submarines that represent the higher end of the PLAN's submarine inventory. These units can engage all maritime targets as well as fixed land targets beyond the second island chain, assuming that PLAN nuclear submarines can transit at a minimum speed of advance of ten knots and maintain an endurance of over sixty days. Although very little is known publicly about PLAN nuclear-submarine operations, the 2020 China military power report states that by the mid-2020s the PLAN will have a new Shang-class nuclear-powered, guided-missile variant capable of conducting ASuW, ASW, and land-attack missions.[51] We also credit current Shang-class nuclear-powered attack submarines with a limited land-attack capability using a YJ-18 in either a secondary land-attack mode or a separate YJ-18 land-attack variant.[52]

We credit fast-attack squadrons with being capable of engaging maritime surface targets within the first island chain. The PLA typically fits these units with the Houbei guided-missile patrol boat, which has limited endurance and seaworthiness. These units typically train to operate for only a few days at sea, and they only conduct ASuW training.[53]

Ground-Based Fires

The PLA also fields a wide array of ground-based fires that can help to achieve air and maritime superiority. Within this category, there are seven discrete unit types: surface-to-surface missiles, long-range rocket artillery, coastal-defense cruise missiles, surface-to-air missiles (SAMs), special-operations forces, electronic-countermeasure (ECM) systems, and network-attack systems.

Operated almost entirely by the PLARF, PLA surface-to-surface missiles can engage fixed land and maritime surface targets as far as the second island chain. At the low end of the spectrum, the PLARF fields several short-range ballistic-missile and cruise-missile units capable of engaging fixed land targets within the first island chain.[54] PLARF DF-21D units can engage maritime targets slightly beyond the first island chain, whereas DF-26 units can engage fixed land and maritime surface targets out to the second island chain.[55] Some PLARF operational units now also field newer systems such as the DF-17 hypersonic-glide vehicle and CJ-100 supersonic cruise missile, which are capable of ranging fixed land targets slightly beyond the first island chain.[56]

The PLA ground forces (PLAGF) also have some long-range rocket-artillery systems capable of targeting some fixed land sites on Taiwan.[57] However, given that these units likely will have competing operational requirements that will make them unavailable for operations aimed at achieving air and maritime superiority, we include only one notional unit in our list of shooters.

The PLAN fields approximately six coastal-defense cruise-missile regiments that can engage maritime surface targets within the first island chain. These units mostly operate the YJ-62 ASCM and train to fire these systems in a wide variety of environments.[58]

The PLA operates one of the most robust inventories of SAMs in the world. Units operating these SAMs train to engage large volumes of airborne targets and to operate as part of a larger integrated air-defense system.[59] Given the advertised range for the export variants of SAMs in PLA service, we credit these systems with being capable of engaging airborne targets within the first island chain.[60] For this analysis, we credit the PLAAF with nine SAM brigades that operate along the PRC coastline as well as three PLAN aviation air-defense brigades. We do not include PLAGF air-defense brigades under this category because of the limited range of most of their air-defense systems. Although PLAGF SAM brigades frequently train to redeploy to other parts of the PRC, we assume that the PRC is unlikely to redeploy units from the Beijing capital area or from regions of the PRC that have no redundant coverage.

In addition to acting as forward observers, PLA SOFs can engage in kinetic operations. Given that most PLA press releases on SOF unit training show these units being delivered by helicopter or small boat, we assess that they are limited to operations within the first island chain.[61] The PLA openly discusses using SOF units to target key nodes, and we observe these units training to seize airfields and other key land targets of interest in

the present day.[62] We capture this capability in the form of a notional SOF brigade shooter that can engage fixed and mobile land targets within the first island chain.

Supplementing these kinetic fires, the PLA also operates ECM units. We credit all ECM units with being able to engage airborne targets within the first island chain by jamming the radar signals or data links that some airborne targets must transmit or receive if they are to operate effectively.[63] In addition to this universal capability, some ECM units have additional ones. We credit the Eastern Theater Command Air Force ECM Brigade with the ability to engage mobile targets within the first island chain, since it is equipped with ASN-301 antiradiation drones.[64] We credit the PLASSF's 32090 Unit with being able to degrade all but maritime subsurface targets within the first island chain, given its probable space-jamming capabilities that can degrade at least global-positioning and satellite communications.[65]

Lastly, the PLA has a growing ability to engage in network attack.[66] For this chapter, we amalgamate all PLA network-attack capabilities within a notional PLASSF Network Systems Department shooter that can engage all fixed land targets, regardless of location.

Air Units

The last broad category of shooters is air units. Although PLAAF units constitute most of these shooters, the PLAN and PLAGF also have aviation units that can contribute to achieving air and maritime superiority. Within this category, there are nine unit types: fifth-generation fighters, 4.5-generation fighters, fourth-generation fighters, third-generation fighters, bombers, ASW aircraft, ECM aircraft, rotary-wing aircraft, and UAVs.

Fifth-generation fighter units constitute a small proportion of the PLA's overall combat-aircraft inventory, with the J-20 being the only aircraft type in inventory as of 2021. Although information on the J-20 is limited, the 2020 China military power report states that J-20s will help to enable counterair operations in the western Pacific.[67] Given the J-20's likely low radar cross section, advanced avionics, refueling capability, and ability to field long-range PL-15 AAMs, we credit J-20 units with being able to engage airborne targets beyond the first island chain.[68] Despite the lack of evidence showing J-20s with land-attack munitions, we credit these units with a notional capability against fixed and mobile targets within the first island chain.

The 4.5-generation fighters represent a very capable and pervasive component of the PLA's fighter inventory. The J-10B/C and J-16 account for the bulk of the PLA's current 4.5-generation fighter inventory, although

the PLA also operates a handful of Su-35 and possibly J-11D fighters that fall within this category.[69] Given that PLAAF fourth- and 4.5-generation fighters frequently sortie up to the first island chain, they likely can sortie slightly beyond as well.[70] Units equipped with these aircraft train to perform a wide range of missions, including counterair operations, ground attack using guided munitions, ground attack with forward observers, and maritime surface strike.[71] We credit all 4.5-generation fighter units with being able to engage all land targets within the first island chain as well as airborne targets beyond the first island chain. We also credit J-16 units with a maritime-surface-attack capability within the first island chain.

Most PLA fighter units operate fourth-generation aircraft. Flight activity indicates that PLA fourth-generation fighter pilots are comfortable operating within the first island chain.[72] Ground-attack training is a standard topic for these units, and press reporting on training shows them operating with everything from rocket pods to laser-guided munitions.[73] These units also frequently train to engage in counterair missions, often at night and within "complex electromagnetic environments."[74] Photos of PLA fourth-generation aircraft typically show a mix of PL-12 and PL-10 AAMs for counterair missions. Given the capabilities depicted, we credit fourth-generation fighter units with being able to engage all land and airborne targets within the first island chain.

The PLA's remaining inventory of fighter aircraft consists of older, third-generation fighters—notably, the J-7 and J-8. Although the J-8 is capable of air-to-air refueling, in recent years there have been no public reports of either of these aircraft types operating near, let alone beyond, the first island chain. Furthermore, no PLA press reports on J-7 units discuss maritime training. Limited video footage from CCTV-7 shows that J-7 units at least still train to conduct ground-attack missions, using rocket pods.[75] Recent photos of J-7s and J-8s reveal that they typically are fitted with short-range air-to-air missiles.[76] Given this information, we credit third-generation fighter units with being able to engage only fixed land and airborne targets within the first island chain.

Supplementing these fighters are several PLA attack-aircraft units. All these units are equipped with the JH-7 fighter-bomber. JH-7 units regularly train to conduct ground-attack missions with both guided munitions and rocket pods.[77] All JH-7s are also capable of executing maritime-surface-strike missions with ASCMs, although this is predominantly a mission for PLAN aviation JH-7s.[78] JH-7s typically only fly with short-range air-to-air missiles for self-defense. With these capabilities in mind, we credit all JH-7 units with being able to engage all land targets and maritime surface targets within the first island chain.

Bomber units constitute a major portion of the PLA's overall precision-strike capability. All PLA bomber units operate some variant of the H-6 bomber. As of 2021, PLAAF H-6 bomber units characterized training in the "western Pacific" beyond the first island chain as a normal activity.[79] A PLAN bomber unit characterized a seven-hour maritime-strike training flight as routine, indicating that those units also are comfortable operating beyond the first island chain.[80] PLAAF H-6s train to use a wide range of munitions, including LACMs, ASCMs, and iron bombs.[81] PLAAF air-refuelable H-6Ns also likely are capable of fielding air-launched ballistic missiles.[82] PLAN H-6s train with iron bombs and ASCMs.[83] Given these capabilities, we credit all PLA bomber units with being able to attack maritime surface targets beyond the first island chain and fixed land targets within the first island chain. We also credit all PLAAF bomber units with being able to attack fixed land targets out to the second island chain. The PLAAF's single known H-6N unit is credited with being able to attack fixed land targets beyond the second island chain.

In addition to being a sensor system, the PLAN's Y-8 ASW variant also can prosecute undersea targets. These aircraft fly within the first island chain on a near-daily basis and regularly fly beyond the first island chain.[84] PLA press releases describe these units as training to operate in multi-aircraft formations to find undersea targets and destroy them.[85] In some cases, the aircraft receive cueing data from other sensors.[86] Given how these units train and operate, we credit all three units with being able to engage undersea targets beyond the first island chain.

As of 2021, the PLAAF operated a small number of Y-9 GX11 electronic-warfare aircraft that are subordinate to special-mission aircraft divisions. For the sake of simplicity, we amalgamate these aircraft into a single notional shooter. The 2020 China military power report states that these aircraft can "disrupt adversary battlespace awareness at long ranges."[87] We credit this "shooter" with being able to degrade maritime surface and air targets out to the second island chain and fixed, maritime surface, air, and mobile land targets inside the first island chain.

Although PLAGF aviation-brigade attack helicopters likely will be reserved to support the landing portion of the JILC, they could be used to maintain air and maritime superiority if needed. Therefore we include a single notional PLAGF aviation brigade in our shooter list. These units not only can attack all types of land targets on Taiwan; they also train to engage maritime surface targets.[88] We credit this one notional shooter with being able to engage land and maritime surface targets inside the first island chain.

The PLA rarely discusses its UAV units, especially in an attack context. However, PLA air bases frequently host UAVs of various types, many of which can be armed.[89] The PLAAF also has the 69th Aviation Brigade, which operates unmanned J-6 fighters. This unit almost certainly is intended to attack targets on Taiwan.[90] We credit a notional PLAAF UAV unit with being able to engage all land targets inside the first island chain, and the 69th Aviation Brigade with being able to engage fixed land targets inside the first island chain.

Findings

This section provides an overall assessment of PLA confidence in its ability to seize control of the air and sea in the context of a Taiwan-focused JILC. It also offers details about PLA confidence regarding its ability to prosecute various targets of interest across different geographic areas.

The PLA likely has moderate confidence in its ability to seize and maintain control of the air in a Taiwan-focused JILC. It likely is highly confident in its ability to prosecute most target types within the first island chain, especially fixed targets such as airfields and air-defense sites, surface vessels, and aircraft. However, its only moderate confidence in its ability to engage enemy forces beyond the first island chain—forces that still can contest air control inside the first island chain—likely creates doubts in its overall ability to attain control of the air. The potential for the presence of adversary assets capable of contesting air control creates a situation wherein neither side has true campaign-level or strategic air superiority, although the PLA may be able to create local and temporary air superiority when needed.

With moderate confidence of achieving air control or high confidence of denying adversary air control in mind, the PLA likely has high confidence in its ability to seize and maintain control of the seas. The PLA has a greater ability to attrit maritime targets out to the second island chain and thus reduce the adversary's ability to interfere in maritime operations inside the first island chain, especially around Taiwan. Even with contested control of the air, the large number of shooters that can prosecute maritime and airborne targets inside the first island chain suggests higher PLA confidence in attaining maritime superiority. Table 3 presents key findings from this analysis, including our own degree of uncertainty in specific assessments.

Table 3. Assessed PLA Confidence in Achieving Air and Sea Control

Mission	Assessed PLA Confidence	Uncertainty in Our Assessment
Overall air control	Moderate	Moderate
Overall maritime control	High	Low
Fixed (1st island chain)	High to very high	Low
Fixed (2nd island chain)	Moderate	Moderate
Fixed (outside 2nd island chain)	Low	Moderate
Mobile land (1st island chain)	Moderate	Moderate
Mobile land (2nd island chain)	Low to none	Low
Maritime surface (1st island chain)	High to very high	Low
Maritime surface (2nd island chain)	Moderate	Moderate
Maritime surface (outside 2nd island chain)	Low	Moderate
Maritime subsurface (Taiwan / 1st island chain)	Moderate	Moderate
Maritime subsurface (2nd island chain)	Low	High
Maritime subsurface (outside 2nd island chain)	None	Low
Air (Taiwan / 1st island chain)	High	Moderate
Air (2nd island chain)	Low	High

Fixed Land Targets

Targets such as naval bases, harbors, airfields, radar sites, air-defense sites, logistics facilities, and command posts constitute a large portion of those the PLA identifies as needing to be destroyed to seize air and maritime dominance.[91] This section discusses the PLA's confidence in its ability to disable or destroy various types of facilities that may hamper its ability to operate in the air and on the sea.

Given the extensive number of fixed sites that the PLA explicitly identifies as needing to be destroyed and the importance of degrading these

sites to enable it to execute routine wartime operations, fixed land targets are likely the highest-priority target set for the PLA. Rather than wholesale destruction of adversary forces, the PLA places a massive emphasis on destroying select critical nodes that are necessary to the adversary's operational system.[92]

The PLA likely has high confidence that it can destroy or degrade fixed targets of interest within the first island chain and very high confidence for targets on Taiwan. This assessment is based on the large number of sensors and shooters at the PLA's disposal for this target set and the growing complexity featured in PLA training events related to attacking fixed targets. The PLA has nine sensor types and ninety-eight shooters that can engage these targets. PLA training indicates that all identified shooters are also confident in their ability to execute ground-attack missions. PLAAF fighter units frequently train to attack fixed targets inside contested airspace and PLARF short-range ballistic-missile brigades regularly train to execute multiple salvos while under attack.[93]

The PLA likely has moderate confidence in its ability to degrade temporarily fixed land targets out to the second island chain. This assessment is based on the number of shooters, their magazine depth, and training limitations. The PLA has six sensor types and twenty-six shooters at its disposal but will be limited by the magazine depth of those shooters. Furthermore, discussions of PLA training in this field show that there are still some gaps. On the one hand, commentary from a PLARF DF-26 training event indicates that the units deploying these missiles are comfortable executing multisalvo attacks under adverse operating conditions.[94] However, press reporting on PLA bomber units indicates that there are concerns about the bombers being able to operate as part of a larger joint force beyond the PRC's periphery.[95]

For fixed land targets beyond the second island chain, the PLA may have low confidence in its ability to conduct notional strikes. It fields only four identified shooters capable of ranging this target set, and these shooters are extremely vulnerable when operating so far from the PRC. PLAN surface training formations occasionally operate beyond the second island chain, although we have no indications regarding how these training formations might translate into confidence during wartime.

Mobile Land Targets

Mobile land targets include SAM transporter-erector-launchers (TELs), other short-range air-defense systems (SHORADs), mobile radar systems, coastal-defense cruise-missile TELs, and other key support vehicles. The

Science of Campaigns does not identify "mobile land targets" explicitly as a separate category, but it does discuss broadly the need to destroy enemy air-defense systems, radars, and surface-to-surface missile systems.[96] The fact that such systems are frequently mobile and thus more difficult to target warrants a separate target category.

Destroying or suppressing these systems would improve the survivability of PLA air and maritime forces operating within range of the systems in question. Doing so also would increase the probability of a hit for PLA air-launched standoff munitions and surface-to-surface missiles targeting sites typically defended by mobile SAMs and SHORADs. However, most targets within this category are likely not key system nodes. Given the PLA's belief that victory is achieved through systems confrontation (体系对抗) and system-attack-and-destruction warfare (体系破击战), the destruction or suppression of tactical targets likely is not a high priority for the PLA.[97]

The PLA likely has moderate confidence in its ability to prosecute mobile land targets within the first island chain. We base this conclusion on the PLA's limited training to engage such targets. The PLA has nine sensor types and twenty-nine shooters capable of finding and engaging targets of this type, which likely is sufficient for most scenarios. However, these sensors and shooters are limited by the relative lack of training in this discipline.

To find, fix, and fire on mobile land targets consistently, shooters must train regularly to use advanced organic sensors or to use timely target data from an offboard sensor. Although the PLA occasionally conducts training in these skill-sets, it is likely not enough to generate more than moderate confidence. PLA fighter units occasionally, but not frequently, train in ground attack using targeting pods.[98] PLA fixed-wing aircraft and SOF units also occasionally train together to engage ground targets, with SOF units acting as forward observers.[99] However, the lack of press reporting on such training events suggests they are infrequent.

The PLA likely has low to no confidence in its ability to engage mobile land targets beyond the first island chain. The PLA has only two shooters capable of engaging such targets: its aircraft carriers. Although the PLAN operates those carriers outside the first island chain, they have not yet deployed near land targets within or beyond the second island chain.

Maritime Surface Targets

Maritime surface targets include aircraft carriers, other surface combatants, amphibious-warfare ships, and naval auxiliaries. Broadly speaking,

the PLA explicitly states that maritime surface targets should be destroyed to achieve maritime control.[100] The PLA specifically highlights aircraft carriers as representing strategic capabilities, stating that they "assume great significance for a campaign victory" and constitute "strategic 'fist' forces for naval maneuver operations."[101] Logistics vessels also hold great importance, with the *Science of Campaigns* stating that "to strike at and degrade the enemy's logistics has become one of the important means to accomplish campaign goals."[102]

Within the first island chain, the PLA likely has high to very high confidence that it can engage maritime surface targets of interest. Twelve of the identified sensor-unit types can detect surface targets inside the first island chain, and sixty-nine shooters can engage these targets. Historically, PLAN units with a primary ASuW mission set trained heavily in this discipline. However, recent press reporting indicates that these units have shifted the focus of their training away from ASuW, in favor of air defense and antisubmarine warfare in particular.[103] This shift likely indicates that these units have achieved an acceptable level of institutional expertise in ASuW operations and now can devote their attention to other types of competencies.

The PLA likely has moderate confidence in its abilities to engage maritime surface targets between the first and second island chains. It still has a reasonable number of sensors and shooters (eleven and thirty-four, respectively) that can find and engage surface targets in this area. The PLAN and PLAAF also regularly train in these waters.[104] However, in these operating areas the PLA has fewer sensors and shooters to prosecute targets over a larger area, and its naval shooters are particularly vulnerable, so its confidence likely is reduced.

PLA confidence in engaging maritime surface targets beyond the second island chain is likely low. In comparison with the assets available to it in the first and second island chain regions, the PLA has relatively few sensors and shooters (five and ten, respectively) available in this area. In peacetime these shooters only occasionally train to operate beyond the second island chain, and they likely would be extremely vulnerable in wartime.

Maritime Subsurface Targets

Maritime subsurface targets predominantly consist of submarines, both conventional and nuclear. The PLA long has recognized the serious threat of submarines to its transport fleet, but it lacked substantial resources with which to prosecute these subsurface targets—until the PLAN's major shipbuilding efforts that began around 2010.[105]

With the introduction of numerous ASW-capable combatants, modern submarines, and dedicated ASW aircraft, the PLA now likely has moderate confidence in its ability to engage subsurface targets within the first island chain. This assessment is based on the moderate number of sensors and shooters (five and twenty-eight, respectively) available, as well as the increasing confidence observable in training.

Characterization of PLAN training in ASW activities shows the potential for a reasonable amount of confidence. An unspecified level of ASW proficiency is a standard requirement for all PLAN surface combatants before a vessel training center can certify them as operationally ready.[106] Once that minimum level is achieved, ASW-capable units frequently train to operate as ASW formations that hunt for subsurface targets or sanitize areas of any potential submarines.[107] With some regularity, surface combatants also train with submarines and aircraft to conduct joint ASW.[108] However, it is extremely difficult to translate these open-source characterizations of ASW training into an actual confidence level. At best, the increase in training and standards suggests a relative improvement in confidence.

Between the first and second island chains, the PLA may have low confidence in its ability to find and engage subsurface targets. This assessment of low confidence derives from the limited numbers of sensors and shooters available, as well as the lack of training. The PLA has three sensor-unit types and nineteen shooters capable of finding and engaging these targets. These units train only to a limited extent to operate beyond the first island chain.[109] We also assume that PLAN submarines can and do sortie out this far; however, there is only sporadic discussion of PLAN units conducting ASW training in these areas.

Beyond the second island chain, we assess that the PLA has essentially no confidence in its ability to engage subsurface targets reliably.

Airborne Targets

Airborne targets encompass two subcategories of interest to the PLA. The first subcategory is aircraft, consisting of fighters, AEW aircraft, and UAVs. The PLA discusses the need to destroy such airborne targets both generally, with regard to how it intends to achieve air superiority, and specifically, in the context of an island landing campaign.[110] The second subcategory is missiles. With the growing global use of standoff munitions, as well as improvements to PLA weapon systems and sensors, the PLA by 2013 began placing a premium on "anti-missile" capabilities.[111]

Destroying airborne targets has offensive and defensive benefits. In terms of achieving air superiority, the PLA acknowledges that the adversary

inevitably will be able to get combat aircraft into the air, and that once this happens they should be destroyed.[112] With its growing ability to destroy airborne targets far from PRC territorial airspace, the PLA now also likely looks to AEW aircraft and tankers as a means of system destruction, given its appreciation of how important friendly airborne command posts are in informatized environments.[113]

From a defensive perspective, destroying inbound missiles reduces the chance that the PLA's operational system will be disrupted. Although the PLA believes that conflict is most likely to be centered on the maritime domain, it recognizes that the most dangerous course of action by its adversary would be to conduct aggressive strikes against the mainland intending to destroy the PRC's ability to wage war.[114] Defending against incoming missiles helps to mitigate threats to key war-fighting nodes in the PRC and vulnerable amphibious lift during the crossing phase of a JILC.

The PLA likely has high confidence in its ability to destroy or disable airborne targets within the first island chain. Ten of the identified sensor types can find airborne targets, and eighty shooters can engage those targets within this area. The PLA also appears to be highly proficient in executing air-defense missions near its own airspace.

PLA descriptions of training related to engaging airborne targets demonstrate confidence in the service's ability to deal with modern airborne threats. For example, one fighter brigade has discussed how it excels in medium-range air-to-air combat, suggesting it is confident in using the current inventory of medium-range air-to-air missiles.[115] On the ground, SAM brigades appear to be confident in their ability to deal with multiaxis saturation attacks and operate as part of an integrated air-defense system.[116] Discussions of deficiencies focus on units' not always maintaining broader situational awareness, with some fighter units being too aggressive, thereby allowing adversary forces to penetrate in other areas.[117] However, the PLA is seeking actively to resolve the deficiency represented by units trying to achieve high kill rates without addressing actual mission requirements.

The PLA's confidence in engaging such targets between the first and second island chains likely is low. The PLA has a moderate number of sensors and shooters capable of finding and engaging targets in this area (six and twenty-five, respectively). However, the large geographic area, long time-to-target for shooters not on station, lack of permanent shooters on station beyond possible surface action groups, and apparent lack of training likely reduce PLA confidence.

The confidence found in PLA discussions of air operations around its periphery essentially disappears when it comes to operations outside the

first island chain. PLAAF fighter units occasionally discuss flying in the "far seas," with AEW aircraft also occasionally training in these areas, but little else is discussed.[118] This is in stark contrast with the confidence apparent in reporting on PLAAF bomber training beyond the first island chain.

Our analysis of the sensors and shooters the PLA has available today indicates that the service likely has moderate confidence in its ability to seize and maintain control of the air in the context of a Taiwan-focused JILC. It probably has high confidence in its ability to prosecute fixed targets such as airfields and air-defense sites, surface vessels, and aircraft located within the first island chain. However, significantly lower confidence in its ability to engage enemy forces beyond the first island chain—in areas from which enemy forces can launch strikes against near-seas targets—likely creates doubts in its overall ability to attain control of the air. Given the tremendous breadth of sensors and shooters capable of striking maritime targets out to the second island chain, the PLA likely has high confidence in its ability to seize and maintain control of the seas in a Taiwan invasion scenario.

Unless the Chinese Communist Party opts to reduce its defense spending dramatically, PLA modernization trends in terms of hardware and system performance only will increase as time passes. This suggests that PLA confidence will improve as well. Of course, the rate at which the PLA closes the gap with its potential adversaries also is affected by adversary decisions. The United States and its allies now clearly recognize that the PLA is on track to achieve operational overmatch, and they have started to invest in changing that trajectory. Their actions inevitably will impact the PLA's confidence in its own capabilities.

However, the way to diminish PLA confidence in its ability to gain control of the land, sea, and air is not to develop systems that counter PLAN vessels, aircraft, or missiles. Instead, the United States should look to ways of destroying the PLA's information network. Blinding the adversary and destroying its information systems are the hallmarks of American war fighting. However, debates about "how to beat China" should war break out focus too much on killing PLA shooters.

As our discussion of sensors and shooters reveals, the PLA has a plethora of shooters available, and attriting those numbers is an extremely daunting challenge. However, a tally of unique sensor units suggests that the PLA has roughly seventy sensor-unit equivalents that can be brought to bear on a Taiwan-related mission. Although this list is not short, it almost certainly would be less resource intensive to campaign against those

seventy sensor units until the PLA loses information dominance than it would be to attrit enough of the 150 shooter units for the PLA no longer to feel that it could seize Taiwan.

To simplify the problem addressed in this chapter, our methodology examines dedicated sensors and shooters separately. One variable that could impact our findings is the quantity of shooter-based sensors. As mentioned previously, warships in the surface fleet carry their own capable suite of sensors that, if fully integrated into PLA joint operations, could add a significant number of sensors capable of target detection across multiple domains, then prosecute those targets with their shipboard weaponry. This applies to other combatants across the PLA's joint forces as well. Nevertheless, this chapter's focus on sensor packages and the breadth of shooters available provides a substantial basis for examining PLA confidence in securing the sea and air domains in a JILC.

Appendix A. Complete List of Sensor Unit Types

	Fixed 1IC	Fixed 2IC	Fixed Outside	Mobile 1IC	Mobile 2IC	Sea Surface 1IC	Sea Surface 2IC	Sea Surface Outside	Sea Sub-surface 1IC	Sea Sub-surface 2IC	Sea Sub-surface Outside	Air 1IC	Air 2IC	Air Outside
PLAN OBCOMM brigades						1								
PLAN SMA divisions	1					1	1		1	1		1	1	
PLAN radar brigades												1		
PLAN UAV regiments	1			1		1	1							
PLAN operational support flotillas						1	1	1	1	1	1	1	1	1
PLAAF radar brigades												1		
PLAAF SMA divisions	1			1		1	1					1	1	
PLAAF UAV units	1	1		1										
PLAAF Skywave radar brigade												1	1	

PLARF passive-detection unit					1	1				
PLA SSF radar sites									1	1
PLA SSF Yaogan series	1	1	1		1	1	1			
PLA SSF Gaofen series	1	1	1		1	1	1			
Other civilian and military satellites	1	1	1		1	1	1			
PLA SSF TTRBs										
PLA SOF observers	1			1						
Civilian vessels and maritime platforms					1	1		1		

Notes: 1IC = first island chain; 2IC = second island chain; OBCOMM = observation and communications; PLA = People's Liberation Army; PLAAF = People's Liberation Army Air Force; PLAN = People's Liberation Army Navy; PLARF = People's Liberation Army Rocket Force; PLASSF = People's Liberation Army Strategic Support Force; SMA = special-mission aircraft; SOF = special-operations force; TTRB = Theater Technical Reconnaissance Bureau; UAV = unmanned aerial vehicle.

Appendix B. Complete List of Shooter Unit Types

	Fixed 1IC	Fixed 2IC	Fixed Outside	Mobile 1IC	Mobile 2IC	Sea Surface 1IC	Sea Surface 2IC	Sea Surface Outside	Sea Subsurface 1IC	Sea Subsurface 2IC	Sea Subsurface Outside	Air 1IC	Air 2IC	Air Outside
3rd Destroyer Flotilla	1	1				1	1	1	1	1	1	1	1	1
6th Destroyer Flotilla	1	1				1	1	1	1	1	1	1	1	1
2nd Destroyer Flotilla	1	1				1	1	1	1	1	1	1	1	1
9th Destroyer Flotilla	1	1				1	1	1	1	1	1	1	1	1
1st Destroyer Flotilla	1	1				1	1	1	1	1	1	1	1	1
10th Destroyer Flotilla	1	1				1	1	1	1	1	1	1	1	1
CV 16 + air wing	1	1		1	1	1	1	1	1	1	1	1	1	1
CV 17 + air wing	1	1		1	1	1	1	1	1	1	1	1	1	1
22nd Submarine Flotilla						1	1		1	1				
42nd Submarine Flotilla						1	1		1	1				
32nd Submarine Flotilla						1	1		1	1				
52nd Submarine Flotilla						1	1		1	1				
2nd Submarine Flotilla						1	1		1	1				
12th Submarine Flotilla						1	1		1	1				

2nd Submarine Base	1	1	1		1	1	1	1	1	1
1st Submarine Base	1	1	1		1	1	1	1	1	1
11th Frigate Flotilla					1			1		
12th Frigate Flotilla					1			1		
13th Frigate Flotilla					1			1		
14th Frigate Flotilla					1			1		
15th Frigate Flotilla					1			1		
16th Frigate Flotilla					1			1		
17th Frigate Flotilla					1			1		
18th Frigate Flotilla					1			1		
19th Frigate Flotilla					1			1		
Qingdao PTG Squadron					1					
Shanghai PTG Squadron					1					
Fuzhou PTG Squadron					1					
Guangzhou PTG Squadron					1					
1st CDCM Regiment (Fujian)					1					
2nd CDCM Regiment (Fujian)					1					
3rd CDCM Regiment (Shanghai)					1					

Appendix B. Complete List of Shooter Unit Types *(continued)*

	Fixed 1IC	Fixed 2IC	Fixed Outside	Mobile 1IC	Mobile 2IC	Sea Surface 1IC	Sea Surface 2IC	Sea Surface Outside	Sea Subsurface 1IC	Sea Subsurface 2IC	Sea Subsurface Outside	Air 1IC	Air 2IC	Air Outside
Yulin CDCM Regiment						1								
Yulin/Sansha CDCM Regiment						1								
11th CDCM Regiment (Qingdao)						1								
4th Naval Aviation Brigade	1					1						1		
6th Naval Aviation Brigade	1					1								
8th Naval Aviation Brigade	1					1						1		
9th Naval Aviation Brigade	1											1		
5th Naval Aviation Brigade	1					1						1		
ETN Bomber Regiment	1					1	1							
STN Bomber Regiment	1					1	1							
ETN SMA Division (Y-8 ASW)									1	1				
STN SMA Division (Y-8 ASW)									1	1				
NTN SMA Division (Y-8 ASW)									1	1				
ETN Air Defense Brigade												1		

STN Air Defense Brigade									1	
NTN Air Defense Brigade									1	
ETN ECM Brigade									1	
STN ECM Brigade									1	
NTN ECM Brigade									1	
7th Aviation Brigade (J-16)	1		1		1				1	1
8th Aviation Brigade (J-10A)	1								1	
9th Aviation Brigade (J-206)	1		1						1	1
78th Aviation Brigade (J-8DF)	1				1				1	
83rd Aviation Brigade (JH-7A)	1		1		1					
95th Aviation Brigade (J-11B)	1								1	
25th Aviation Brigade (J-7E)	1								1	
40th Aviation Brigade (J-16)	1		1		1				1	1
41st Aviation Brigade (J-11A)	1								1	
85th Aviation Brigade (Su-30MKK)	1		1						1	1
4th Aviation Brigade (J-11A)	1								1	
Aviation Brigade (J-10B/C)	1		1						1	1

Appendix B. Complete List of Shooter Unit Types *(continued)*

	Fixed 1IC	Fixed 2IC	Fixed Outside	Mobile 1IC	Mobile 2IC	Sea Surface 1IC	Sea Surface 2IC	Sea Surface Outside	Sea Subsurface 1IC	Sea Subsurface 2IC	Sea Subsurface Outside	Air 1IC	Air 2IC	Air Outside
6th Aviation Brigade (Su-35/30MKK)	1			1								1	1	
26th Aviation Brigade (J-16)	1			1		1						1	1	
124th Aviation Brigade (J-10A)	1											1		
125th Aviation Brigade (J-10A)	1											1		
54th Aviation Brigade (Su-30MKK)	1			1								1	1	
130th Aviation Brigade (J-10A)	1											1		
131st Aviation Brigade (J-10C)	1					1						1	1	
132nd Aviation Brigade (J-7E)	1											1		
16th Aviation Brigade (J-11A)	1											1		
18th Aviation Brigade (J-7H)	1											1		
97th Aviation Brigade (J-7E)	1											1		
98th Aviation Brigade (J-16)	1			1		1						1	1	
99th Aviation Brigade (J-16)	1			1		1						1	1	
109th Aviation Brigade (J-8DF)	1											1		

110th Aviation Brigade (JH-7A)	1											1		
111th Aviation Brigade (J-11B)	1											1		
1st Aviation Brigade (J-20)	1		1									1	1	
2nd Aviation Brigade (J-10C)	1		1									1	1	
3rd Aviation Brigade (J-16)	1		1		1							1	1	
31st Aviation Brigade (JH-7A)	1		1		1									
61st Aviation Brigade (J-10B)	1		1									1	1	
63rd Aviation Brigade (J-11B)	1											1		
88th Aviation Brigade (J-7H)	1											1		
89th Aviation Brigade (J-11B)	1													
15th Aviation Brigade (JH-7A)	1		1		1									
34th Aviation Brigade (J-10A)	1											1		
35th Aviation Brigade (J-10A)	1		1									1		
44th Aviation Brigade (J-7G)	1											1		
55th Aviation Brigade (J-11A)	1											1		
52nd Aviation Brigade (J-7G)	1											1		
53rd Aviation Brigade (J-7L)	1											1		

Appendix B. Complete List of Shooter Unit Types *(continued)*

	Fixed 1IC	Fixed 2IC	Fixed Outside	Mobile 1IC	Mobile 2IC	Sea Surface 1IC	Sea Surface 2IC	Sea Surface Outside	Sea Subsurface 1IC	Sea Subsurface 2IC	Sea Subsurface Outside	Air 1IC	Air 2IC	Air Outside
19th Aviation Brigade (J-11B)	1											1		
21st Aviation Brigade (J-7L)	1											1		
43rd Aviation Brigade (J-10A)	1											1		
56th Aviation Brigade (J-10B)	1			1								1	1	
70th Aviation Brigade (J-10A)	1											1		
72nd Aviation Brigade (J-10C)	1			1								1	1	
28th Bomber Regiment	1	1				1	1							
29th Bomber Regiment	1	1				1	1							
30th Bomber Regiment	1	1				1	1							
22nd Bomber Regiment	1	1				1	1							
23rd Bomber Regiment	1	1				1	1							
24th Bomber Regiment	1	1				1	1						1	
107th Bomber Regiment	1	1				1	1							
108th Bomber Regiment	1	1												

106th Bomber Brigade	1	1	1		1	1							
20th SMA Division (notional all ECM)	1			1	1	1					1	1	
1st SAM Brigade											1		
8th SAM Brigade											1		
5th SAM Brigade											1		
14th SAM Brigade											1		
3rd SAM Brigade											1		
4th SAM Brigade											1		
15th SAM Brigade											1		
10th SAM Brigade											1		
19th SAM Brigade											1		
J-6 Attack UAV Brigade	1												
Notional PLAAF UAV attack capability	1			1									
ETCAF ECM Brigade				1							1		
STCAF ECM Brigade											1		
NTCAF ECM Brigade											1		
613 Brigade (DF-15)	1												

Appendix B. Complete List of Shooter Unit Types *(continued)*

	Fixed 1IC	Fixed 2IC	Fixed Outside	Mobile 1IC	Mobile 2IC	Sea Surface 1IC	Sea Surface 2IC	Sea Surface Outside	Sea Subsurface 1IC	Sea Subsurface 2IC	Sea Subsurface Outside	Air 1IC	Air 2IC	Air Outside
614 Brigade (DF-17)	1	?												
615 Brigade (DF-11A)	1													
616 Brigade (DF-17)	1	?												
617 Brigade (DF-16)	1													
623 Brigade (CJ-10)	1													
624 Brigade (DF-21D)						1							1	
625 Brigade (DF-26)	1	1				1	1							
626 Brigade (DF-26)	1	1				1	1							
627 Brigade (DF-17)	1	?												
635 Brigade (CJ-10)	1													
636 Brigade (DF-16)	1													
646 Brigade (DF-26)	1	1				1	1							
653 Brigade (DF-21D)						1								
654 Brigade (DF-26)	1	1				1	1							

655 Brigade (DF-17)	1	?												
656 Brigade (CJ-100)	1	1				1	1							
666 Brigade (DF-26)	1	1				1	1							
Army, Navy, and PLAAF SOF	1			1										
Army rocket-artillery brigades	1													
Army aviation brigades	1			1		1								
ETC Army ECM Brigade														
STC Army ECM Brigade												1		
NTC Army ECM Brigade												1		
PLA SSF ECM brigades				1								1		
PLA SSF NSD/TTRB offensive cyber	1											1		
Notional PLAAF UAV Attack Capability	1	1	1											
Total	**98**	**~26**	**4**	**29**	**2**	**70**	**34**	**10**	**28**	**19**	**10**	**80**	**26**	**8**

Notes: 1IC = first island chain; 2IC = second island chain; ASW = antisubmarine warfare; CDCM = coastal-defense cruise missile; ECM = electronic countermeasures; ETC = Eastern Theater Command; ETCAF = Eastern Theater Command Air Force; ETN = Eastern Theater Navy; NSD = Network Systems Department; NTC = Northern Theater Command; NTCAF = Northern Theater Command Air Force; NTN = Northern Theater Navy; PLAAF = People's Liberation Army Air Force; PLASSF = People's Liberation Army Strategic Support Force; PTG = guided-missile patrol craft; SAM = surface-to-air missile; SMA = special-mission aircraft; SOF = special-operations force; STC = Southern Theater Command; STCAF = Southern Theater Command Air Force; STN = Southern Theater Navy; TTRB = Theater Technical Reconnaissance Bureau; UAV = unmanned aerial vehicle.

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Kevin McCauley

14. PLA Logistics Support for Large-Scale Amphibious Warfare

The People's Liberation Army (PLA) believes that logistics support is one of the key elements that would determine the success of any large-scale, joint landing operation. The initial support for the landing-assault force and the over-the-shore logistics support are the most difficult and critical logistics-delivery missions. The PLA actively conducts research into logistics support for amphibious warfare and has identified many problems that would require resolution before it could support a large-scale landing operation successfully. The PLA currently does not possess the requisite logistics capabilities—namely, equipment, specialized logistics forces, amphibious ships, transport aircraft, and war reserves—to support a large-scale amphibious landing on Taiwan successfully. There is little evidence that the extensive logistics exercises and training on multiple mission areas necessary to ensure the successful execution of the complex and difficult logistics-support plan have happened.

PLA logisticians consider transport, matériel and oil supply, medical, search and rescue (SAR), logistics-infrastructure protection, and maintenance of war-matériel reserves the main functions of logistics support in a large-scale campaign that comprises blockade, joint-firepower strikes, and island-landing operations. Such a conflict could escalate with foreign intervention, and there could be chain-reaction conflicts initiated by countries taking advantage of Beijing's preoccupation with operations against Taiwan.

This type of escalation beyond the island-landing campaign would stress strained logistics capabilities further.

The PLA is working to construct a precision, just-in-time logistics capability, to incorporate intelligent technologies to improve planning and decision-making, and to enable timely support to mobile operational units. When fully deployed, the logistics integrated command platform will provide a common operating picture and support a fast and efficient logistics system. Logistics forces rely heavily on the Beidou satellite navigation positioning system for communications and coordination of mobile logistics support to dispersed operational units. The PLA's Joint Logistics Support Force is developing multiple networks, databases, and a data-cloud platform to support logistics planning and supply to units in combat.

The PLA is expanding its logistics capabilities, including air and maritime transport capabilities. Civil-military integration allows the PLA to leverage civilian assets to support delivery of forces and matériel. The Chinese National Defense Mobilization Law of 2010 supports mobilization of national resources and promotes civil-military integration. Logistics mobilization of civilian transportation assets is enabled by the 2017 National Defense Transportation Law, intended to strengthen the integration of military requirements into civilian transportation resources. However, numerous PLA sources detail problems with a lack of suitable civilian ships and aircraft, equipment not meeting military standards, and poor training.[1]

This chapter examines PLA logistics support for a large-scale invasion of Taiwan. It draws heavily from a 2017 volume entitled *Operational Logistics Support,* published by the PLA's All-Army Logistics Academic Research Center.[2] The primary focus of this book is on logistics support for a large-scale amphibious operation against Taiwan. It is part of a series of logistics publications intended to support Central Military Commission (CMC) decision-making. This "internal" (内部) publication provides highly detailed information on PLA logistics doctrine and capabilities. It also discusses PLA weaknesses and offers proposals for remedying them.

Strategic Issues Increasing Logistics Requirements

The CMC's military strategic guidelines for the "new era" identify sea-based threats as the primary concern because of territorial and maritime-rights issues. The joint island landing campaign against Taiwan is the main focus of military preparations and the principal military means of enforcing Taiwan's integration with the People's Republic of China (PRC). The PLA's evaluation

of the security environment during an operation against Taiwan recognizes several escalatory events: the possibility of U.S. and Japanese intervention, such as a blockade; a chain reaction in other directions, including actions by countries such as the Philippines with territorial claims in the South China Sea, conflict on the disputed PRC-Indian border, or conflict on the Korean Peninsula; and international sanctions and embargo.[3]

The following strategic scenarios could have a significant impact on logistics capabilities and requirements during a large-scale landing operation against Taiwan.

- U.S. and Japanese intervention would increase the scale, scope, and intensity of the conflict, requiring the PLA to deploy forces and logistics assets to counter these actions. Initiating operations to deny access to the area of operations increases the requirements for the PLA Air Force (PLAAF), the PLA Navy (PLAN), the PLA Rocket Force (PLARF), the PLA Strategic Support Force, and logistics forces. Intervention by Washington would deny Beijing's preference for a war of quick decision, forcing the PRC into preparations for a protracted conflict.[4]
- A blockade, possibly combined with international sanctions and an embargo, would increase the importance of strategic matériel reserves and acquisition of alternate sources of resupply. Russia likely would provide logistics support and access to resupply as far as possible, along with Iran, Pakistan, and some of the other Shanghai Cooperation Organization countries. The PRC would need to increase strategic reserves in advance to mitigate the impact of a blockade, and a prolonged conflict would require national mobilization.[5]
- The possibility of chain-reaction conflicts in the South China Sea or Indian border region or on the Korean Peninsula would require coordination and support with other strategic directions. Conflicts in secondary directions could draw off support and forces from operations against Taiwan, depending on their number and scale.[6]

The PRC's belief that the United States might intervene would appear to negate Beijing's desire for a war of quick decision. A large-scale, protracted war would place greater emphasis on civil-military integration, people's war, and national mobilization. Civil-military resource sharing and integrated civil-military support would have importance in the areas of matériel supply, transportation, engineering and construction, equipment support, medical care, and mobilization of high-tech logistics equipment and personnel to meet operational requirements.[7]

Operational Issues Affecting Logistics Support

The operational stages, scale, and methods employed in a large-scale landing operation will affect logistics support. PLA leaders view future warfare as a high-intensity, dynamic, nonlinear, noncontact, system-of-systems confrontation involving high consumption and destruction. These future warfare characteristics add to the complexity and difficulty of logistics support. The PLA believes a future joint landing operation will include comprehensive employment of strategic deterrence; seizure of air, maritime, and information superiority in the area of operations; a focused blockade to seal and control the area around Taiwan; a large-scale, joint-firepower campaign; assault landings on Taiwan, and possibly some of the outer islands; and on-island operations. Throughout the campaign, information operations, precision strikes, and highly mobile forces will play critical roles. Additionally, operations will expand past the eastern part of Taiwan to seize advantage and strategic initiative to control the space around Taiwan and counter U.S. intervention.[8]

Foreign intervention is an important factor affecting the PLA's logistics operations. Analysis in *Operational Logistics Support* estimates that support for a large-scale landing and on-island operations against Taiwan would need to last approximately three months. However, U.S. intervention, blockade, and international sanctions and embargo would lead to protracted war. Enemy actions such as information warfare and firepower strikes can disrupt the PLA's logistics operations, including command and control, and interrupt support to operational forces. The threat of precision strikes will necessitate protection and concealment of logistics forces and infrastructure.[9]

Crossing the Taiwan Strait poses great difficulties for the PLA's logistics-delivery mission. The strait is 220 kilometers (km) wide at the widest point and 130 km at the narrowest point. The tides, waves, currents, winds, weather, beach conditions, and enemy obstacles and defenses pose great challenges to transporting and landing troops and matériel. The logistics-support system will sustain hundreds of thousands of troops implementing blockade, firepower strikes, and landing operations. Embarking, transporting, and unloading the immense force and supplies in an unfavorable natural environment and under enemy attack will present an unprecedentedly complex and arduous task.[10]

The logistics mission will change with transitions to new operational stages. These missions include supporting forces during the following operational stages: strategic deployment of forces and supplies to and their

assembly on the coast; seizing air, maritime, and information superiority; joint blockade and fire-strike operations; embarkation and maritime transport; landing operations; and on-island operations. Support requirements for the PLAN, PLAAF, and PLARF will be high during all operational stages. Such a large operation will demand all the resources of the PRC and PLA, including the People's Armed Police, militia, and reserves.[11]

PLA theories for assault-landing operations are evolving and attempting to catch up with those of more-advanced militaries. Vertical landings, over-the-horizon assault landings, and integrated joint landings are changing the PLA's traditional concept of landing operations. At the same time, PLA theorists estimate that a traditional large-scale landing cannot be replaced in the era of information warfare but rather will be supplemented by airborne, air-assault, and over-the-horizon landing methods as these capabilities improve. Such evolving concepts for amphibious landings have a significant impact on logistics.

Timelines for providing logistics support are compressed dramatically. The accelerated landing of combat troops will shorten the timelines for meeting critical logistics requirements during the beach assault and seizure of a landing base. According to *Operational Logistics Support,* large amounts of high-tech landing equipment, such as air-cushion vehicles and wing-in-ground-effect vehicles conducting over-the-horizon landings, can limit the effects of enemy fire strikes. These systems require high maintenance, are vulnerable to enemy fires, and—importantly—are not deployed in large numbers yet. A higher operational tempo will increase the importance of maintaining command of logistics units and coordination with supported units. These actions require a fully integrated command-information system and trained command personnel capable of responding to rapidly changing logistics requirements on a dynamic battlefield involving frequent transitions in logistics support and adjustments in the logistics-support plan.[12]

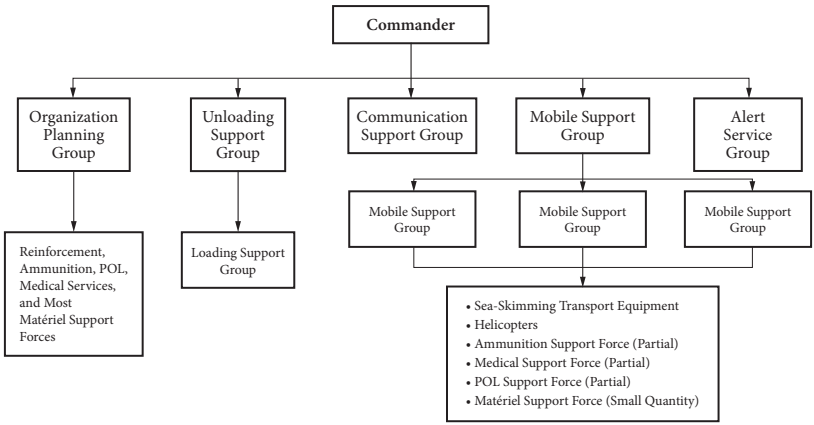
Logistics Command and Control

The PLA believes that logistics command should be highly centralized, but it should have a decentralized capability to respond at lower echelons to rapidly changing situations. The command should be highly mobile to ensure command and coordination of mobile logistics forces and survivable against enemy fire strikes and information attacks. The logistics command, ranging from the strategic to tactical levels, includes multiple networks providing transportation and delivery; petroleum, oils, and lubricants (POLs)

have separate command systems from the main logistics command. These command structures flow from the CMC joint operations command center to theater- and campaign-level forces. See exhibit 1 for an example of the landing-campaign logistics organization. The command organization for a landing operation includes the following elements:[13]

- An organization planning group responsible for planning logistics support for the assault force, organization and coordination, air control of vertical-delivery support, and reinforcements
- A mobile support group responsible for command and control of mobile support groups for the assault landing
- An unloading support group providing command and control of the unloading of matériel, POLs, and equipment of the landing-support force
- A communication support group providing communication support and coordination with forward units, and the campaign formation communication hub
- An alert service group responsible for force protection

Exhibit 1. Landing Force Logistics Command Organization and Force Composition



Ensuring the survivability of command and support units is an important effort. The PLA expects that units in the main operational direction will be reinforced, but logistics-command and -support units in secondary directions will receive little to no reinforcement. Multiple smaller support units are to be established for redundancy and to prevent overall

paralysis in the event that one group is severely damaged or destroyed. The communication network should be capable of providing stable and resilient communications in a complex electromagnetic environment in which the enemy employs soft- and hard-kill means. Logistics-support command is located at sea during the assault-landing stage, where it relies on vulnerable wireless and satellite communications for command and coordination. Communications can be strengthened through the use of advanced frequency-hopping radio stations, communication discipline, and burst communications; the last mentioned can help to counter enemy jamming, reconnaissance, and interception. The establishment of auxiliary radio stations to attract enemy interference can protect the main radio-communication channels. Radio stations also can be set up to create false communications networks for deception.[14]

Transportation and Delivery

Transportation of forces and matériel for a large-scale landing is a major logistics task requiring strong ground, air, and maritime transportation support capabilities. One PLA source estimates that transportation requirements would be three thousand military trains, one million vehicles, 2,100 aircraft, and more than eight thousand ships to transport troops, equipment, and matériel and evacuate wounded during a large-scale amphibious operation. Another PLA source estimated that 550 to 700 logistics ships, landing ships, and transport aircraft would be required to land matériel on Taiwan.[15] Traffic volume to the southeast coastal embarkation areas and transit across the Taiwan Strait, combined with evacuation of large numbers of casualties, would be unprecedented. Railways, followed by roads, represent the main transportation means to deliver forces and matériel from the interior to embarkation areas along rivers and the coast. Air and waterway transport will supplement movement as required. Enemy fire strikes on bridges and tunnels in mountainous areas, in addition to strikes on airports, ports, and embarkation areas, could cause significant disruption of transportation. These key nodes along lines of communication will require defensive and protective measures.[16]

Theater-command coordination for force projection is complicated. The attempted integration of multiple support forces of the military, national and local governments, and civilian enterprise transportation organizations creates command, planning, and coordination problems. PLA analysts gave an example in an article that discusses the following

commands and organizations coordinating delivery of forces: the theater joint operations command center; the joint logistic support center command; the headquarters of the participating unit(s); national and local rail, road, water, and air transportation dispatch centers (depending on the situation); and civilian enterprises providing mobilized transportation. The joint logistic support center within a theater assists in the planning and use of the civilian and military transportation resources.[17]

A central transportation and delivery headquarters would be established during wartime operations; see exhibit 2 below. It mainly would comprise the transportation and delivery departments of the Eastern and Southern Theater Commands, with augmentation from the PLAAF, PLAN fleets, PLARF bases, and relevant local government departments. The wartime transportation and delivery command system would be established at the strategic (CMC Joint Operations Command Center), theater (joint), and campaign direction levels connecting to subordinate operational forces. The Eastern and Southern Theaters' joint logistics organizations would be responsible for mobilization and distribution of transportation assets, organization of military transportation and mobile support of troops, transportation protection, rush repair, and construction. The transportation and delivery command would be integrated into the operational and logistics command system, but it would remain relatively independent

Exhibit 2. Transportation and Delivery Command Organization

Echelon and Mission	Participating Organizations
Strategic Transport and Delivery Headquarters (HQ) (within CMC Joint Operations Command Center) Mission: Unified transportation plan; mobilization and allocation of transportation; organization of repair; guidance of war zone during emergencies; recommendation of traffic defense measures to operational units	• National Defense Mobilization Department • Logistic Support Department's Transport and Delivery Bureau • Joint Staff Department's Operations Bureau • Traffic management elements of the Ministry of Transport, information industry (telecommunication), civil aviation, and public security
Theater Joint Transport and Delivery HQ (Eastern and Southern Theaters) Mission: Organization and protection of transportation in the war zone; evacuation of wounded; rush repair; coordination with civil transport	• National Defense Mobilization Department • Joint Logistics Support Force • Transportation and communications personnel from other theaters, Air Force, Navy, Rocket Force, and provincial governments and other transportation personnel
Campaign Direction Mission: Assistance of operational groups with traffic control; transportation maintenance and repair	• Eastern and Southern Theater, and Logistic Support Department transportation personnel

at the strategic and campaign levels. A centralized command develops a "transportation plan" (输送方案) and "transportation support plan" (输送保障方案). Mobilization and requisition orders are issued for civilian transportation assets and the refitting of ships. The "wartime augmentation plan" (战时扩编方案) will expand motor transport troops, specialized traffic militia, military representative organizations along traffic lines, combat-readiness departments, and the military catering supply system. The plan also will adjust personnel levels, supplement equipment levels, and clarify deployments and tasks.[18]

The war zone within the Eastern and Southern Theaters represents a complex geographic environment vulnerable to natural disasters. The region is mountainous and contains a dense waterway network of rivers and canals where heavy rainfall can lead to transportation disruptions. There are many mountain roads posing difficulties for the movement of heavy equipment, with few alternative routes in the event of blockage. On Taiwan, the natural environment along the west coast creates complex conditions for landing troops and matériel. Most beaches have difficult compositions, including mudflats with shallow water. On the west coast, ebb tides can leave two hundred meters of mudflats.

Forces and supplies must be landed during a short time span. In the Taiwan Strait, strong winds and high sea states persist for eight to nine months of the year, typhoons develop during half the year, and there are northeast monsoons for three or four months. Ships unloading without a wharf easily can become stranded. Currents mostly run parallel to the coast, which can cause landing ships and craft to miss their intended landing sites and strike underwater obstacles. Fog, which occurs more than ten days per month, can help conceal the landing force, but it also can increase the difficulty of maintaining formations and landing waves in large-scale landings. The PLA assesses that there are many landing areas on Taiwan, but the complex beach, meteorological, and hydrological conditions, combined with Taiwan's defenses, create difficulties for landing troops, equipment, and supplies.[19]

The joint landing and logistics forces require strategic mobility to deploy forces to embarkation areas and across the strait for the landing and on-island operations. Deployment will require large-scale air, road and rail, and water transportation from multiple directions in multiple echelons from the strategic rear area to the coast and to Taiwan. Secondary fronts also will require transportation support in the event of chain reactions. In 2017, the PLA judged its military transportation force to be weak and its infrastructure vulnerable.[20]

Maritime Delivery

Sealift will be the primary link in the logistics chain by which the largest volume of forces and matériel will be transported across the strait. This section will examine elements and issues identified by PLA logistics studies concerning the PLA's ability to leverage maritime transport resources, focusing heavily on civil transport.

The authors of *Operational Logistics Support* assess that the first-echelon force, and likely the second echelon, will need to conduct "shore-to-shore" (岸到岸) landings directly onto the beach, augmented by lightering. This source posits that the first-echelon force will be landed primarily by amphibious landing ships, air-cushion vehicles, fishing boats, and other landing craft, augmented by civilian ships converted to landing ships.[21]

PLA leadership believes that civilian semisubmersible transport vessels could support the landing of amphibious equipment. The PLA also has used semisubmersibles as platforms for army aviation. The ships' large, flat deck can carry amphibious vehicles and air-cushion landing craft for unloading at sea. Semisubmersibles and other suitable civilian ships carrying fuel supplies could use floating or underwater pipelines to pump fuel to the shore. A new stern ramp for a roll-on/roll-off (RO/RO) ship has been observed to be capable of launch and recovery of amphibious armored vehicles, supplementing the landing of forces by other means.[22]

A PLA source recommends developing the capability to unload containers without a terminal. This capability includes the development of auxiliary crane ships and specialized unloading and transport equipment to allow the unloading of containers without a terminal or wharf. This primarily would support the logistics buildup after a logistics forward support base is established.[23]

PLA officials state that the civil fleet lacks the capabilities for amphibious force delivery and equipment and matériel unloading if the following are lacking: a wharf; at-sea roll-off capability; hoisting and load-change capability; or a large-scale sea-to-shore pipeline discharge function. The PLA intends to refit civilian-ships to support the assault landing—specifically, to transform civilian ships into landing ships. In addition, active or reserve specialized technical personnel would be needed to supplement the civilian crews; however, according to a 2014 PLA article, there are insufficient specialized reserve personnel.[24]

The PLA can mobilize large and medium-size state-owned civil shipping enterprises to deliver forces and provide logistics support. There are two methods of civilian-ship mobilization; agreement mobilization is

employed to mobilize civilian ships for nonwar maritime support missions, while compulsory requisition is employed in an emergency to mobilize civilian ships into the active force as reserves. China established the first national maritime strategic-projection support fleet in October 2012, using the China Shipping Group (now merged with COSCO) as a model. The joint logistics force has identified civilian ships built to military specification for mobilization.[25]

The strategic-projection support fleet is a component of the national strategic-projection support force. It is a reserve component formed from large shipping enterprises—for instance, China COSCO Shipping, Hainan Strait Shipping Company, China National Offshore Oil Corporation, and China Shipbuilding Industry Corporation—made responsible primarily for force transport and logistics support. They are formed into a three-tier structure made up of "general corps" (总队), "groups" (大队), and "squadrons" (中队). The civilian fleet also is required to support offshore and open-sea offensive and defensive operations.[26]

PLA experts noted in 2017 that the civilian shipping force needs improved training for wartime operations and training assessment standards to ensure the overall quality of the force. They complain that commercial enterprises are focused more on business than military-related training, and the businesses have not established the training regimen required under the National Defense Transportation Law to support military operations. They have not created training organizations with designated personnel to formulate training requirements and plans, which results in civilian crews lacking the skills required to operate under combat conditions. The PLA leadership made proposals to improve training organization with military training supervision and guidance for the strategic-projection support fleet. These proposals include annual assessments of the civilian fleet to improve quality and the establishment of a training department at the general corps, a training section at the group, and a training group at squadron levels to ensure requirements are met.[27] However, PLA sources do not specify whether any proposals have been implemented. PLA sources also recommend that the PLAN increase the number of training exercises with mobilized civilian shipping on logistics support and wartime operations. Most civilian-ship training with the military involves one or two ships—a number inadequate to meet requirements for a large-scale landing operation.[28]

Exhibit 3 lists possible missions for civilian ships in support of the PLA. Civilian ships require modifications that include the following: deployment of specialized military communications equipment; provision of

Exhibit 3. Possible Missions of Civilian Ships in Support of the PLA

Mission Purpose	Support Task	Applicable Ship Type
Transportation and delivery	Joint implementation of troop, equipment, and material supply transportation support	Passenger RO/RO ships or vehicle RO/RO ships, multipurpose ships, containerships, bulk cargo ships, general cargo ships, oil tankers
	Landing and unloading support for organic units	Semisubmersible barges (ships) or heavy cargo carriers, multipurpose ships or bulk carriers, deck barges, tugboats
At-sea replenishment	Dry and liquid replenishment as a supplement to comprehensive supply ships	Oil tankers, multipurpose ships or containerships
Medical support	Rescue and transfer of patients, early treatment and evacuation support for large numbers of patients as a supplement to the standard medical service equipment	Passenger RO/RO ships (refitted as health transport ships), containerships (refitted as hospital ships), high-speed passenger ships and motorized marine fishing vessels (refitted for rescue), rescue/salvage boats
Engineering support	Assistance in port and wharf repair, channel dredging and obstacle clearing, etc. as a supplement to military auxiliary ships	Tugboats, deck barges, salvage boats
Equipment technical support	Maintenance, towing and other equipment technical support for ship repair, as well as helicopter relay support, etc.	Tugs, semisubmersibles (barges) or heavy cargo carriers, crane boats
Safeguarding of maritime interests	Participation in protecting maritime rights and other support operations	Motorized marine fishing vessels

Source: Wang Hewen, "Thoughts on Promoting Development of Civilian Ship Carrying Out National Defense Requirements under New Situation," p. 23.

living areas for augmented military personnel; medical facilities; improvements to ship structure and performance, such as reinforcing decks or preparing helicopter landing sites; and firefighting and rescue equipment. PLA sources indicate that some modifications could be relatively easy to accomplish, while others would be extensive.[29]

Air Delivery

The PLAAF is fielding and developing larger transport aircraft to support strategic delivery. Air transport can deliver supplies and personnel over great distances more rapidly than other methods, but in smaller quantities. The army aviation force is expanding as well, with new transport helicopters fielded and a heavy-lift helicopter planned to increase delivery capabilities. The Y-20 medium transport entered military service in 2016; it reportedly can carry the fifty-eight-ton Type 99A2 main battle tank. PRC press reports speculate that the PLAAF eventually will receive one hundred to four hundred Y-20s, or even more. Large numbers of this or future large transport aircraft are required if the PLA plans on a significant capability to airlift supplies and forces onto Taiwan.[30]

The PLAAF has studied the U.S. military's use of unmanned vehicles (UVs) and precision air delivery to provide logistics support in Afghanistan.[31] In 2017, the PLAAF began experimenting with delivering supplies to remote units with unmanned aerial vehicles (UAVs). The PLAAF logistics department partnered with the civilian company SF Express to use a medium-size drone to provide supplies by parachute. The PLAAF viewed this experiment as part of the "intelligent battlefield revolution."[32] UVs could provide future emergency logistics deliveries to isolated units on Taiwan. As larger-capacity UVs are developed and deployed, they could become an important method for providing support to the assault-landing force.

The civil air fleet reserve force is an important resource to augment the PLAAF's strategic-projection capabilities, which currently are limited. In 2011, the CMC incorporated the establishment of a strategic-projection reserve force into the Twelfth Five-Year Plan. The PRC began creating a civil aviation strategic-projection support fleet in 2013. This force initially was embedded in China Southern Airlines and China Eastern Airlines, but later other air transport enterprises were included. Currently, there are fifteen civil support fleets based in major airlines to meet increasing requirements for overseas nonwar and wartime operations. The civilian airline strategic-projection support fleet has supported evacuations from Libya and international disaster-relief operations such as the Indian Ocean tsunami and earthquakes in Haiti and Chile.[33]

The civilian airline strategic-projection support fleets include passenger and cargo aircraft. Exhibit 4 shows the PRC's current civilian passenger aircraft numbers by airline. According to PLA experts, as of 2019 the PRC had 143 large and medium-size civilian cargo aircraft that would meet PLA standards for strategic projection. These have a total payload of 6,200

Exhibit 4. Current Major Civilian Airlines and Passenger Aircraft Inventory

Airline Company	Aircraft
Air China	662
China Southern	786
China Eastern	642
Hainan Airlines	740
Xiamen Air	116
Shenzhen Airlines	116
Sichuan Airlines	130

tons and include sixty 737, thirty 757, and twenty-six 777 Boeing cargo aircraft. The indigenous C919 airliner, primarily intended for passengers, reportedly will constitute a large proportion of the future civil air fleet.[34]

Ground Transportation

Rail and road are the main methods for deploying the assault-landing force and supplies to embarkation areas. Air and waterway transport will supplement ground transportation to the coast. Ground transportation will rely on rail for longer distances and the transportation of tracked vehicles, with road transportation for shorter distances and the movement of wheeled vehicles. Large numbers of forces and amounts of matériel will require transportation not only within the war zone (i.e., the Eastern and Southern Theater Commands) but also from the Northern and Central Theaters to the southeast coast. The PLA estimates that tens of millions of tons of equipment and supplies will be transported to the southeast coast. The PLA assesses that 40 percent of rail capacity will be used for the operation, and in special cases up to 60 percent of rail capacity may be used.[35]

Heavy-equipment transporters (HETs) are an important transport asset. Subordinate to the Joint Logistics Support Force and the army, HET units provide strategic delivery of heavy and tracked equipment. These transport brigades and regiments, linked with mobilized civilian equipment, are becoming increasingly important as the PLA mechanizes. Employment of these transportation units requires coordination among multiple military and civilian departments. The PLA inventory includes an unknown number of HETs.[36] The PLA also fields a large, albeit unknown, number of motor-transport brigades and regiments for strategic delivery by road.[37]

Large numbers of civilian HETs would need to be mobilized for wartime employment. Civilian enterprises contain large numbers of HETs, but many, including newly produced vehicles, do not meet military requirements for moving armor. Civilian HETs are not distributed evenly throughout the PRC; instead, they are concentrated in eastern and southern coastal regions, where they can support the movement of armor to

embarkation areas. To make them suitable for military use, semitrailers often require modification by the receiving unit. PLA sources label the vehicle mobilization system immature at present. The PLA assesses that the current numbers of military and civilian HETs are insufficient to support emergency requirements.[38]

Delivery Support during the Various Operational Stages

The joint landing operations can include the following stages: operational preparation, preliminary operations, maritime transit and assault landing, and on-island operations. Each poses different logistics requirements for delivery of forces and matériel.

Operational Preparation Stage

The main task in the operational preparation stage is to deliver troops to assembly areas, operational positions, and embarkation areas on time. The duration of this stage depends on transportation capabilities and the forces and matériel transported. Logistics missions during this stage include supporting the deployment of the PLAAF and PLARF conventional-missile units to implement combat operations; transporting the landing force to embarkation areas; ensuring the adjustment and transportation of joint logistics forces and completing the movement of the required military supplies, POLs, ammunition, medical supplies, and other combat-matériel reserves; mobilizing civilian transport, especially shipping, and completing the refitting of ships to support landing operations; and completing the camouflage and protection of key transportation targets and preparing for rush repair. Mobilization, requisitioning, and refitting of civilian ships take a long time, so they must begin in advance. These logistics missions could provide indications and warning of the impending operation early in the preparation stage.[39]

Mobilizing and refitting civilian ships to make up for the shortfall in amphibious lift also take time, varying with the number of modifications. While the PRC has access to a significant number of civilian ships, they require difficult refitting and crew training to support the delivery of the amphibious landing force. The lack of uniformity and uncertain availability of civilian ships add to the problem of refitting them for amphibious operations.[40]

Preliminary Stage

The preliminary stage includes military deterrence, joint fire strike, and blockade operations. The blockade could last several months as an

independent operation or for a relatively short time as part of the joint landing campaign. By the time the joint landing campaign is conducted, most of the forces and matériel already will have been transported to the coast. The PLA predicts that if the United States intervenes, strikes will be conducted against PRC military targets, large and medium-size cities, important transportation hubs, ports, airports, tunnels, and bridges. Repair forces will be mobilized to support the delivery of the remaining forces on schedule. Defensive measures and camouflage and concealment will be employed to safeguard transportation nodes, ports, airfields, and embarkation areas. Civilian ships will be dispersed and concealed for protection.[41]

Multiple methods and locations will be employed for embarkation to disperse and protect the loading operation. Embarkation will employ large and small ports, military and civilian ports, ocean and river ports, and fixed and temporary embarkation points.[42]

Sea Crossing and Landing Stage

The sea crossing and landing stage is the key to the entire joint landing. Air, maritime, and information superiority are critical for a successful transit and assault landing. According to PLA experts, air and maritime supremacy should be 100 percent against Taiwan, and if the United States intervenes, the PLA should achieve 60–70 percent air and maritime supremacy in the area of operations to protect transiting forces adequately. The PLA identifies four stages of the transit and assault-landing delivery: sea crossing preparation, embarkation, sea crossing, and unloading and landing.[43]

The sea-crossing-preparation stage begins during the operational preparation stage. The mobilization and refitting of civilian ships will have been completed. When the objectives of the blockade and joint fire strike operations are achieved, the transportation and delivery command will establish a joint embarkation command post to command the embarkation command posts for each embarkation area. This joint embarkation command post will organize repairs of ports and wharves; prepare troop assembly and loading areas; add defensive systems and communications equipment to the civilian ships; and prepare cranes, loading equipment, and temporary wharves to support embarkation.[44]

The embarkation stage links up transport ships and units at the dispersed embarkation points for loading. Each campaign formation—a group army–size task force—will have an embarkation area that is subdivided into brigade embarkation zones and battalion-level embarkation points. A sea standby area will be designated for assembly of shipping. The PLA recommends that embarkation be concealed—for example, by loading at

night. Close coordination is necessary among the embarkation command post, the PLAAF, the PLAN, and ground air-defense forces to maintain an effective air-raid early-warning system. Loading and unloading for each landing direction, echelon, and group must be coordinated carefully with the use of returning ships to evacuate the wounded.[45]

The sea crossing stage requires close coordination between the PLAN and civilian ship formations. The transportation and delivery headquarters coordinates with the PLAN in organizing the civilian ship formation. The amphibious task force's transport group commands the transport ships during the transit. The PLAN, PLAN aviation, and PLARF will be responsible for underwater, surface, and air surveillance, and they will provide cover for the transport formations during navigation. The PLA will open a secure transit corridor to the designated landing beaches to maintain air and maritime superiority over the transport formations and eliminate any threat to them. To account for the difference in speed of the civilian ships, the PLA must plan carefully to regulate the correct arrival of the various landing waves.[46]

The unloading and landing stage is the most difficult and intense stage. It requires efficient and rapid landing to reduce casualties and build up combat power on the beach to seize a landing base for the second echelon. PLA experts assess that all the first echelon and most of the second echelon will unload and land without ports. Civilian ships converted into landing ships will unload at the beach with amphibious-assault ships and craft, while other civilian ships will unload at offshore platforms or temporary wharves once constructed. Landing of second-echelon forces will be conducted immediately on beaches where the initial assault force has achieved a successful landing. Follow-on force landings will require flexibility to adjust their landing areas when the initial assault landing is slowed or blocked to avoid congestion and reduce casualties. This will require flexible logistics command and coordination to redirect logistics support on the basis of changing situations.

If possible, second-echelon and reserve forces will land on constructed temporary wharves or in functioning captured ports. Organizing the various landing directions, landing ship groups, subdirections, echelons, and landing waves will require close coordination with the offshore unloading command of the unloading support group. The transportation and delivery command will be mainly responsible for installing offshore-transfer platforms and establishing a technical-support team composed of waterway military representative offices, local shipping companies, technical-support detachments, and port shipping departments to assist in organizing the lightering of forces from the platforms to the beaches.[47]

Campaign logistics support forces will be responsible for the unloading of matériel, equipment, POLs, and other means of support for the assault force. Logistics units will land behind first-echelon brigades. Landing times will be short, because tides and hydrology in the area will impact the ability to resupply the initial assault force. The PLA expects Taiwan's ports to be defended heavily, prepared for destruction, and within range of enemy fire support. These conditions would require initial logistics support to be conducted over the shore. When ports are seized, repairs are expected to be long and complicated. So PLA experts carefully have studied, for instance, the construction of the Mulberry artificial harbors that supported the Normandy invasion. They conclude that multiple and flexible unloading methods would be required to build up the necessary forces on Taiwan. Several methods for landing logistics at the landing site are proposed, including the following:[48]

- Airdrop of supplies using informatized technology employing positioning systems and controllable parachutes for precision airdrops. The PLA states that fuel bladders, medical equipment, and other matériel can be air-dropped, including in palletized form.[49]
- Vertical landing of troops, equipment, and supplies by helicopter to provide urgent reinforcement.
- Air-cushion vehicles to land personnel and matériel directly on beaches that are unsuitable for other landing methods.
- Construction of wharves and ramps for RO/RO ships to provide a relatively high-volume means of unloading personnel and matériel, although they would be vulnerable to enemy fire strikes. Construction of wharves and exit roads from the beaches is considered difficult. Small fishing ports can be used for unloading light equipment and small quantities of supplies once obstacles are removed and a wharf is constructed.
- Pipelines to provide a means to deliver a high capacity of fuel and fresh water from ship to shore. The PLA has high-volume pipelines with short deployment times.[50]

On-Island Combat Stage

During the on-island combat stage, the joint logistics command organization will organize transportation within Taiwan. Tasks during this stage include constructing an unloading base composed of a temporary harbor and repairing damaged enemy ports. Motor-transport units will supply and transport forces conducting operations on Taiwan. Field

medical units will treat wounded and evacuate them first to the logistics base, then back to rear hospitals. The campaign transport and delivery command will organize air and sea transport to and from Taiwan during this stage.[51]

Quickly establishing a logistics forward support base in the main landing direction is critical for creating an on-island support capability that is connected to maritime and air support assets. Enemy fire strikes and counterattacks pose serious threats to establishing a forward support base. According to PLA experts, establishment of the support base will begin approximately two hours after the landing of the first wave of the first-echelon campaign formation. The unloading force should be deployed within six hours to support unloading of the heavy equipment of the second echelon. The base should be set up in a dispersed manner to provide greater survivability, since protection capabilities are weak during the initial stage of the landing. The support base will include a command information system, matériel-unloading systems, and a rear support system performing rescue, transport, repair, and other critical functions. The support base will conduct the following missions:[52]

- Remove remaining obstacles in coastal waters, on beaches, and on land; set up navigation aids; open channels to the beaches; and organize and adjust logistics support.
- Construct and maintain transfer platforms and wharves and repair or construct landing fields for fixed- and rotary-wing aircraft.
- Organize the unloading of follow-on troops, heavy equipment, and matériel.
- Establish service stations to provide food and accommodation for transiting troops.
- Organize equipment maintenance and repair.
- Organize an alert system and deploy ground-based air defenses to protect the support base.

The command organization of the logistics forward support base likely will be located with the rear command post of the first-echelon campaign formation. The commander will be the deputy commander of the rear command post, and the command will be augmented with additional personnel. The command organization will be mainly responsible for planning and preparation, force projection, base establishment and management, advance surveying, coordination of unloading, and various logistics services. Exhibit 5 shows the support base command organization.[53]

Subordinate groups of the logistics forward support base will comprise modular logistics forces reinforced with PLA ground-force and PLAN operational forces. Modular teams will be capable of recombination according to the required scale and changing requirements. The logistics forward support base command will include the following groups, with each group composed of subordinate specialized modules:[54]

- The advance command group probably will be commanded by the base deputy commander, military transportation personnel, and others as needed. The advance command group will land with the first-echelon brigades and be responsible for conducting base topographic survey and site selection, organizing advance troops to repair or construct wharves, and preparing for transportation service.
- The rush repair and construction group will include ground-force engineers, naval and civilian port personnel, PLAAF personnel, and other specialized and technical personnel responsible for organizing and guiding the emergency repair and construction of docks, airports, roads, and other required infrastructure. Subordinate modules will include land and sea obstacle removal, wharf emergency repair, wharf emergency construction, airport construction, road and bridge repair, and mobile support modules responsible for opening and maintaining transportation infrastructure.
- The unloading transport group will comprise combat service, military transportation, and mobilization departments, as well as relevant civilian personnel responsible for scheduling, coordinating, and organizing loading and unloading at ports, temporary wharves, and airports. Subordinate modules will include maritime-support, unloading-service, transfer, and mobile-transportation modules responsible for the movement of heavy equipment and matériel onto and around the island.
- The rear support group will serve as the campaign logistics forward support force, opening field stations and implementing base support for the landing forces. The rear support group will include the multifunctional theater joint logistics support brigades or field service stations, which will provide resupply and early medical treatment, as well as other modules that might provide ammunition, POLs, other matériel, field hospitals, equipment repair, food, and shelter to support troops in the field.
- The service support group will be responsible for the field command and communications structure, adjusting the unloading, lightering,

and transfer of maritime, ground, and air transportation, and organizing maritime, ground, and air alert and defense functions. Subordinate modules will include the command adjustment, alert, and communications-support modules responsible for command adjustment of maritime and land transfer, unloading, maneuver, and other operations of the campaign logistics force.

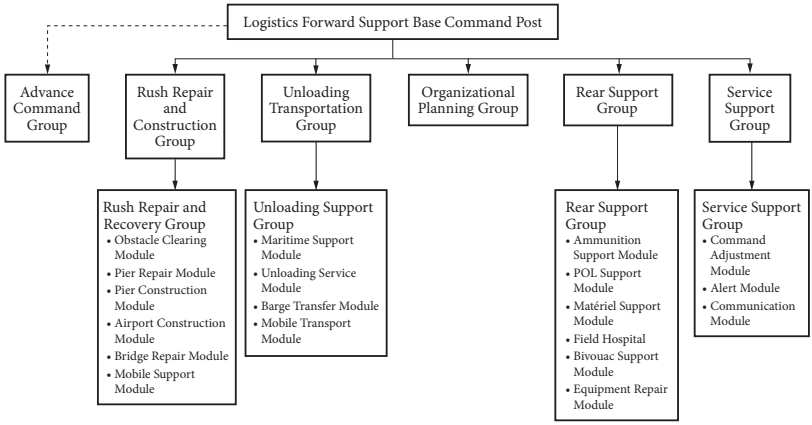
Modular logistics units will provide dispersed multipoint deployment to support forward operational units, all connected by the command information system. Reserves will be formed, including a rear reserve, prepositioned reserve, and mobile reserve. Logistics manpower, equipment and matériel resources, allocation areas, and command locations will be adjusted flexibly according to changing battlefield situations and operational stages to enable continued and stable logistics support. A strong and survivable command information system is critical to maintain command, control, and coordination of dispersed forces on a dynamic battlefield. The command information system will include wired, wireless, satellite, datalink, and other communications means. Multiple redundant nodes will ensure the survivability and continuous operation of the network. The logistics command network will be connected to the operational command information system to maintain coordination with operational units.[55]

The logistics forward support base is critical to the success of the landing operation and requires robust defenses. In addition to reliance on the campaign-level defensive system, the support base also will require the integration of its own defense assets into a regional defense system. Logistics self-defense assets will be deployed on the basis of the nature of the enemy threat and concentrated near high-value targets such as command posts, concentrations of supplies and equipment, and the transportation system. Various cover and concealment methods will be employed to improve the survivability of the support base and logistics units, including camouflage, natural shelter, terrain, vegetation, and civilian buildings. Measures also include antireconnaissance means to protect equipment from enemy optical and radar reconnaissance, decoys and false targets such as false radio networks, and protective field defensive positions.[56]

Unloading Operations

As mentioned previously, the ability of the PLA to off-load large volumes of forces and matériel to reinforce landing zones will be crucial to the overall success of a cross-strait landing campaign. Without it, combat forces already ashore could experience incredible losses. This section will explore in depth how the PLA intends to deliver critical follow-on forces and supplies.

Exhibit 5. Logistics Forward Support Base Command Organization and Force Formation



The PLA believes that it will need to employ multiple methods to land troops, equipment, and matériel. PLA experts discuss various methods for seizing a port but predict that seizing a usable port is unlikely. They believe that Taiwan will defend its ports, destroy critical infrastructure such as cranes, lay land and sea mines, emplace obstacles, scuttle ships at entrances to ports and at wharves, sink containers full of rocks as obstacles, and set flame devices. The PLA will seize ports during the landing operation, but restoring destroyed ports requires an intensive repair and construction effort employing large numbers of personnel and large quantities of matériel and time. Only certain parts of destroyed ports need to be restored initially, although this would include clearing port entrances, removing dockside obstructions, and placing navigation aids. RO/RO ships would need only a suitable gangway for unloading. Roads and bridges leading out of the captured port would require repair to support movement from the port area.[57]

Anticipating limited access to Taiwan's ports initially, the PLA has conducted research on equipment for unloading large quantities of matériel and heavy equipment over the shore. Delivering equipment and supplies across Taiwan's beaches will be difficult because of the defenses and obstacles, potential adverse weather, and natural beach conditions featuring mudflats and soft beach terrain. Civilian equipment-unloading capacity is large and can be mobilized along the southeast coast to support this effort. The relevant equipment includes self-propelled floating crane platforms and vessels that can be moored with engineering barges to form transfer platforms at sea. These transfer platforms can be used to transfer forces and supplies from civilian ships to the platform and to provide lightering

to the shore. Transfer platforms also can be used to support the construction of artificial floating wharves or to repair damaged wharves. Truck-mounted and tracked cranes can be used to unload civilian ships. Bridge or gantry cranes can be transported by special ships to replace damaged cranes in ports.

However, there is little evidence of the PLA training to carry out construction and unloading using floating platforms and temporary wharves under combat conditions. Training realism will be important, as these unloading options are vulnerable to enemy firepower, weather, and sea conditions.[58]

To solve the challenges of over-the-shore logistics support, the PLA could employ artificial floating wharves, beach unloading platforms, or maritime barge transfer platforms. Airlanding of troops and matériel also can augment the buildup of forces on Taiwan.

Artificial Floating Wharf

An artificial floating wharf landing area would include a pier for unloading RO/RO ships and a pier with cranes for unloading cargo ships in a protected estuary or coastal area. When constructed on the coast, floating wharves would need breakwaters to shield against or dissipate waves and minimize the impact of wind and tide. The PLA assesses that it quickly can construct artificial floating wharves to provide an effective means of rapid unloading. Around 2014, the PLA experimented with two five-thousand-ton trestle wharves to construct two temporary piers to unload one armored regiment and an artillery regiment in one tide period. Multipurpose pontoons, floating wharves and floating cranes, engineering barges, semisubmersibles, ground-force bridging equipment and road-mat layers, and other specialized equipment could be used to set up the floating wharf and provide access to and exit from the beach. Wind, waves, tides, beach topography, geological conditions, and natural or artificial obstacles existing on the Taiwan coast would add to the difficulty of choosing the correct location for the floating wharf.[59]

Beach Unloading Platform

Similar to the floating-wharf concept, a beach unloading platform could be used to unload RO/RO ships. Floating or elevated trestle systems with tracked unloading systems or ground-force bridging equipment can provide access to the beach. A location would be selected, considering the natural and artificial environment. A coastal area with relatively steep topography would be required to enable the berthing of large ships, and a breakwater system would be required to protect the unloading platform.[60]

Maritime Barge Transfer Platform

A maritime barge transfer platform could be employed if floating wharves or temporary piers cannot be constructed because of coastal conditions. Large civilian ships could unload forces and matériel at the floating platform; these would then be lightered to the beach. The floating platform would require cranes to unload cargo ships and a RO/RO-unloading platform. The anchorage location would need to meet the requirements of berthing a ten-thousand-deadweight-ton transport ship. As with the other methods, a system would be required to protect the structure from wind and waves.[61]

Airlanding Forces and Matériel

Airlanding can augment the delivery of forces and matériel on Taiwan. Enabling aircraft to off-load also will be a significant challenge. The Taiwan military will defend airports, deploy strong counterattack forces within striking distance, and destroy airport infrastructure to deny the PLA their use. The PLA will attempt to repair damaged airports or construct landing fields for the airlanding of troops and supplies. Specialized logistics units with attached engineering assets will undertake this mission. The airfields will be vulnerable to defending firepower strikes and counterattacks. Reconnaissance teams will help to assess the situation of the damaged airfield or intended landing site to support the development of a repair or construction plan. Other personnel will be required to remove unexploded ordnance and mines to allow for repairs to runways and infrastructure. In addition to runway repairs, navigation aids and lights will be set up, and water supply, power sources, and communications will be installed.[62]

Matériel and POL Supply

The large number of participating units and the high intensity of combat during the assault landing will require the sustained, continuous, high-volume supplying of ammunition, engineering explosive equipment, and POLs to the beach—a great stress on logistics support. PLA analysis of consumption rates estimates that large-scale landing operations will require around thirty million tons of various types of combat matériel and fifty-six million tons of oil in total from start to finish. The ability of the logistics force to maintain a continuous flow of supplies directly affects the combat capability of the assault force and can determine the success of the landing. PLA experts stress the employment of helicopters, precision airdrop, or UVs to provide supplies as a component of a multidimensional

delivery system. For the near term, these methods would appear suitable primarily for emergency support (owing to the system's limited capacity) rather than for delivering large quantities of ammunition and POLs.[63] The future fielding of large-capacity unmanned systems could increase the delivery means for logistics support.

Each operational stage presents different support requirements. A joint blockade operation could be long, requiring large quantities of matériel and POLs delivered at sea by comprehensive supply ships, oil tankers, and mobilized civilian ships. The PLA estimates that a blockade in support of a joint landing campaign would be shorter than an independent blockade. The joint fire strike operation is relatively easier to supply from mainland bases supporting the PLARF and PLAAF. High-intensity assault-landing operations will have high consumption rates of ammunition and POLs, with high casualty and attrition rates. These conditions add to the difficulty of resupply from the sea without a port or temporary landing facilities.

Intervention by the United States and possibly other countries would increase significantly consumption rates by the PLAN, PLAAF, and PLARF. A blockade of the PRC, international sanctions, or embargo could impact the availability of resources, especially of POLs, requiring rapid mobilization of the national economy and resupply from foreign sources. However, according to PLA sources, the National Defense Mobilization Law does not address matériel mobilization specifically. The PLA considers matériel-mobilization capabilities relatively solid, but meeting the needs of a large-scale conflict would stress the system. A long support-preparation stage would be required to ensure the availability of resources required for the joint landing operation, possibly providing indications and warning to the adversary.[64]

PLA officials state that matériel support has improved at the strategic, campaign, and tactical levels by combining fixed and mobile support and multidimensional support, augmented by mobilized forces and equipment. However, support for a large-scale operation presents problems because the PLA possesses too few support forces in general, including transport units, specialized forces and equipment, and reserve units. PLA experts also believe that the military suffers from relatively weak maritime and air support forces that do not meet the requirements of large-scale conflict effectively. Influenced for decades by the strategic concept of coastal defense, the PLA's shore-based support forces are relatively strong, compared with weak maritime mobile support forces and supply ships and backward matériel-handling capabilities that lack mechanization and intelligent technologies. Strategic and campaign emergency support forces are small, and the support brigades in each theater are not sufficient in numbers,

capabilities, and training to provide adequate emergency mobile logistics support. According to PLA experts, the tactical-level matériel support force is adequate. However, reserve support forces are not standardized, and training does not meet the requirements of actual combat. They conclude that it will be difficult to meet the matériel-support requirements of a future large-scale operation.[65]

Key PLA sources note that matériel and POL supply will focus on combining fixed-point and accompanying mobile-support methods. A combination of level-by-level and skip-echelon support will be used, with a reliance on the latter. Flexibility is key to ensuring the timely and uninterrupted flow of supplies down echelon. Intermediate links in the logistics system should be reduced as much as possible to create a relatively flat system for rapid resupply.[66]

A large-scale landing will require vast amounts of POLs. Using PLA analysis of recent conflicts, fuel consumption can account for more than 70 percent of logistics matériel. Both military and civilian POL support would be required. Consumption rates are made using careful calculations derived from numbers and types of equipment, usage, and duration of each operational stage. The PLA does not believe the current structure and layout of fuel reserves is adequate. Furthermore, a chain-reaction conflict with India, on the Korean Peninsula, or in the South China Sea would require additional fuel reserves for those secondary conflicts. The PRC relies on foreign oil, with nearly two-thirds of imported oil passing through the choke point at the Strait of Malacca. An enemy blockade would result in a national oil shortage and seriously affect military fuel supplies. Recently the PRC increased oil stockpiles to approximately one hundred days of reserves, and it has constructed underground petroleum reserves and filled the available reserve storage to address this issue.[67]

A joint POL command would be created with personnel from the CMC joint logistics department; theater commands; PLAN, PLAAF, ground forces, and PLARF; and other relevant government organizations. The CMC-level command is responsible for overall planning, organizing, and coordinating POL support at the national level. Each theater-level, joint POL command includes personnel from the theater; PLAAF, ground forces, PLARF, and fleet; and relevant local departments. The theater command (Eastern or Southern) is responsible for implementing joint POL support within the war zone. Operational groups or campaign formations would form a corresponding POL command organization to organize and coordinate POL support to subordinate operational units.[68]

Theater rear-area oil depots form the backbone of the POL organization, supported by the basic support force composed of field oil-pipeline

units, emergency oil-support battalions, and other mobile-support forces. Local oil-support forces will augment these forces. In a Taiwan-invasion scenario, modular units would be organized to form emergency oil-station teams, oil-pipeline units, field oil-depot units, oil-depot rush units, airport oil-support units, and field oil stations for mobile support.[69]

Each element or phase of the joint campaign will entail unique POL support requirements. Joint fire strike POL support primarily meets the needs of conventional missile and aviation forces. The operation will be high intensity, with an urgent and heavy mission to provide vast quantities of aviation fuel. Support for blockade operations mainly would focus on the PLAN, PLAN aviation, and PLARF. An air and maritime blockade involving extended operations could consume large quantities of POLs. Support for large numbers of naval forces would be the main task, with at-sea replenishment difficult to accomplish under combat conditions. Support for the assault-landing operation will have high requirements for POLs, with delivery to and over the shore difficult to carry out during combat to overcome the beach defenses and seize a beachhead. First-echelon forces will rely on organic POL support, with the landing of the second echelon greatly increasing demand. The joint logistics force will land on the island and establish a POL forward support base under the rear support group of the logistics forward support base. Pipelines from ships can provide fuel to the support base. Army aviation can lift fuel bladders to the island to provide emergency support. The PLA assesses that on-island combat will be of short duration and limited scale, lowering logistics requirements during this stage. However, emergency support missions will be complicated by the complex terrain and destroyed or damaged infrastructure on Taiwan.[70]

Ensuring stability of POL sources is a strategic issue, and the possibilities of blockade, sanctions, and an embargo all complicate the situation. According to PLA sources, the PRC needs to increase oil reserves to meet wartime requirements, reduce its dependence on foreign countries for wartime crude oil, accelerate diversification of foreign oil sources, and reduce its dependence on maritime strategic choke points. This has occurred to some degree with the construction of oil pipelines and alternative routes for oil imports. But PLA experts believe that it must increase reserves of refined fuels for ships and aircraft and capacity for emergency production by refining enterprises. At the military level, increased construction and expansion of POL support bases are required. To simplify POL support, PLA experts argue that military-equipment fuel types should be standardized and augmented using alternative fuels. To support POL supplies for blockade and assault-landing operations, large-capacity amphibious tracked

refueling vehicles are needed. The field oil-pipeline network should be established to provide direct support between rear oil depots and military-port oil depots. Shore-to-sea refueling capacity needs strengthening, with PLAN oilers and comprehensive supply ships providing additional support and civilian ships providing fixed-point resupply along the navigation channel. Ship-to-shore support for the landing force initially will be derived from amphibious resupply vehicles and fuel barrels, followed by fuel pipelines and depots established to support on-island combat.[71]

POL support for the landing operation will require well-trained specialized forces. However, PLA experts believe there is a gap between the existing specialized POL support force and the requirements of a large-scale landing operation. There are too few personnel dedicated to providing mobile POL support; thus, specialists would have to be pulled from oil depots, which would weaken those depots' capabilities. Moreover, there are too few field oil-pipeline units to support requirements. Reserve POL support units and local support forces, which might not have adequate training, would need to be mobilized to meet shortfalls. Additionally, POL infrastructure and supply forces are vulnerable and require protection. An emergency-repair force, an alert system, defensive measures, and camouflage and concealment would be required to protect and restore oil support during combat. National mobilization would be required to provide sustained strategic POL support for the operation.[72]

Combat Medical Treatment and Casualty Evacuation

The PLA places great emphasis on the rescue, medical treatment, and evacuation of casualties; it views them as important to maintaining troop morale. And they will be needed, given that unit concealment will be difficult, leading to high casualty rates. In *Operational Logistics Support,* the authors estimate that 120,000 casualties could occur during a large-scale operation. The nature of air and naval blockade operations and support for the sea-crossing and landing operations will lead to a need to rescue personnel at sea. The vast maritime operational area, along with its difficult sea and weather conditions, will add to the complexity of maritime SAR. In 2017, the PLA assessed that its joint SAR force was weak and poorly organized and trained. Additionally, the frontline PLAN medical support force was considered weak.[73]

To ensure the survival of personnel who end up in the sea, it is necessary to rescue them quickly. For each formation, SAR is performed primarily by

ships that are part of that formation or by ships immediately adjacent to it. The PLA intends to establish integrated military and civilian SAR forces, to create a three-dimensional SAR system, and to standardize rescue procedures. This system would divide the Taiwan Strait into a series of grids, with each warship responsible for performing SAR operations in its section. PLA experts argue that to ensure rapid response during wartime, SAR organization and planning to determine the composition and operations of SAR forces need to occur during peacetime. The PRC military must improve its warships' rescue and medical capabilities, and it must create an independent medical-support and a limited surgical capability.[74]

During the landing stage, casualties will be high and will include severe compound injuries and burns. Adverse weather, hydrological conditions, and enemy attacks will increase the difficulty of treating and evacuating wounded at the landing site. The PLA believes that battlefield first aid at the battalion or company level needs to be implemented within ten minutes of injury, emergency treatment at the brigade level within three hours after injury, and preliminary treatment at a brigade medical aid post or field hospital within six hours. Campaign logistics will be responsible for conducting evacuation to medical institutions. The PLA considers combat-medical forces at all echelons to be insufficient at present, requiring reinforcement to improve battlefield first aid and emergency treatment. During the assault-landing stage, casualty evacuation will be difficult and time-consuming, placing great importance on forward medical-support units.[75]

The PLA believes that joint logistics medical capabilities are relatively strong, capable of establishing forty-six field hospitals and forty-three brigade medical aid posts and processing thirty-six thousand patients a day. Military rear hospitals will be able to admit seventy thousand patients after wartime expansion. Local medical facilities will provide additional support. Field medical equipment has improved, and medical supplies can support up to six hundred thousand troops. Combat-medical support can meet the needs of eighteen thousand wounded at one time, and wartime medical reserves can support up to five hundred thousand troops for thirty days. The PLA believes that the wounded will account for approximately 70 to 80 percent of total casualties.[76]

During the blockade stage, casualties caused by enemy strikes primarily will occur in the PLAN and PLAAF, although there will be others associated with ground-based and civilian targets. Rescue of downed pilots and sailors at sea is an important mission during a blockade. PLA experts believe that PLAN medical-evacuation assets are weak. The PLA assesses that the assault-landing stage will account for about 60 percent of

total casualties, with on-island combat accounting for 27 percent. Several medical aid posts and a specialized casualty forward rescue group will be established on each landing beach. Brigade, battalion, and company medical organizations will provide support during on-island operations. Campaign medical organizations will reinforce tactical-level medical support until field hospitals are established on Taiwan.[77]

Infrastructure Support

Logistics infrastructure support—which includes construction, maintenance, supply, camouflage and concealment, and emergency repair—is an important logistics mission. Airfields, military ports, field positions, and rear warehouses are parts of the basic infrastructure required for large combat operations. During the preparation stage, support is required for forces in deployed positions and assembly areas. Requisitioning of civilian buildings and houses provides quarters, as well as dispersal and concealment, for troops. Logistics-support forces will need to conduct urgent, emergency repair to command facilities, airports, wharves, power grids, depots, and battlefield positions.[78]

Infrastructure support during the strategic-deployment stage includes support for troop movement and assembly. The sea- and air-blockade stage will require expansion of airports and wharves and continuous field- and shore-service support. The joint fire strike stage will require emergency construction, repair of damaged facilities, and facility protection and camouflage. The landing stage will require support to ensure provision of water and power supplies, and forces will need to rush repair and construction of airfields and other important facilities.[79]

Although preparations for an emergency operation against Taiwan began in 2001, the PLA assessed in 2017 that the support of battlefield facilities was inefficient. Existing infrastructure was constructed mainly for defensive operations, with a lack of large operational bases and support bases to meet the requirements of large-scale offensive operations. Existing airfields, military ports, and wharves require modernization and upgrades, according to PLA sources. The PLA also assesses that its ability to camouflage and otherwise protect existing infrastructure is low.[80]

War Reserves

Weakness in war-matériel reserves is a critical logistics limitation for the PRC. The PLA assesses that the PRC's war-readiness matériel reserve is

insufficient to support a large joint landing operation, and intervention by the United States or chain-reaction conflicts in other directions would stress war reserves further. Consumption standards for combat against Taiwan were formulated in the first years of the new century to guide the strengthening of war reserves; however, revision of the consumption standards had not occurred by 2017, despite force modernization and updating of combat doctrine that had occurred. The fielding of new weapons and equipment and the development of new operational methods require revised consumption standards to support planning and maintenance of sufficient war reserves. It is unclear whether the PLA has revised consumption rates since 2017. The PLA assesses that improvements have occurred in recent years; however, the matériel reserves are designed primarily to meet nonwar military operations such as disaster-relief and stability-maintenance operations, although they could meet the requirements of a medium-scale conflict. The PLA estimated that the amount of reserves in 2017 could not meet the requirements of a large-scale war; first-line depots are described as empty, second-line depots are considered weak, and third-line depots are far from the front line. Reserves of new and advanced matériel are not established fully, while old matériel accounts for a large portion of the war reserves.[81]

According to PLA experts, matériel reserves in the main strategic direction and frontline tactical areas need strengthening. The military also must improve its capability to move supplies rapidly to the threatened direction, as well as to increase the volumes of military matériel and civilian high-tech and general material. Civil-military integration officials need to plan systematically and coordinate military and local reserve missions. The PLA planned to strengthen matériel reserves along the coast to form a large-scale support capability by 2015 and to accelerate construction of the scale and layout of the depot system by 2020, but the statuses of these plans are unknown. The turnover of old reserve matériel has been hampered by bureaucratic barriers. Old matériel needs to be eliminated and new matériel reserves must be acquired to support "trump card" weapons and equipment, such as precision weapons; informatized equipment and mobile systems; and specialized matériel for combat in complex terrain, such as the Indian border. PLA experts believe that improved coordination between national strategic-matériel reserves and economic-mobilization departments is required to maintain reserves of items that cannot be manufactured quickly, such as special matériel with high technical content and material with high military and civilian versatility.[82]

Modernization: Precision Logistics Support Using Information and Intelligent Technologies

The CMC's military strategic guideline in the "new era" is guiding national defense modernization—including logistics construction—to fight and win wars. This guideline includes improving logistics capabilities for transportation and delivery, battlefield matériel supply, medical support, infrastructure support, and war reserves. PLA experts assess that logistics problems are being resolved incrementally, but solutions to some of the problems remain difficult and represent bottlenecks in supporting a large landing operation.[83] The PLA believes that information and intelligent technologies enabling a precision logistics capability can resolve some logistics challenges associated with supporting a large-scale landing operation. Traditional passive logistics-support methods, slow execution, bloated staffs, complex management, and bureaucratic barriers represent inherent problems restricting improvements in logistics efficiency. To overcome these impediments, PLA logistics is attempting to transition from a traditional system to achieve a more flexible and mobile capability. PLA logisticians are testing an intelligent logistics system using artificial intelligence technology to improve planning and decision-making. The PLA also is experimenting with unmanned delivery systems that could provide emergency support in the near term and important logistics support in the mid- to long term if and when larger-capacity UVs are deployed to the force.[84]

To address logistics weaknesses, the PLA is investing in new—at least new to the PLA—technologies to improve precision logistics support. PLA logisticians believe these technologies will provide for a modern precision logistics system that can support operations better. These technologies include intelligent-driving and autonomous vehicles; automatic identification technologies; data-mining technology; the Internet of things; big data; cloud computing; and 5G mobile communications. The PLA believes that intelligent logistics can support timely decision-making and enhanced precision logistics, such as monitoring combat-logistics requirements, casualties, warehouse allocation, sorting and packing, automatic loading and unloading, and rapid long-range delivery.[85]

Informatized logistics equipment can accelerate the response time that is critical for the first-echelon landing force when consumption of ammunition and POLs is high, casualties heavy, and logistics forces few. Informatized systems can increase logistics efficiency by collecting and transmitting information in real time, forecasting combat-unit requirements, providing support in advance, reducing redundant links, improving

response time, providing combat-unit locations on the battlefield, and integrating logistics forces into a system of systems.[86]

PLA experts believe that employment of multiple delivery methods can increase the efficiency and response time of matériel supply. Ground transportation, including the integration of UVs, will remain the main method of providing high-capacity support. Precision airdrop of supplies can reach isolated units and provide emergency support. This is especially true for airborne and special-operations forces in the enemy rear area. Helicopters or unmanned aerial vehicles also can support distant units and conduct emergency evacuation of wounded personnel. Air-cushion vehicles and wing-in-ground-effect vehicles can land supplies on beaches that are difficult to access by other means. Deployed pipelines are a stable and efficient method to transport POLs and fresh water to the forward area. Pipelines can be employed from ship to shore and from the shore inland.[87]

The PLA assesses that its ability to support a large-scale offensive operation is improving but that weaknesses persist in every mission area. Significant deficiencies exist in transportation and war reserves. Certain circumstances would create additional requirements and stress for logistics—for example, intervention by the United States could change the nature of the conflict from a war of quick decision to a protracted war and expand the area of operations. A chain-reaction conflict in the South China Sea, at the Indian border, or on the Korean Peninsula would require logistics support in additional areas. A blockade, international sanctions, or an embargo would force national mobilization. War-matériel reserves—especially oil—would need to be stockpiled in advance, along with other strategic matériel and resources. The PLA's assessment of the characteristics of future war includes the following: dispersed mobile forces, high consumption and destruction rates requiring highly mobile and responsive support units, and just-in-time precision logistics employing a highly integrated command information system.

Logistics command, coordination, and organization of forces is complex. The PLA believes that the repeated reorganization of the logistics forces has caused internal frictions, complex coordination issues, low proficiency, and difficult organizational and command issues affecting response times and the efficiency of wartime logistics support. The dual logistics system of the Joint Logistics Support Force combined with the service logistics system creates command-and-coordination issues when supporting a large-scale conflict. Adding to this complexity is the need to coordinate with government agencies and civilian enterprises to accomplish mobilization, requisitioning, repairs and construction, and transportation.

Wartime-logistics functional areas establish separate command networks from the strategic to the campaign levels that could lead to coordination problems during a dynamic, large-scale operation.[88]

The lack of a full system-of-systems operational capability linking all the services and branches into an integrated entity creates connection problems between operational commands and the logistics system. The PLA assesses that the informatization level remains relatively low in the areas of automation, information systems, and intelligent technologies. The command information system of the logistics forces does not meet requirements for major combat operations. Logistics command information system problems can disrupt logistics plans and missions, adversely affecting operations. These disruptions can hamper communications among command levels, front and rear support elements, and logistics and operational units. To address these issues, the PLA is developing a precision logistics capability using the logistics integrated command platform to provide just-in-time support to operational units, but it is unclear how far these efforts have progressed.[89] PLA experts believe that each logistics mission area has weaknesses. They argue that the greatest weakness involves the delivery of forces and matériel across the Taiwan Strait to defended beaches without the option of unloading at a port. The landing stage would see the highest destruction rates and the heaviest consumption of ammunition and POLs. The PLA plans to establish floating transfer platforms and temporary wharves to enable civilian ships to support the logistics force. Enemy strikes, weather, tides, and beach conditions add to the difficulty of this operation.

The PLA regards mobilization of civilian shipping and aircraft as a problem, despite the guidance of the National Defense Mobilization Law and National Defense Transportation Law. Civilian maritime, air, and ground transportation do not meet military requirements adequately. Civilian crews are not trained for combat operations, and they receive only limited training with the PLA under large-scale combat conditions.

The lack of war-matériel reserves presents another significant impediment to supporting a large-scale offensive operation. War reserves have been established to support disaster-relief and internal-stability operations. They are not stocked to support modern forces, weapons, and equipment for a large operation. Much of the matériel is old and includes stocks of parts for demobilized equipment. The PLA's modernization requires replacement of older reserve equipment and spare parts to support the modern equipment now deployed in the force. The current depot system is not appropriate to support a Taiwan invasion, especially if the conflict were to become protracted. Stockpiling oil and other strategic resources would be necessary in the event of escalation and protracted war.

SAR, medical support, and evacuation of the wounded are important missions that can affect morale. Rescuing casualties at sea will be difficult in a large area of operations, especially given the possibility of poor weather. The PLA assesses maritime SAR assets as being too few to support a large combat operation. Some areas of medical support are assessed as adequate, but field medical support needs improvement. The PLA is stressing field medical aid during training, but not for a large-scale amphibious operation.[90]

Infrastructure support is critical for deployment of forces and matériel to embarkation areas. The PLA believes that enemy strikes will damage or destroy key nodes, requiring repairs. The PLA currently lacks the necessary units for transportation protection and emergency repair for the rail, road, air, and waterway transportation systems spread over four theater commands. The PLA has inadequate transportation-repair forces, with the wartime emergency-repair mission depending on local transportation engineering enterprises that are ill prepared to conduct large-scale emergency-repair operations. PLA experts believe that these problems can be solved by establishing and training local emergency-repair teams and reforming the enterprise militia-management system. As of 2017, the military had not created a reliable emergency-response plan.[91]

The PLA assesses that even after years of construction in the main strategic direction (i.e., the area facing Taiwan), infrastructure capabilities still are insufficient to support major combat operations. The PLA believes that airfields and ports have poor layouts and throughput capacity, with inadequate support facilities for new weapons and equipment. In 2017, PLA experts concluded that only 55 percent of the airfields had special railway lines for replenishment of oil, ammunition, and other matériel. The PLA believes that many navy ports do not have the capability to support multiple ship types and do not meet the needs of high-intensity combat support. Only Fuzhou, Quanzhou, Xiamen, and some other ports in the war zone have the required heavy lifting equipment. Protection and camouflage of air and naval facilities are considered poor, with more than 80 percent of the airfield and port facilities exposed aboveground. Early-warning and special-aircraft and missile units are not considered to be well protected. Transportation lines in the area of operations are vulnerable because they contain many viaducts and tunnels that can be damaged easily and are difficult to repair.[92]

At this time, PLA logistics capabilities likely cannot support a large-scale invasion of Taiwan. The PLA would have to initiate a significant effort to improve the multiple areas limiting logistics support. Depending on

the pace and scale of efforts to improve logistics capabilities, the project likely would take at least several years once started. Such a crash effort could provide early indications and warning of an intention to invade Taiwan. Alternatively, if the PLA maintains a slow, methodical approach to logistics modernization, it could take at least a decade to achieve a capability to support a large-scale amphibious landing on Taiwan.

Notes

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6. Ibid.
7. Ibid., pp. 28, 39.
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9. Ibid., pp. 29, 38, 66, 192–96.
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18. *Operational Logistics Support,* pp. 98–99, 169–70.
19. Ibid., pp. 94–95, 137; Chen, Ren, and Wang, "Problems and Countermeasures of Sea Crossing," pp. 166–69.
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Ian Easton

15. Hostile Harbors

Taiwan's Ports and PLA Invasion Plans

On 18 February 2016, Chinese Communist Party (CCP) heavyweights gathered in Shanghai to witness the birth of a colossal maritime-logistics conglomerate. Under the watchful gaze of Politburo members, local party leaders, and central government representatives, China COSCO Shipping Corporation emerged onto the watery scene.[1] Created by the unification of COSCO (China Ocean Shipping Company) Group and China Shipping Group, Beijing's newest state-owned enterprise controls over one thousand ships, forty-six containerports, 190 berths, and a legion of subsidiaries around the world—including at least four on Taiwan.[2]

CCP committees in charge of implementing the national military-civil fusion strategy of the People's Republic of China (PRC) highlighted the COSCO megamerger.[3] Everyone who was anyone in the party-state understood what the future held for Taiwan and why one day the military might need access to those ships and ports. Since 1993, the annexation of (or "reunification" with) Taiwan—an independent country also known as the Republic of China (ROC)—had been driving China's military buildup. People's Liberation Army (PLA) doctrine referred to the conquest of Taiwan as China's "main strategic direction."[4]

War across the Taiwan Strait was hardly inevitable. It seemed possible, and at times even likely, that an interlocking campaign of political warfare

undertaken by various CCP operatives—men and women posted worldwide in a broad array of front organizations, associations, and companies—might be able to subvert Taiwan's democratic government and bring the island nation down without a fight.[5] Yet their success was uncertain. And if the CCP's propagandists, liaison workers, united front workers, intelligence officers, and psychological warriors all failed, the military had to be ready to use overwhelming force.[6]

The PLA war plan came in several flavors, most of them combining mental coercion with bold notes of physical destruction, involving operations in the electromagnetic, air, and sea domains. Beijing's military planners assumed that strikes and blockades alone would not be sufficient to force Taipei's surrender.[7] At some point, Taiwan would have to be invaded and occupied, and this would require a huge fleet of troop transports.[8] Some ships could be off-loaded directly onto the island's beaches, but the vast majority would require access to ports on Taiwan to disgorge their lethal loads.[9]

Here, strategic planners in Beijing faced an interesting problem: how to justify the military's intervention into an ostensibly civilian logistics force. PLA uniforms would be a bad look—counterproductive in an increasingly interconnected, globalized world full of statesmen and business leaders who had to remain convinced that China's intentions were peaceful. How could they keep the military behind the scenes while simultaneously ensuring that COSCO Shipping and other strategic enterprises would be ready to execute their wartime orders if and when the time came? Enter the lawyers.

On 1 January 2017, the PRC National Defense Transportation Law went into effect. Among other things, it mandated that all China's basic infrastructure and related transportation platforms henceforth would be treated as military-civil fusion assets. At the CCP's discretion, they now were required legally to be designed, built, and managed to support future military operations. In the event of conflict, they would be pressed into wartime service; in the present, during peacetime, they had to prepare accordingly.[10] Later that same year came the PRC State Intelligence Law, which declared that all Chinese companies had to cooperate with Beijing's intelligence operations—indeed, that there was no legal way for them to refuse. The law demanded that companies cover up intelligence-related activities, keeping them secret, to ensure that the targets of CCP exploitation (foreign customers and business partners) never would know they were being spied on.[11]

Of course, companies in the PRC never really had been independent legal entities capable of saying no to the Communist Party and its armed wing. The CCP has a long history of using civilian fronts to conduct military operations and collect intelligence of strategic value.[12] Companies in China

have no rights beyond those the party-state has allowed to them. For its part, the CCP sits above the law and uses it to enforce its own will.[13] Now Beijing was presenting that fact in stark terms.

These new laws did not state why the CCP felt that such drastic measures were needed; that explanation would be left to internal PLA documents. One such text made the benefits of military-civil fusion plain, noting that the Chinese military now could exploit over two thousand global-transport ships, 650,000 merchant marines, and one thousand subsidiary organizations for power projection. Moreover, because the CCP either directly or indirectly controlled over one hundred foreign ports, those, too, could be exploited for military purposes. The COSCO Shipping collective was merely the tip of the iceberg. The CCP was building a mammoth logistics complex aimed squarely at defeating Taiwan and the United States.[14]

This chapter will explore the following questions: How is the PLA preparing to exploit existing port facilities on Taiwan to support an island-invasion campaign? What are the assumptions guiding these preparations? On the basis of known PLA assumptions and other factors, which ports on Taiwan might be targeted for seizure in the event of an invasion, and why?

The Ultramega

At the beginning, it seems important to acknowledge five fundamental points about a Taiwan invasion scenario, and to remember them as we examine the finer details.[15] Without this baseline, we might draw flawed conclusions regarding the central role that ports likely would play in Chinese amphibious operations.

First, the scale and scope of an all-out Taiwan invasion almost defy human comprehension. We cannot see such an endeavor clearly in our minds because nothing like it ever has happened before; no point of comparison or juxtaposition exists. Our natural impulse when thinking about such a future amphibious operation is to look to the past, but no similar historical event has occurred. The leading potential candidates, Operation Overlord (D-day in Normandy, France, in 1944) and Operation Iceberg (the Battle of Okinawa, Japan, in 1945), were each only a fraction of the size this operation probably would be, and far less complex.[16]

Second, history's grandest amphibious operations were relatively simple affairs in terms of the geographic and human battle spaces. The Normandy landings occurred in rural France along a relatively flat, fifty-mile beachfront. The famous bluffs overlooking Normandy's beaches were only

100–170 feet high, and the coastal area had been evacuated of civilians, making it a free-fire zone. The Battle of Okinawa unfolded on a tiny island sixty-six miles long and seven miles wide, with a civilian population of around three hundred thousand. Okinawa's highest point is Mount Yonaha, a mere 1,650 feet in elevation. Both Normandy and Okinawa were lightly garrisoned.[17]

In sharp contrast, Taiwan is an extremely rugged, heavily urbanized nation of 23.6 million people, most of whom live on the main island, which is 245 miles long and ninety miles across at its widest point. Taiwan is made up of over a hundred islands, most too tiny to see on a map; but many of the outer islands bristle with missiles, rockets, and artillery guns, and their granite hills have been honeycombed with tunnels and bunker systems. The main island of Taiwan has 258 mountain peaks over 9,800 feet in elevation.[18] The tallest, Yushan (Jade Mountain), is just under thirteen thousand feet high.[19] Unlike Normandy or Okinawa, the coastal terrain here is easily defensible. Taiwan has only fourteen small invasion beaches, and they are bordered by cliffs and dense urban population centers. Linkou Beach near Taipei provides an illustrative example. Towering directly over the beach is Guanyin Mountain (2,020 feet); on its right flank is the Linkou Plateau (820 feet); to its left is Yangming Mountain (3,590 feet). Structures made of steel-reinforced concrete blanket the surrounding valleys. Taiwan gets hit frequently by typhoons and earthquakes, so each building and bridge is designed to withstand severe buffeting.

While this geography itself is extreme, the landscape also is thick with armed defenders. In wartime, Taiwan could mobilize a counterinvasion force of at least 450,000 troops, and probably far more. While Taiwan's standing military is only around 190,000 strong, it has a large reserve force composed primarily of recent conscripts who have received basic training. In 2020, Taiwan's then defense minister estimated that 260,000 reservists could be mobilized in a worst-case scenario to augment active-duty personnel. This appears to be a conservative estimate. Over two million men on Taiwan are in the national reserve system, along with a large number of registered personnel in civilian agencies and companies: airline personnel, bulldozer operators, construction workers, truck drivers, bus drivers, fishing-boat crewmembers, firefighters, police officers, and others.[20]

Third, were a battle for Taiwan to occur, it would involve other complexities that are vitally important but "squishy," meaning that they cannot be quantified satisfactorily. It would be the first country-on-country war in which both attacker and defender had in their arsenals modern, long-range missiles capable of cracking open ships and devastating land targets

with precision from hundreds of miles away. No one actually knows what such a fight would look like because it never has happened before. Both sides would have advanced cyber weapons, electronic-warfare suites, smart mines, and drone swarms that never have been tested in real-world combat. Both would have satellites and at least some ability to attack satellites. Both would have economic leverage to use and the ability to cripple the other's economy. Both would have large numbers of its citizens living in the other's territory, some of whom are saboteurs and spies (and some of those double agents). Both would have the fearful option of using weapons of mass destruction to disperse biological, chemical, and radioactive agents against the other. And both might apply more-exotic weapons, such as directed energy weapons and hypersonic missiles.

The most critical question, of course, is what the United States would do. It seems logical to assume that the White House would send aid to Taiwan. Whether the president at the time would order American forces to defend Taiwan is unknown. According to the Taiwan Relations Act of 1979, the U.S. military must expect to defend Taiwan and prepare accordingly. To date, there is no historical case in which an American president failed to send forces to support the defense of Taiwan in response to a crisis.[21] If this track record is indicative of future performance, the United States is almost certain to defend Taiwan in the event of a Chinese attack.

In a time of crisis, American leaders likely would surge overwhelming national resources to the Taiwan Strait area and make their commitments to Taiwan's defense more explicit, in hopes of convincing the PRC to de-escalate tensions. Unlike the U.S. military, the PLA has not seen combat since 1979; nobody serving in China today, except a handful of geriatric generals, has any combat experience.[22] Equally important, the Chinese military does not train very often in realistic, highly complex environments.[23] These two facts call into question whether the PLA could pull off a complex invasion operation successfully.[24] If the United States came to Taiwan's defense, few experts would give China good odds—at least in the near term.

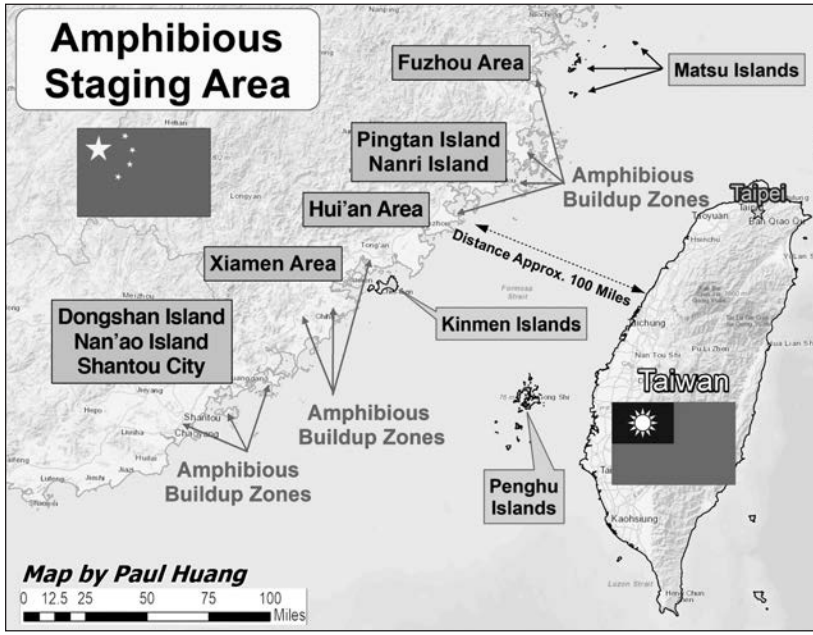
Fourth, some things we can count on, or at least estimate. The quantifiable elements of the PLA invasion operation would be mind-boggling. Millions of armed forces members in uniform would be mobilized in China, including soldiers, sailors, airmen, rocketeers, marines, cyber warriors, armed policemen, reservists, ground militiamen, and maritime militiamen. It seems likely that somewhere between one and two million combat troops would have to cross the Taiwan Strait, which is eighty miles across at its narrowest point and 255 miles at its widest.[25]

PLA troop numbers, of course, are highly speculative "best guesses" that rest entirely on assumptions. In theory, the PLA might land as few as three or four hundred thousand soldiers—for example, if the Taiwanese president was killed or captured prior to Z-day and armed resistance crumbled. On the other hand, if Taiwanese government leaders survived and mobilized everything under their power in a timely fashion, the PLA might have to send more than two million troops to Taiwan, including paramilitary forces such as the People's Armed Police and militia forces. Why so many? Commanders planning offensive operations typically want a three-to-one superiority over the defender; if the terrain is unfavorable, they want a five-to-one ratio—and sometimes more.[26] Assuming Taiwan had 450,000 defenders, the PLA general in charge therefore would want to have at least 1.35 million men, but the number probably would be closer to 2.25 million.[27]

If the PLA invasion force was a million or more men, we might expect an armada of thousands—or even tens of thousands—of ships to deliver them, augmented by thousands of planes and helicopters.[28] The vast majority of these ships would not be from the PLA Navy (PLAN). Vessels that included tugs, oilers, barges, ferries, fishing boats, semisubmersible platforms, container carriers, and heavy roll-on/roll-off (RO/RO) cargo ships would be mobilized. According to Chinese military sources, many ships would be deployed as decoys, conducting feints to distract attention away from the main assault.[29] For the PLA, enormous ship numbers now are attainable. The CCP's military-civil fusion strategy has been gearing up for just such an operation. China's civilian fleets are vast, and every day more hulls are being retrofitted to support a future military campaign against Taiwan.[30] Thousands of tanks, armored personnel vehicles, artillery guns, and rocket launchers would accompany the invaders. Mountains of equipment and lakes of fuel would cross with them.

Fifth, supporting the war effort would be over ninety million CCP members, along with the industrial might of a Chinese superpower with over 1.4 billion people. China's Marxist-Leninist system is uniquely capable of extracting and harnessing private resources for the state's use. According to internal PLA writings on "Xi Jinping Thought," one of the Communist Party's greatest strengths is its ability to force collective action and conduct mass campaigns, especially in times of emergency.[31] The battle of Taiwan would be the supreme emergency—the "ultramega."

Exhibit 1. PLA Amphibious Staging Area



Source: Project 2049 Institute

Ports Matter

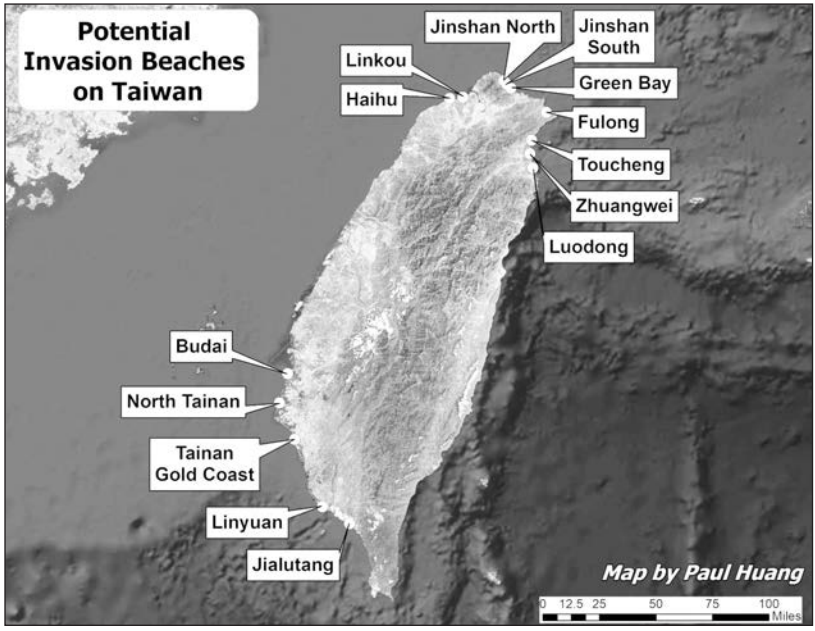
The imagination-crushing dimensions of a PLA amphibious operation against Taiwan—the moving of millions of humans and machines—all rely on robust logistics lines. Without them, everything else quickly crumbles and falls apart.

Why Taiwanese Ports Must Be Defended

Chinese military writings that appear indicative of doctrine argue that the success or failure of an invasion of Taiwan likely would hinge on whether Chinese amphibious-landing forces are able to seize, hold, and exploit the island's large port facilities.[32] By themselves, Taiwan's beaches and coastal airports are too small to land enough PLA troops, tanks, and supplies to secure a solid lodgment ashore. Because these sites lack purpose-built infrastructure for unloading large transports and because they occupy inherently exposed positions, PLA researchers fear that Chinese landing forces could be encircled on the beaches, showered with defensive fires, and overrun by Taiwanese counterattacks.[33]

Only Taiwan's large ports could support the rapid influx of hundreds of thousands of PLA reinforcements and their heavy armor—the massive second-wave force in charge of hammering into the island's inland cities and mountains. From the Chinese military's perspective, beachheads (captured beaches) and airheads (captured airports) are necessary but insufficient parts of a major amphibious-landing zone.[34] According to internal PLA studies, beaches and airports even might be considered auxiliary or supporting wings, while the core—the fulcrum of an invasion of Taiwan—is that nation's own ports.[35]

Exhibit 2. Potential Invasion Beaches



Source: Project 2049 Institute

Chinese military studies argue that the Taiwanese cannot defend themselves effectively and oppose PLA amphibious landings unless they are able to prevent the aggressor from seizing and using Taiwan's civil and military port infrastructure.[36] So the PLA has invested remarkable amounts of resources into researching and planning how to take Taiwanese ports. This effort has included careful assessments of Taiwan's port-defense plans and capabilities.

Assessing Taiwan's Port-Defense Plans

PLA researchers expect that the Taiwanese military will make the defense of the island's ports a top priority and take extraordinary measures to secure them and, if necessary, to deny them to the attacking side.[37] Sources expect that the Taiwanese military will make their ports defensive strongholds in wartime, surrounding them with an interlocking network of firing positions. According to Chinese military writings, the center of each Taiwanese port will be defended with concentrated ground forces in well-prepared, covered defense works, which could include underground bunkers and tunnel systems.[38] Such points could be located near the ports' docks, cranes, command centers, and communication nodes.

These imagined strongholds will be watched from above by Taiwanese infantry units deployed in company and platoon strength to firing positions in the surrounding urban buildings that overlook the ports. Spotters, snipers, and air-defense units will take up positions on rooftops. Tanks, armored fighting vehicles, coastal artillery, and heavy artillery will be hidden amid *nearby infrastructure,* a term whose meaning likely includes locations in warehouses, empty factories, man-made tunnels, and improved natural caves, and under bridges.[39] Defenders, it is assumed, will be located inside prepared defensive positions near beaches that flank port entries, as well as hilltops overlooking the ports, nearby traffic intersections, and other positions favorable to the defense.

The Chinese military assumes that Taiwanese forces will operate under an air-defense umbrella provided by short-range surface-to-air missiles, antiaircraft guns, and electronic-warfare vehicles. PLA studies note that the island's port-defense operations could be bolstered further by any available Taiwanese air force fighters, navy fast-attack craft, army helicopter gunships, coastal-defense cruise-missile launchers, and multiple-launch rocket systems.[40] They anticipate that Taiwanese defense forces will emplace coastal mines and obstacles near the mouths of ports. Reportedly, the channels leading into and out of Taiwan's major commercial ports and naval bases already have defenses, including antisubmarine defenses and underwater-surveillance arrays. These would be augmented rapidly in a conflict. PLA sources further estimate that the defenders will set up minefields and obstacles on nearby beaches, which the ROC military will cover with machine guns in blockhouses and entrenched firing pits.[41] In addition to the employment of Taiwanese infantry in static defense positions around port areas, Chinese analysts believe the defenders will divide into specialized antitank teams, antiairborne (parachute or air-assault) teams, rapid-reaction counterattack teams, and reserve-force teams.[42] These forces are

expected to occupy hardened and camouflaged positions from which they can provide dense and overlapping fields of fire and maintain interior lines of communications via tunnels or covered alleyways.

PLA researchers report that Taiwan's military greatly emphasizes the use of mines and obstacles. These commentators believe that Chinese amphibious forces approaching the island's ports by sea will face a combination of sunken ships sticking out of the surf, anchored and floating sea mines, railroad-stake emplacements, log ramps, concrete wave breakers, Belgian gates, Czech hedgehogs, and something that PLA texts call "walnut crackers." Awaiting amphibious tanks in port zones will be improvised Taiwanese "success mines" (gasoline drums packed with plastic explosives and shrapnel), antitank mines, antitank ditches, antitank walls, and tank traps. Awaiting amphibious infantry ashore will be antipersonnel mines, Mexican sisals (fire-resistant plants with circular arrangements of spiky, sword-like leaves up to six feet long), webs of barbed wire, iron crash barriers, piles of glass shards embedded in concrete, water-filled trenches, iron spike boards, antipersonnel revetments, and "contamination zones" (which the PLA reportedly fears could involve poison gas or radiological agents). Together, these anticipated obstacles are expected to create man-made kill boxes inside and around ports.[43]

Chinese military researchers believe that the Taiwanese military will seal up the mouths of vulnerable ports by sinking large containerships. If the attacking side breaches these barriers, the defenders reportedly intend to pump oil and gasoline into their harbors to produce "seas of fire"—flaming slicks set alight to incite panic, create chaos, and produce mass casualties. As a final resort, it is thought that Taiwan's military will blow up docks, cranes, power plants, fuel-storage depots, water-supply lines, causeways, and other basic port infrastructure as they retreat into the surrounding cities, thereby denying the port facilities to the invader.[44]

Port-Attack Methods

Having considered the Taiwanese military's likely port-defense plans, Chinese military studies posit six tactical approaches for overcoming the defenders and seizing their ports. Interestingly, PLA research materials weigh the pros and cons of each individual approach, thereby providing insights into the leadership's preferences and perceived challenges. The following section offers a brief summary of these assessments.[45]

Direct Amphibious Attacks

In the first approach, undercover PLAN vessels—amphibious landing ships or RO/RO cargo ships—would transport motorized infantry units into Taiwan's ports via normal shipping channels and land them directly at the docks. The attackers would unload, fight their way across port zones, and seize surrounding urban areas.

The perceived advantages of such an approach would be speed, survivability, and shock. Whereas unloading heavy equipment via beaches is a slow process, docks allow for rapid unloading, so more attack units could come into action in a timely manner. Operational researchers in the Chinese military express a belief that this method could save many PLA lives while astonishing the defender, shaking his confidence, and weakening his morale.

The perceived disadvantages of such an approach are that it could work only when the targeted ports already had been cleared of obstacles or were left lightly defended. Even then, there could be dangers; PLA ships sailing into the ports could get ambushed and bottled up by defensive actions, including sabotage and "sea of fire" tactics. Landing units also could get hit by Taiwanese air attacks, long-range artillery bombardment, and heavy counterattacks launched by reserve units or mobility forces hiding in Taiwan's interior.

Indirect Amphibious Attacks

The PLA could land amphibious armored mechanized units on the beaches flanking Taiwan's ports. Having secured landing beaches and opened them for reinforcements to land, the attackers would conduct rapid pincer attacks to seize surrounding urban areas, encircling the ports and cutting them off from reinforcements. They then would fight their way into port zones from the inland side.

The perceived advantages of such an approach are that it could work when Taiwan's ports are well defended—indeed, PLA researchers estimate that a port's flanks are likely to be the weakest points, and therefore the best to exploit. Moreover, the PLA's amphibious tanks, infantry fighting vehicles, and armored transports are highly mobile—they are shock forces tailor-made for operations such as this. Ideally, port defenders would be so surprised and demoralized by being encircled that they would surrender without a fight.

There are several perceived disadvantages to such an approach. After PLA amphibious armored mechanized units get off the beach, they

are likely to be overly reliant on easily severed roadways. They could get bogged down by Taiwanese minefields and obstacle networks in urban areas, especially if they are not supported sufficiently by combat engineers. In open areas where maneuvering is relatively easy, they could get hit by superior Taiwanese ground forces with heavy armor. A final perceived disadvantage is that such an indirect approach would be relatively slow to bear fruit—pincer movements take time to develop. So the PLA might fail to seize the targeted ports quickly. Second-wave forces then would lack access to infrastructure in a timely fashion, risking a quagmire.

Sea-Skimming Raids

The PLA could use a composite force of helicopters, hovercraft, and ground-effect vehicles to conduct surprise attacks on port zones. By flying just above the wave tops at high speeds, these units notionally would enter ports before the defenders knew what hit them and rapidly seize their docks, along with the surrounding urban areas and military bases.

A perceived advantage of such an approach is that it could be undertaken at night and in rough weather conditions, thereby shocking the defenders. Another distinctive advantage is that the attacking side could avoid sea mines and obstacles by flying over them. The PLA then could concentrate forces on landing zones within the ports themselves, or wherever those on scene assess as best. These notional operations would be fast and flexible.

A perceived disadvantage of such an approach is that it could land only a relatively small number of troops. For this reason, sea-skimming raids are considered best employed against ports that are thinly defended or those whose defenders already have been devastated by preassault missile strikes. Chinese military texts state that such raids could be effective only against Taiwan's small- and medium-size ports with narrow channels. Another disadvantage planners anticipate is that command and control would be difficult, given the potential variety of assets and units involved.

Air Assaults

The PLA could use large numbers of helicopters to drop troops behind Taiwan's port zones and their surrounding urban areas. The attackers would seize favorable terrain and defensive strongholds in interior areas and encircle the ports. The PLA then would attack those ports from their rear.

The perceived advantages are many. The attackers could gain the element of surprise and get behind the defenders' lines into lightly defended areas. They would avoid the "hard shell" prepared by Taiwan's military around port zones and would be able to move rapidly enough to sow chaos

and avoid heavy fire. Such operations could be coordinated with seaborne amphibious-assault groups to present the defenders with multidimensional and multidirectional attacks. These operations would be conducted by elite troops organized in battalion- and company-size units that are flexible and easy to coordinate.

The perceived disadvantages are that the Taiwanese military could find, counterattack against, and wipe out Chinese attackers at their landing zones using overwhelming firepower. Helicopters are highly vulnerable to air defenses, making such operations perilous unless the PLA has at least localized air control, which cannot always be guaranteed near ports. A battalion-strength air assault reportedly requires two square kilometers of open space. Given the rough geographic and urban terrain around ports, suitable locations generally are found only far outside port zones. This means that the PLA could not actually seize important ports using this method alone; for it to be effective, planners would have to combine it with other lines of effort. On balance, however, Chinese military researchers appear to be especially impressed with the potential for air assaults to achieve favorable results as part of a broader amphibious campaign.

Horizontal Attacks

The PLA could treat ports as secondary targets. Its focus instead would be on traditional joint amphibious operations to capture and build up division-size landing beaches. After the beaches and any nearby coastal airports were secure, the attackers would land second-wave reinforcements in the form of armored mechanized units. These units would roll up the coastline to expand lodgments, taking port zones along the way.

The perceived advantages of this approach are that the attackers could bring overwhelming troop numbers to bear against even well-defended ports. Heavy land-attack firepower, capable of defeating Taiwanese armor, could punch through port defenses quickly, allowing amphibious units to achieve decisive victories.

The perceived disadvantages are that the Taiwanese military could use geographic bottlenecks and defense works along coastal roads to pin down Chinese armor columns. Taiwanese tanks and artillery, along with infantry armed with antitank recoilless rifles and man-portable missile launchers, would be in their element. Taiwan's defenders could infiltrate behind PLA lines at night or in bad weather and conduct raids on the attacker's supply lines, which might sow chaos and prolong operations to seize and open ports, thereby paralyzing the second wave of the assault.

Special-Forces Infiltration

The PLA could use infiltration tactics to seize ports using special forces capable of covertly entering Taiwan by plane, helicopter, boat, or submarine. Undercover Chinese military teams first would conduct special reconnaissance missions, avoiding detection by the defenders while collecting intelligence on the layout of port defenses. Special units then would launch multidirectional attacks using irregular tactics to seize and hold important defensive positions, bridges, road intersections, and docks until reinforcements arrived.

The perceived advantages are that such operations could have a force-multiplier effect, with small but elite teams surprising and overcoming larger adversary units. These operations would avoid collateral damage and protect vital infrastructure from destruction. They also could provide a diplomatic coup for the attacking side by confusing the international community and reducing its response.

The perceived disadvantages of this approach are that it could be difficult to infiltrate into Taiwan, given the defender's reconnaissance and surveillance capabilities. Special-forces units are lightly armed, making them vulnerable to regular ROC army units that have more troops and heavier firepower. If discovered, the raiders could have their clandestine communications equipment jammed. They even might be cut off from reinforcements and run out of ammunition and supplies.

Integrated Port-Seizure Operations

After assessing individual tactical approaches for seizing ports, Chinese military studies examine ways to combine them into an integrated operational concept.[46] They emphasize that the PLA's objective is not only to take and occupy Taiwan's large ports but to open them and use them as soon as possible to support the overall invasion campaign. PLA researchers warn: "If ports are damaged in combat because the defending side destroys them, or because our side significantly damages them in the course of executing operations to seize them, well then, occupying those ports means nothing. . . . We must do our utmost to ensure the least possible damage is done to port infrastructure."[47]

With this overriding objective in mind, the sources we examined propose an integrated attack plan for amphibious operations against large, well-defended Taiwanese ports. That plan is summarized in the following sections of the chapter.[48]

Phase 1: Execute Paralyzing Strikes

PLA units will soften up the defenders prior to amphibious landings using precision strikes and joint fires that target local centers of gravity. Chinese military texts propose the following plan:

- Theater ballistic missiles, bombers, and fighter-bombers will carry out precision strikes on the defender's frontline port defenses, including early-warning sites (incorporating radars and signals-intelligence equipment), hardened bunker facilities, air-defense missile launchers, coastal-defense batteries, and command posts. They then will conduct raids on the Taiwanese military's rear assembly areas and long-range artillery sites. Finally, they will intercept the defenders' mobile reinforcements and reserve units as they converge on the targeted port zones.
- Shipborne guns and artillery will destroy and suppress the defender's fortifications and heavy firepower (e.g., artillery and tanks) on nearby beachheads and inside port zones. They then will interdict the defender's frontline mobile counterassault units.
- Helicopter gunships, amphibious artillery, and amphibious tanks will destroy any remaining beachhead targets, such as coastal-defense batteries and tanks.

Phase 2: Conduct Commando Operations

PLA special-forces units will carry out operations to pave the way forward for the main amphibious assaults. They will be inserted by helicopters, ground-effect vehicles, powered delta-wing aircraft (ultralights), and gliders. Their mission will be to seize firing positions, coastal-defense batteries, and missile-launch sites that pose a threat to landing forces. They could "leapfrog" frontline beach defenses to seize key defense works in Taiwan's "shallow interior," thereby severing links between forward defenders and their rear-area reinforcements. They also could infiltrate deeper into surrounding areas to conduct ambushes and raids in a manner that supports amphibious landings against ports and developing the follow-on campaign to conquer Taiwan.

Phase 3: Make Amphibious Assaults

PLA units will collect intelligence on Taiwan's port defenses "by all means necessary" and select weak points through which to cut with concentrated amphibious landings made by sea and air. After beach obstacles and coastal fortifications have been destroyed using direct fires, large amphibious

forces will make landings from the sea, supported by troops arriving by helicopters, hovercraft, and ultralights. Once ashore, amphibious-assault units will conduct pincer movements from the beaches, surrounding port zones and isolating defenders into pockets of resistance.

Phase 4: Enter and Seize Ports

PLA amphibious-assault units will conduct sea-skimming attacks over obstacles blocking the port mouths and land squarely in the middle of port zones. At the same time, PLA units will attack into the ports from multiple angles under the cover of helicopter gunships. Assault teams will pour into underground facilities and complex bunker networks, supported by combat engineers who specialize in blasting through heavy doors and walls. Amphibious tanks will smash through small buildings and, together with amphibious artillery and armored fighting vehicles, use direct fires on defending infantry platoons and companies bunkered into multistoried buildings. Attack helicopters will rake defenders in high-rises with cannon and machine-gun fires. Transport helicopters will ferry in growing numbers of troops to build up captured lodgments. Theater ballistic-missile launchers, bombers, fighter-bombers, and shipborne guns will provide heavy fire support. Air-defense missile launchers and air-defense guns will create a defensive bubble around captured ports.

Phase 5: Defeat Counterattacks

PLA joint forces will fight and defeat Taiwanese counterattacks against captured port zones. When necessary, the PLA will occupy favorable terrain, stage ambushes, and turn defensive obstacles against enemy mobile units attempting to retake ports.

Phase 6: Safeguard and Exploit Ports

PLA combat engineers will clear obstacles and work to open ports rapidly, allowing a massive second wave of reinforcements with main battle tanks and other heavy equipment to stream into captured lodgments continually. The PLA will exploit the port's docks and cranes to off-load ships, tipping the balance of forces fighting along the coast as quickly as possible. Any remaining defenders will be mopped up. As the main battlefront moves inland toward final victory, captured ports will be garrisoned heavily to protect them from potential counterattacks and saboteurs.

PLA Preparations

The PLA is preparing the battlefield for future port landing operations in two key ways. First, it is collecting intelligence about Taiwanese ports. Intelligence is vital for preparing any envisioned future battlefield. Indeed, Chinese sources indicate that intelligence collection is a priority mission. PLA texts state that the Chinese military will "use all available means to collect intelligence on a broad scale and thereby obtain knowledge of the port defenders' deployments and situations. Thus, we can find and exploit their weaknesses with precision."[49]

Over the past two decades, the CCP has established representative offices in Taiwan's major ports, invested in Taiwanese port-building projects, and gained direct access to at least some of Taiwan's basic port infrastructure. For example, Kaohsiung's Kao Ming Container Terminal was partly owned by a joint venture comprising three CCP-controlled companies: China Merchants, China Shipping Terminal, and COSCO Shipping.[50] In July 2018, COSCO Shipping bought out Orient Overseas, a major investor in Taiwanese terminals, thereby reportedly gaining outright control over the Kao Ming Container Terminal.[51]

Today, this strategically located terminal in the Port of Kaohsiung uses automated "smart" cranes made in Shanghai by Shanghai Zhenhua Heavy Industries Company Limited (ZPMC), a PRC state-owned enterprise with close ties to the Chinese military.[52] Other Taiwanese ports, including the Port of Taipei, use a significant number of cranes from ZPMC.[53] In addition to cranes and other port infrastructure, ZPMC and COSCO Shipping both own large dual-use ships that have trained with the PLA and almost certainly would support amphibious-landing operations against Taiwan.[54]

The automated command-and-control systems that ZPMC equipment employs in the Ports of Kaohsiung and Taipei and elsewhere use centralized networks fed by surveillance cameras deployed around the port. They further leverage truck and container location-tracking systems, with radio-frequency identification (known as RFID) technology matched to each truck's chassis.[55] Given that ZPMC is a CCP-owned company with close ties to the PLA, it seems almost certain that its automated surveillance systems could send data back to China, allowing the Chinese military to collect real-time intelligence on Taiwan's ports continuously. While this is speculative, PLA operatives could have installed a variety of covert surveillance devices on the gantry cranes themselves.[56] In addition, the presence of CCP officers and their agents in Taiwan's major ports might allow undercover PLA operatives to develop relationships with the local business community that could be exploited for intelligence-gathering and psychological-warfare operations.[57]

Second, winning over, or at least controlling and corrupting, hearts and minds is an equally vital part of the PLA's preparation of the future battlefield. As Chinese military researchers observe, "Psychological warfare is extremely important for victory in our landing operations. Amphibious-landing forces will form specialized psychological warfare units to execute compellence, crumbling the morale of those defending ports and devastating their will to resist."[58]

According to authoritative texts, the PLA will undertake psychological operations "specifically tailored to their targets by message and method," using traditional means such as propaganda broadcasts, messages in balloons, leaflets, and floating buoys, alongside messages delivered via advanced-technology tools such as social media. The Chinese military will employ "any effective measure. . . . We can also use enticements for the businessmen around the defender's port zones, getting them to spread our messages and conquer local hearts."[59]

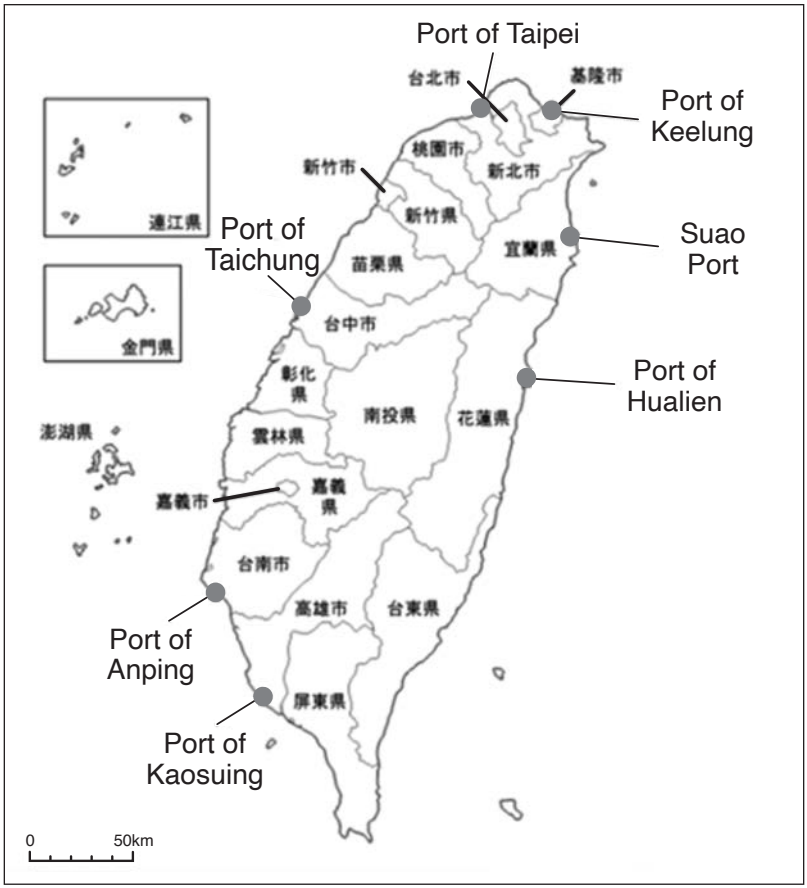
Targeted Ports

Considering known PLA assumptions and other factors, which ports on Taiwan might be targeted for seizure in the event of an invasion, and why? Chinese military research indicates that PLA planners are likely to take a large number of factors into consideration when determining which of Taiwan's ports to target for amphibious landings. According to Chinese sources, the PLA's most likely targets will be ports that could support the rapid off-loading of main battle tanks and other heavy equipment. The ideal candidates for attack would be well-developed commercial or industrial ports flanked by beaches and river deltas in relatively flat and lightly urbanized areas.[60] From these criteria, the Port of Taichung appears to be the most probable location for a major PLA landing attempt. In addition, Chinese planners almost certainly would consider the Ports of Kaohsiung, Mailiao, Taipei, and Anping (Tainan) as potential targets. In contrast, while the Port of Keelung is strategically located, it appears to meet none of the geographic criteria that would make it an appealing target for seizure.

Internal PLA sources consider Taiwan's naval ports to be the most heavily defended and by far the most difficult to capture. Nonetheless, the book *Research on Port Landing Operations* states that Taiwanese naval ports almost certainly would be targeted for "all-out" attacks and seizure, because their infrastructure is ideal for creating major landing zones and bases of operations from which to push inland.[61] While not mentioned by name, the port of Zuoying, near Kaohsiung, appears to be the particular

location that PLA planners have in mind. The Ports of Keelung and Suao might be considered as well, but their locations would present an attacker with immense logistical challenges. Exhibit 4 lists Taiwan's major ports and describes some of their important features.

Exhibit 3. Taiwan's Largest International Containerports



Source: "Automated Container Terminal in Taiwan."

Internal PLA documents analyzed in this chapter demonstrate that the Chinese party-state continues to prepare for a Taiwan invasion campaign with a remarkable degree of focus, and to this end it has developed a large and growing set of military and nonmilitary capabilities. If the theories laid out in Chinese military textbooks are put to the test, Taiwan's own port infrastructure could become the critical battlefield that decides which side prevails. The Taiwanese government has demonstrated a willingness to

Exhibit 4. Taiwanese Ports

Name	Type	Size	Details and Considerations for Amphibious Operations	Suitability for Invasion
Port of Kaohsiung	Commercial, industrial, and military	Mega	Dense urban environment, could be flanked from nearby beaches and river delta, wide range of excellent port facilities under some degree of CCP influence, overlooked by Shoushan/"Monkey Mountain" (1,168 feet) and Banping Mountain (720 feet), located near major army and marine corps bases, likely to be well defended	Medium-high
Port of Zuoying	Military	Large	Urban, could be flanked from nearby beaches and river delta, overlooked by hills, overlooked by Shoushan/"Monkey Mountain" (1,168 feet) and Banping Mountain (720 feet), located at large navy and marine corps bases, likely to be well defended	Medium-high
Port of Taichung	Commercial	Large	Light urban, could be flanked on both sides from river deltas and beaches, overlooked at a significant distance by the Dadu ridgeline (1,017 feet), close to large air force and army bases, likely to be well defended	High
Port of Keelung	Commercial and military	Large	Dense urban environment, unfavorable coast for flanking attempts, close to Taiwan's capital, surrounded by mountains on all sides, including Wuzhi (Five Finger) Mountains (2,293 feet) and Huo/Keelung Mountains (1,929 feet), location of navy base, likely to be well defended	Low
Port of Taipei	Commercial	Large	Nonurban, close to Taiwan's capital, has port infrastructure under some degree of CCP influence, could be flanked from large nearby beach and river delta, overlooked by Guanyin Mountain (2,021 feet), Linkou Plateau (820 feet), and Yangming Mountain (3,589 feet), located near marine corps and army bases, likely to be well defended	Medium-high

Suao Port	Military and fishing	Large	Nonurban, surrounded on two sides by Qixing Mountains (750 feet), Xiaomao Mountain (2,579 feet), Dong'ao Ling Mountain (2,694 feet), and other high peaks, location of large navy base, likely to be moderately defended	Low
Port of Mailiao	Industrial	Medium	Nonurban, could be flanked by nearby river delta, surrounded by flat wetlands, likely to be lightly defended	Medium
Port of Anping (Tainan)	Commercial	Small	Urban, could be flanked from small river delta and large nearby beach, surrounded by flat wetlands, nearby large air force base and army aviation base, likely to be well defended	Medium-high
Port of Hualien	Commercial	Small	Light urban, overlooked by high mountains, nearby large air force base and underground complex, likely to be moderately defended	Low
Port of Makung	Military and fishing	Small	Nonurban, main port of Penghu Island group, location of navy base, likely to be moderately defended	Varies[1]

Notes: "Suitability for Invasion" estimates are based on the limited sources available, which are not current, and are constrained further by the author's imperfect understanding of the defensive terrain and other military factors; they constitute "best guesses" only.

1 If the Penghu Islands were invaded, the ROC navy base at Makung almost certainly would be the key target to seize. But whether the PLA would attack the Penghus before or during a Taiwan invasion campaign is an open question. Obviously, taking Makung would not give the PLA a foothold on Taiwan itself.

Source: Geographic data come from Google Maps, local government websites, and hiking-enthusiast blogs. Information on Taiwan's order of battle can be found in Easton, *The Chinese Invasion Threat,* pp. 283–307.

Exhibit 5. PLA Roles and Missions in Port Landing Operations

Unit Type	Service/ Branch	Roles and Missions
Infantry	PLA ground forces	Motorized (and combined-arms) infantry and amphibious mechanized infantry units will make amphibious landings around ports, generally in coordination with PLA Navy marines. They will secure and expand lodgments, defeat counter-attacks, support armor offensives inland, support combat-engineering operations to clear obstacles and repair docks, and guard artillery and air-defense assets.
Armor	PLA ground forces	Armored brigades and battalions with amphibious tanks will make amphibious landings in support of infantry units. They will coordinate with airborne operations, air assaults, and special-forces units to seize important targets around ports. Amphibious-tank units will attack upriver deltas to seize key terrain and flank port zones. Conventional armored units will land as part of the second wave to smash counterattacks, expand lodgments, and hammer inland.
Special forces	PLA ground forces	Special forces will collect intelligence, carry out raids, seize and occupy strategic points, designate targets for precision strikes, and conduct psychological warfare.
Artillery	PLA ground forces	Long-range rocket artillery capable of reaching across the Taiwan Strait will support joint fire strikes on targets to secure control over the information, air, and sea domains. Shipborne guns will carry out direct fires on coastal-defense works, obstacles, and enemy batteries to support infantry and tank landings. Amphibious artillery and antitank artillery units will support operations to seize, hold, and develop lodgments. Long-range artillery units will locate and destroy enemy batteries that could devastate captured ports.
Air defense	PLA ground forces	Air-defense units will provide a protective umbrella over all units during all stages of the invasion. They will help secure air control early in conflict. They will then protect amphibious fleets as they assemble, load, and cross the strait. They will protect amphibious-assault units as they make landings, seize ports, strengthen lodgments, and smash counterattacks. They will protect second-wave and reserve forces as they land and push into the island.
Army aviation	PLA ground forces	Army aviation (helicopter) units will engage coastal targets with direct fires prior to amphibious assaults. They then will provide fire support during the invasion and make raids on interior targets. They will make coastal air assaults, carry out electronic-warfare operations, transport special forces, and conduct logistics-support missions as needed.

Electronic countermeasures	PLA ground forces	Electronic-countermeasures units will collect electronic intelligence. They then will jam the defender's communications, radars, fire-control systems, and precision-guidance systems. They will conduct electronic feints and deception operations to ensure operational surprise. They will support air-defense operations and amphibious operations.
PLA Air Force	PLA Air Force	Air force units will seize and maintain air control. They then will employ bombers and fighter-bombers to strike the defender's command posts, artillery batteries, mobile reserve forces, and coastal defenses. They will provide air cover and fire support for amphibious operations and air assaults. They will coordinate with civil aviation assets to conduct airborne assaults. They will mop up targets that army artillery units miss and help smash counterattacks.
Surface fleet	PLA Navy	Navy units will seize and maintain sea control. They will support amphibious assaults and port-seizure operations. They will resist third-party (U.S.) intervention operations. After minesweepers have cleared safe channels to shore, small numbers of naval amphibious ships and massive numbers of civilian transports will land troops and equipment on Taiwan. The surface fleet and PLA Naval Air Force will provide fire support, conduct air-defense operations, and enforce maritime "keep-out zones."
Marines	PLA Navy	Marine units will make amphibious landings to seize port zones independently or in coordination with army amphibious units. They will attack important targets from the coast into the island's depths. They will conduct special-forces missions. They will create false targets, carry out feints, and undertake other deception operations to maintain operational surprise.
Theater missiles	PLA Rocket Force	Ballistic and cruise missiles with theater ranges will carry out joint strikes with the air force at the outset of conflict to gain control over the electromagnetic and air domains. They will coordinate with the navy to seize sea control and then cover amphibious operations. Next, they will provide fire support for the amphibious assaults, protecting them from counterattacking forces in the island's rear areas and depths. They will resist third-party (U.S.) intervention operations.
People's Armed Police	People's Armed Police	People's Armed Police units will assemble from all across China as needed to safeguard supply lines and garrison occupied territory. They will protect against enemy raids and air attacks. They will guard critical infrastructure and, when needed, restore it. They will ensure internal stability within seized port zones. They will support logistics operations. When necessary, they will augment amphibious-landing operations.
Ground and maritime militia	Militia of China	Militia units will assemble from all across China as needed to safeguard supply lines and garrison occupied territory. They will protect against enemy raids and air attacks. They will guard critical infrastructure and, when needed, restore it. They will ensure internal stability within seized port zones. They will support logistics operations. When necessary, they will augment amphibious-landing operations.

Source: Xu and Wang, *Research on Port Landing Operations,* pp. 72–88.

address many of its defense challenges; however, some of them remain only partly addressed, while others have been left completely unaddressed—because of their political sensitivity. One of the last mentioned appears to be port security.

It cannot be known which of Taiwan's ports the PLA ultimately would select to attack in the event of war and what those attacks would look like in practice. Nonetheless, educated guesses can be made on the basis of Chinese military research materials that have emerged on the subject, and those guesses can be tested against other sources of information, including reports on known or suspected PLA activities of relevance, such as military exercises focused on port seizure. Undoubtedly, a basic understanding of the local geography could prove useful to such analytic endeavors. All this information and more should help inform future efforts to make Taiwan's ports better defended and more secure.

There is much that Taiwan's government can do to protect itself better from the threats examined in this chapter. Taiwanese leaders could close CCP-controlled representative offices. They could remove and replace critical port infrastructure that is linked to the Chinese military. They could increase readiness and intensify current preparations for future port-defense operations. To defend better against known PLA plans to invade Taiwan through its harbors, the ROC military could acquire and field significant numbers of additional missiles and mines. Taiwan could build a larger and better-trained ground force, with a focus on elite units that specialize in urban warfare, such as marines and military police.

Taiwan's reserve force could be overhauled to ensure that the nation is capable of rapidly mobilizing hundreds of thousands of well-trained and confident personnel for homeland-defense missions. Taiwan could stockpile munitions and supplies near ports. Taiwanese leaders could educate the public better about the threat, so that everyday citizens are able to identify and resist PLA political-warfare operations and know how to contribute should a man-made disaster occur. Enoch Wu and other thought leaders on Taiwan have started resilience-improvement initiatives involving first aid training, civil-military workshops, and mass-casualty simulations to prepare the Taiwanese public for the shock of war.[62] These programs could be expanded and scaled up, with a focus on at-risk port cities.

As a final note, it bears emphasizing that there are many reasons why Beijing so far has elected to put off an invasion attempt and instead uses only nonlethal forms of coercion against Taipei. Of these, Taiwan's political strength and military power are unlikely to be the main deterrent factors. U.S.-Taiwan security relations are the paramount strategic variable in the decision-making calculus of leaders on both sides of the

Taiwan Strait.[63] Going forward, the United States could improve deterrence by sending Marines and special-operations forces to Taiwan on long-term training, advisory, and liaison missions and beginning port-defense exercises with the Taiwanese military. And the United States could send high-ranking generals and admirals to participate in those exercises. Today, vanishingly few senior leaders at the Pentagon could give the president of the United States expert counsel in the event of a Taiwan Strait conflict; they have never even toured Taipei, let alone examined Taiwan's coastal battle space and interacted with their counterparts in the field.

Ultimately, the road to strategic success leads away from the application of pure military solutions to political problems. The United States and Taiwan should strive toward what Mark Stokes has dubbed an "NSC relationship": normal, stable, and constructive. The current ambiguity surrounding America's policy toward Taiwan is likely to prove structurally unstable over the long run because it isolates Taipei, emboldens Beijing, and invites miscalculation on all sides. The United States should continue moving away from its past policy of diplomatically isolating Taiwan—keeping it vulnerable, as a concession to Beijing—and find an innovative way to treat Taiwan as the internationally important, independent country that it actually is.

Notes

1. 中国远洋海运集团正式成立 ["China COSCO Shipping Corporation Officially Stood Up"], 中共湖北省委军民融合发展委员会办公室 [*CCP Hebei Office of the Provincial Military-Civil Fusion Development Committee*], 23 February 2016, www.hbjmrh.gov.cn/xwdt/cbgy/9929.htm.
2. This includes representative offices in Taipei, the Port of Keelung, the Port of Taichung, and the Port of Kaohsiung. See "Taiwan (台湾)," *COSCO Shipping Development Co.,* 9 April 2021, development.coscoshipping.com/col/col1729/index.html, and "China COSCO Shipping Corporation Officially Stood Up."
3. "China COSCO Shipping Corporation Officially Stood Up."
4. 军事科学院军事战略研究部 [Academy of Military Science Strategic Research Department], 战略学 [*Science of Military Strategy*] (Beijing: Military Science Press, 2013), pp. 198–99; 刘海江 [Liu Haijiang] and 李志远 [Li Zhiyuan], eds., 联合战术思想研究 [*Research on Joint Tactical Thought*] (Beijing: Lantian Press, 2012), p. 156.
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15. The following section is adapted from Ian Easton, "Why a Taiwan Invasion Would Look Nothing Like D-day," *The Diplomat,* 26 May 2021, thediplomat.com/2021/05/why-a-taiwan-invasion-would-look-nothing-like-d-day/.
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17. The Normandy beaches were defended by around 50,000 troops under German command. Okinawa had around 78,000 Japanese defenders, augmented by 40,000 Okinawan conscripts who had been pressed into service. See Dave Roos, "D-day: Facts on the Epic 1944 Invasion That Changed the Course of WWII," *History,* updated 4 June 2020, www.history.com/news/d-day-normandy-wwii-facts; "Unprecedented Scale: D-day's Fighters, Helpers, Victims," *AP News,* 5 June 2019, apnews.com/article/world-war-ii-europe-france-e91b21d9697a4fa5b0393c72554c3725; Megan Johnson, "Rudder's Rangers and the Boys of Pointe du Hoc: The U.S. Army Rangers' Mission in the Early Morning Hours of 6 June 1944," *Army Historical Foundation,* n.d., armyhistory.org/rudders-rangers-and-the-boys-of-pointe-du-hoc-the-u-s-army-rangers-mission-in-the-early-morning-hours-of-6-june-1944/; and Spector, *Eagle against the Sun,* pp. 532–34.
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19. Bai, *Course Book on the Taiwan Strait's Military Geography,* p. 68.
20. However, it is not public information how many guns Taiwan has stockpiled for its army, marines, and military police reservists. Nor is it clear whether Taiwan's poorly resourced and politically unpopular reserve system could mobilize effectively and use a significant number of those personnel. Much too would depend on strategic early warning and the will of Taiwan's president and his or her cabinet to act with alacrity. See John Feng, "Taiwan to Begin 24/7 Simulation of Chinese Invasion," *Newsweek,* 20 April 2021, www.newsweek.com/taiwan-begin-24-7-simulation-chinese-invasion-1584984, and John Feng, "Taiwan to Raise 'Temple Militia' of Holy Villagers to Fight Off Chinese Invasion," *Newsweek,* 20 April 2021, www.newsweek.com/taiwan-raise-temple-militia-holy-villagers-fight-off-china-invasion-1585020. For background on Taiwan's operational readiness, see Mark Stokes, Yang Kuang-shun, and Eric Lee, *Preparing for the Nightmare: Readiness and Ad Hoc Coalition Operations in the Taiwan Strait* (Arlington, VA: Project 2049 Institute, September 2020), project2049.net/2020/09/01/preparing-for-the-nightmare-readiness-and-ad-hoc-coalition-operations-in-the-taiwan-strait/.

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26. For example, see John J. Mearsheimer, "Why the Soviets Can't Win Quickly in Central Europe," *International Security* 7, no. 1 (Summer 1982), p. 15. See also Robert Ross Smith, "Luzon versus Formosa," in *Command Decisions,* ed. Kent Roberts Greenfield (Washington, DC: Center of Military History, 1987), pp. 461–77, and Ian Easton, *The Chinese Invasion Threat: Taiwan's Defense and American Strategy in Asia* (Manchester, U.K.: Eastbridge Books, 2019), p. 39.
27. Obviously, this is a simplistic formula, but it seems logical—and informed guesses are undoubtedly better than the available alternative.
28. In 2014, the PRC already had well over 70,000 registered transport ships, with 25,113 in Shanghai and 23,725 in Xiamen—directly across the Taiwan Strait. Since then, these vessels have grown both in numbers and in their dual-use capabilities. See 中国口岸年鉴2014 [*China Port Authority Yearbook 2014*] (Beijing: China Port Authority Press, 2014), pp. 38–40. For a recent examination of military-civil fusion developments in this area, see Conor M. Kennedy, *Civil Transport in PLA Power Projection,* China Maritime Report 4 (Newport, RI: China Maritime Studies Institute, December 2019), digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1003&context=cmsi-maritime-reports. For background on China's impressive naval shipbuilding industry, see Andrew S. Erickson, "The Chinese Naval Shipbuilding Bookshelf," *China Analysis from Original Sources,* 11 February 2021, www.andrewerickson.com/2021/02/the-chinese-naval-shipbuilding-bookshelf/, and Andrew S. Erickson, ed., *Chinese Naval Shipbuilding: An Ambitious and Uncertain Course* (Annapolis, MD: Naval Institute Press, 2016).
29. See Xu and Wang, *Research on Port Landing Operations,* pp. 72–88.
30. For example, see Conor Kennedy, "Ramping the Strait: Quick and Dirty Solutions to Boost Amphibious Lift," Jamestown Foundation *China Brief* 21, no. 14 (16 July 2021), available at jamestown.org/program/ramping-the-strait-quick-and-dirty-solutions-to-boost-amphibious-lift/.
31. Jiang and Luo, *Realizing the Deep Development of Military-Civil Fusion,* pp. 203–204.
32. Xu and Wang, *Research on Port Landing Operations,* pp. 9–12.
33. Cao, Sun, and Yang, *Informatized Army Operations,* pp. 134–35; Cao, Wu, and Sun, *Informatized Joint Operations,* pp. 202–203.

34. Cao, Sun, and Yang, *Informatized Army Operations,* pp. 140–41.
35. Xu and Wang, *Research on Port Landing Operations,* p. 12.
36. Ibid., pp. 11–12.
37. Ibid., pp. 40–43. Unless otherwise noted, the following paragraphs draw from ibid.
38. Considering the context, *heavy ground forces* appears to refer to armored or mechanized infantry battalions or brigades.
39. The term appears in Xu and Wang, *Research on Port Landing Operations,* pp. 40–43.
40. Although it seems probable that most already would have been lost or expended by the time PLA amphibious-landing forces were within visual range of Taiwan.
41. Xu and Wang, *Research on Port Landing Operations,* pp. 41–42.
42. Taiwanese armored units or mechanized infantry units likely would be tasked with destroying PLA armor and clearing the PLA's airborne landing zones. Taiwanese marines and army special-forces teams could be in charge of rapid counterattacks, although they also could be held in strategic reserve and tasked with nighttime raids against PLA lodgments once the daylight hours had drawn to a close.
43. See also Cao, Sun, and Yang, *Informatized Army Operations,* p. 124.
44. Ibid., p. 148.
45. The following sections draw from Xu and Wang, *Research on Port Landing Operations,* pp. 44–60, and Cao, Sun, and Yang, *Informatized Army Operations,* pp. 160–63.
46. Xu and Wang, *Research on Port Landing Operations,* pp. 61–70; Cao, Sun, and Yang, *Informatized Army Operations,* pp. 160–63.
47. Xu and Wang, *Research on Port Landing Operations,* p. 101.
48. The following sections draw from ibid., pp. 101–10, and Cao, Sun, and Wang, *Informatized Army Operations,* pp. 160–63.
49. Xu and Wang, *Research on Port Landing Operations,* p. 104.
50. "COSCO Pacific Joins Hands with China Merchants International and China Shipping Terminal to Invest in Kao Ming Container Terminal at Port of Kaohsiung, Taiwan," *COSCO Shipping,* 19 December 2012, ports.coscoshipping.com/en/Media/PressReleases/content.php?id=20121219. See also "Interim Report 2020," *China Merchants Port Holding Company Limited,* 31 March 2021, www.cmport.com.hk/entouch/investor/reports.aspx, and "Local Contacts—Taiwan," *OOCL,* 7 July 2021, www.oocl.com/taiwan/eng/localinformation/localcontacts/Pages/default.aspx. OOCL was acquired by COSCO, a PRC state-owned enterprise, in 2018.
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52. "ZPMC Bags ASC Order," *WorldCargo News,* 1 February 2009, www.worldcargonews.com/news-in-print/zpmc-bags-asc-order-46373. For background on ZPMC, see Kate O'Keeffe and Chun Han Wong, "U.S. Sanctions Chinese Firms and Executives Active in Contested South China Sea," *Wall Street Journal,* 26 August 2020, www.wsj.com/articles/u-s-imposes-visa-export-restrictions-on-chinese-firms-and-executives-active-in-contested-south-china-sea-11598446551. See also U.S. Defense Dept., "DOD Releases List of Additional Companies, in Accordance with Section 1237 of FY99 NDAA," news release, 28 August 2020, www.defense.gov/Newsroom/Releases/Release/Article/2328894/dod-releases-list-of-additional-companies-in-accordance-with-section-1237-of-fy/, and "Qualifying Entities Prepared in Response to Section 1237 of the National Defense Authorization Act for Fiscal Year 1999 (PUBLIC LAW 105-261)," *U.S. Department of Defense,* 28 August 2020, media.defense.gov/2020/Aug/28/2002486689/-1/-1/1/LINK_1_1237_TRANCHE-23_QUALIFYING_ENTITIES.PDF, and "Taipei Crane Deal Gives Lift to ZPMC," *Lloyd's List,* 11 December 2007, lloydslist.maritimeintelligence.informa.com/LL101894/Taipei-crane-deal-gives-lift-to-ZPMC.
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54. See "Automated Container Terminal in Taiwan," *Nippon Express,* 26 November 2019, www.nipponexpress.com/press/report/26-Nov-19.html.
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56. For example, as mentioned, COSCO, a PRC state-owned enterprise, has representative offices in Taipei, the Port of Keelung, the Port of Taichung, and the Port of Kaohsiung. See "Taiwan (台湾)."
57. Xu and Wang, *Research on Port Landing Operations,* p. 69.
58. Ibid., pp. 69–70.
59. Ibid., pp. 11–14.
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J. Michael Dahm

16. Chinese Ferry Tales

The PLA's Use of Civilian Shipping in Support of Over-the-Shore Logistics

The People's Liberation Army (PLA) probably will not be able to conduct a successful cross-strait invasion of Taiwan unless and until it masters what the U.S. military calls joint logistics over-the-shore (JLOTS). While *JLOTS* is not a term that Chinese military authors typically use, they nevertheless have considered how the PLA should conduct logistical support immediately after a large-scale amphibious assault and have commented on the capabilities the PLA may require to do so. These capabilities include unloading in rudimentary or damaged port facilities; using temporary piers or wharves to off-load vehicles and supplies directly to shore; and unloading cargo ships, including roll-on/roll-off (RO/RO) ships, at sea and then lightering matériel to a captured port or beachhead.

PLA authors uniformly assert that "civilian" ships, working closely with the military, will be an integral component of any major cross-sea logistics operation, including over-the-shore operations. In recent years, the PLA has conducted a number of exercises to bolster military-civil fusion (MCF) in amphibious operations. To what extent have these exercises helped to develop the JLOTS capabilities needed for a Taiwan invasion?

This chapter sheds light on this vital question by examining carefully MCF exercises held in 2020 and 2021. In the summer of 2020, the PLA's

Joint Logistics Support Force (JLSF) conducted a complex, large-scale, maritime-logistics exercise in China's Eastern Theater—the military command that would be responsible for a cross-strait invasion. Taking place in Lianyungang, Jiangsu Province, Exercise Eastern Transportation-Projection 2020A featured the JLSF working closely with a large number of substantial civilian RO/RO ferries, cargo ships, tugs, and construction vessels, as well as PLA landing craft, in an amphibious-logistics exercise that became increasingly complex over the course of two months. While the PLA did not repeat this exercise in the summer of 2021, it did conduct unit-level training in the Southern Theater Command and a large exercise in the Eastern Theater Command. These amphibious exercises appeared to move beyond benign logistics or the deployment of second-echelon forces in amphibious-landing areas; they involved civilian RO/RO ferries working in concert with larger PLA Navy (PLAN) amphibious-assault ships, deploying first-echelon forces offshore in beach-landing operations. In September 2021, the PLA also tested and evaluated a new floating-causeway system, an effort to improve on a modular floating pier showcased in 2020.

This chapter integrates open-source media reports with ships' tracking data from Automatic Identification System (AIS) terminals and commercial satellite imagery to reconstruct the 2020 and 2021 MCF exercises.[1] On the basis of an in-depth analysis of the events, the chapter offers the following conclusions about the PLA's capabilities to conduct amphibious operations using civilian ships as a core component of a large-scale amphibious operation:

- As of 2021, the PLA and its reserve civilian merchant fleet probably were unable to provide significant amphibious-landing capabilities or the maritime logistics in austere or challenging environments necessary to support a large-scale, cross-strait invasion of Taiwan.
- The PLA's use of civilian shipping in amphibious exercises appears to be limited to select ships that demonstrate capabilities that are nascent but not yet capable of supporting a cross-strait invasion. However, capacities could increase rapidly after initial capabilities are demonstrated formally and exercise participation expands to a larger number of civilian ships.
- The 2020–21 exercise events appear to have been scripted and focused on establishing procedures and on coordinating among military units and civilian components.
- The 2020 JLSF exercise featured experimentation with a number of novel logistics capabilities that have been slow to develop and likely have not matured yet, probably owing to a lack of investment. In a

possible change to that pattern, the 2021 activity saw the introduction of the first new amphibious-landing technologies in over fifteen years.

- In most cases, civilian shipping support to amphibious exercises was provided during daylight hours; events were timed for when tides and weather conditions were favorable; and many evolutions took place in the sheltered waters of an inner harbor.
- In the 2020 JLSF exercise, there was no evidence of simulated combat conditions during the exercise; no defensive actions (e.g., convoying, escorting, evasion, or diversion) were observed. In the 2021 amphibious-landing exercises, civilian ferries appeared to be deployed and positioned in ways aimed at mitigating potential threats to these vulnerable ships.
- These 2020–21 exercises likely provide a baseline for the PLA's use of civilian shipping to support large-scale amphibious logistics and furnish a road map for the types of capabilities and capacities the PLA may need for future operations.

JLOTS with Chinese Characteristics

According to U.S. military doctrine, *logistics over-the-shore (LOTS) operations* involve the loading and off-loading of ships in austere areas where fixed port facilities are damaged, unavailable, or inadequate for operational needs. *Joint logistics over-the-shore operations* occur when forces from different services—in the case of the U.S. military, the Army, Navy, and Marine Corps—join together to conduct LOTS operations.[2]

While some Chinese military authors have examined U.S. concepts and translated JLOTS as "岸滩联合后勤" (literally, "shore-beach joint logistics"), Chinese military scholars do not appear to have adopted the U.S. term widely.[3] Nevertheless, the Chinese military has discussed how to conduct logistics operations where port facilities are not available. Terms more typically associated with these operations include "人工港" (artificial port) and "无码头卸载" ("no-dock" or "dockless" unloading). This terminology is employed most often in the context of an amphibious "landing base" (登陆基地). A landing base is established immediately after a successful amphibious assault by deploying quickly the at-sea component of the "transportation and projection force" (运输投送力量). In a post-amphibious-assault scenario, the transportation and projection force facilitates transshipment of second-echelon troops and heavy equipment

from ships offshore. Use of the landing base is expected to continue until an adequate "fixed transshipment base" (固定转运基地) can be established in a captured enemy port or harbor.[4]

PLA experts have taken lessons from Chinese and foreign military history that underscore the significance of access to amphibious-landing bases. The 1949 campaign to seize Kinmen (Jinmen) Island, in which Republic of China (ROC) forces routed PLA forces conducting an amphibious raid, stands out as an example found in many Chinese writings.[5] The loss occurred in large part because PLA boats that had landed successfully on Kinmen at high tide became stranded at low tide, leaving them unable to return and bring second-echelon reinforcements from the mainland. ROC forces decimated the exposed craft. Two Chinese military authors took a pointed lesson from the Kinmen campaign: "Even if the first-echelon combat force can seize the beachhead, if logistic support cannot keep pace, the follow-on echelon will not be able to disembark, which will have a great impact on the entire landing operation and even the overall joint operation in extreme cases."[6]

The amphibious logistics required for a cross-strait invasion of Taiwan would be significantly larger in scope than that associated with the battle over the small island of Kinmen. Reading about Allied over-the-shore logistics during the invasion of Normandy in the Second World War appears to be required for PLA logistics students, given the number of references to that operation. In a January 2020 article, PLA experts observed that the strategic port of Cherbourg, France, located a few miles from the Allied beachheads on the Normandy coast, effectively had been destroyed, then booby-trapped by retreating German forces. It took British and American forces three weeks to restore port operations in Cherbourg. The authors asserted that Taiwan forces likewise would sabotage ports and harbors if the mainland attempted to invade the island. Therefore, like the Allies in their successful efforts to conduct logistics operations through an artificial port built in Normandy, the PLA too must have capabilities to move significant amounts of matériel, equipment, and personnel ashore in the absence of adequate port infrastructure.[7]

Chinese military authors writing on logistics uniformly assert that civilian shipping will be an integral component of any large-scale "cross-sea projection" (跨海投送) operation, especially a cross-strait invasion of Taiwan.[8] The 1982 Falklands War furnishes another favored case study for PLA logisticians, who are quick to point out that Great Britain's Royal Navy requisitioned not only tankers, RO/RO cargo ships, and containerships but also passenger ships, tugboats, fishing boats, and other vessels.[9] Chinese military authors appear to categorize transportation and projection

capabilities as either military or civilian. In terms of maritime-projection forces, one Chinese military article observes that the PLA uses five types of ships to support amphibious logistics: amphibious dock ships, tank landing ships and landing craft, RO/RO ships, ordinary cargo ships, and fishing boats.[10]

Chinese military authors have identified several different capabilities that they believe the PLA should have to support amphibious-landing bases. These capabilities include temporary facilities for unloading directly to a beach: barges, floating piers, and temporarily installed elevated piers. Temporary piers, sometimes translated as "trestle piers" (栈桥码头), may be combined with large barges at the end of the piers to berth ships, forming a mobile port. In some environments, to reach the deep water required for large ships, temporary piers would have to be impractically long. Therefore, Chinese military experts aver that the PLA also must have the capability to set up a "floating offshore sea base" (海上浮动卸载基地) when a relatively safe area is available offshore, to transfer heavy equipment from a large RO/RO or other cargo ship to smaller vessels suitable for landing directly on a beach. Mother ships or barges with cranes also may be necessary for unloading containers, vehicles, or other cargo onto smaller ships. Finally, rapid port- and harbor-repair capabilities may be necessary to establish provisional unloading points in damaged ports.[11]

A 2020 PLA exercise featured most of these logistics capabilities. Operations ranged from off-loading cargo and rolling stock at a rudimentary port facility to the use of relocatable floating piers. Floating piers were combined with a large, semisubmersible barge to form a mobile port. The exercise also featured RO/RO and general-cargo vessels using deck barges and floating cranes to load and unload cargo offshore. Landing craft ferried cargo and equipment from the offshore floating bases to a beach.

The 2020 JLSF Amphibious-Logistics Exercise

In the summer of 2020, the JLSF conducted a complex logistics exercise named Eastern Transportation-Projection 2020A (东部运投—2020A). According to a banner that appeared in a video covering the exercise, this was "military-civil joint training" (军地联合训练), making it an MCF event.[12] This exercise provides insights about Chinese capabilities to con-duct over-the-shore logistics in support of a Taiwan invasion or other large-scale military lift operation.

A detailed analysis of publicly available sources, including media reporting, civilian-ship AIS tracking data, and commercial satellite

imagery, reveals that the exercise took place over two months between June and August 2020. Two major foci of the exercise appear to have been the integration of civilian ships into military-logistics operations and the training of their crews. These ships included large RO/RO ferries, general-cargo ships, a semisubmersible barge normally used in port construction, tugs, deck barges, a floating crane, and possibly fishing boats. Cargo and equipment off-loaded by the civilian ships were not limited to benign matériel; tanks and other armored vehicles were discharged directly onto a beach from a civilian ferry using the floating pier.

A one-minute video posted on Chinese-government social media in August 2020 provides a useful starting point for an analysis of the event.[13] PLA JLSF uniform shoulder patches are clearly visible in the video. Name placards show a Sr. Col. Wang Pengyu (王鹏宇) and a Col. Wang Qiang (王强) prominently seated at the center of the exercise-viewing area. A 2019 *PLA Daily* article identifies these officers as the director and political commissar, respectively, of an unspecified JLSF "Eastern Theater Dispatch Center" (东部战区某调度中心).[14] This dispatch center is likely subordinate to the Wuxi Joint Logistics Support Center (无锡联勤保障中心), which provides coordination and command of military and civilian logistics support in the Eastern Theater.

Staff from the Eastern Theater JLSF almost certainly led this joint military-civilian exercise. In the video, Colonel Wang offers remarks about training objectives. He states that the exercise demonstrates that the PLA has the ability to use any port or ship, not just military ports and ships, to transport PLA personnel and equipment rapidly in support of combat operations. In addition to goals related to improving the loading time of ships, Colonel Wang emphasizes safety and the need to exercise logistics operations with civil participants to prevent accidents in future operations.[15]

Analysis of information gleaned from the video, including signage, ship names, and background features, indicates that the exercise took place in Lianyungang, Jiangsu Province. Lianyungang is a port city in the far northeastern corner of the PLA's Eastern Theater, ninety nautical miles (nm) southwest of Qingdao. Subsequent analysis shows that Lianyungang served as the embarkation port for the exercise. Lanshan, a district of the city of Rizhao, approximately 22 nm north of Lianyungang, served as the exercise objective. Lanshan features a dry-bulk-cargo terminal with a quay used for RO/RO off-loading, as well as a beach in a protected harbor where offshore unloading and amphibious landings took place.[16]

Participating Vessels

The 2020 exercise involved two dozen different commercial ships, tugs, and military landing craft, most of which rotated in and out to conduct specific events over the course of the six-week operational phase of the exercise. Many of the participating ships are owned by subsidiaries of Chinese state-owned enterprises, such as the China Ocean Shipping Company (COSCO), Sinotrans, and the China Communications Construction Company (CCCC)—specifically, the CCCC Third Navigation Engineering Bureau.[17]

Six RO/RO ferries from the Bohai Ferry Group, a privately owned shipping corporation and the largest ferry operator in Asia, also participated in the exercise. According to the group's website, its ships have been built to national-defense standards and have been organized into the "Eighth Transport Dadui" (海运八大队), part of China's maritime militia strategic-projection support-ship fleet (战略投送支援船队).[18] This fleet is "responsible for force projection and logistics support in diversified military missions," including combat operations.[19] A maritime militia affiliation of the state-owned-enterprise ships (e.g., those of COSCO and CCCC) used in the exercise could not be determined.

In addition to the civilian vessels, as many as eight utility landing craft (LCUs), four Type 271 *(Yupen)* LCUs and three to four Type 067 *(Yunnan)* LCUs, also participated. Table 1 lists civilian ships observed participating in the exercise.

Capabilities and Technologies

A number of novel amphibious capabilities and technologies used to integrate civilian shipping into amphibious operations were identified in commercial satellite imagery during the 2020 JLSF exercise.

Modular Floating Pier

The opening line of a Chinese news article about the August 2020 exercise sets the stage for its coverage of the training event: "A loading and unloading joint command post is opened. Roll-on and hoisting lines of operation expand synchronously. When the formation of ferries arrives at a certain sea area, a multimode temporary pier [多方式临时码头] is set up to quickly unload and land."[20] This "temporary pier" was to figure prominently in Exercise Eastern Transportation-Projection 2020A. It allowed RO/RO ferries to discharge armor and rolling stock directly to a beach-landing area.

Table 1. Civilian Ships Participating in Exercise Eastern Transportation-Projection 2020A

Ship Name	Type	Length/Gross Tonnage	Owner
Bang Chui Dao	RO/RO	443 ft. / 15,500 t	China Shipping Passenger Liner Co. (COSCO)
Hai Yang Dao	RO/RO	443 ft. / 15,500 t	COSCO
Sheng Tai	General cargo	323 ft. / 4,000 t	China COSCO Shipping Corp. (COSCO)
Bo Hai Bao Zhu	RO/RO	538 ft. / 24,000 t	Shandong Bohai Ferry Co. (BFG)
Bo Hai Ma Zhu	RO/RO	590 ft. / 33,400 t	Shandong Bohai Ferry Co. (BFG)
Bo Hai Yin Zhu	RO/RO	529 ft. / 19,800 t	Shandong Bohai Ferry Co. (BFG)
Bo Hai Zhen Zhu	RO/RO	538 ft. / 24,000 t	Shandong Bohai Ferry Co. (BFG)
Sheng Sheng 1	RO/RO	394 ft. / 10,300 t	Weihai Haida Passenger Transportation Co. (BFG)
Zhong Hua Fu Xing	RO/RO	696 ft. / 45,000 t	Weihai Haida Passenger Transportation Co. (BFG)
Tian Zhu Shan	General cargo	323 ft. / 4,000 t	Shanghai Changjiang Shipping (Sinotrans)
San Hang Gong 8	Heavy lift	213 ft. / Unknown	CCCC
San Hang Tuo 4007	Tug	147 ft. / 842 t	CCCC
San Hang Tou 2007	Tug	105 ft. / Unknown	CCCC
San Hang Tuo 1009	Tug	108 ft. / Unknown	CCCC
*Wish Way**	Heavy lift	512 ft. / 16,600 t	CCCC
Jin Xu 9	Unknown	Unknown	Unknown

Notes: BFG = Bohai Ferry Group; CCCC = China Communications Construction Co.; COSCO = China Ocean Shipping Company.
* possible participant.

The temporary pier—what the PLA has called an "offshore mobile unloading platform" (海上机动卸载平台)—was noted in commercial satellite imagery in Lanshan in September 2020.[21] Images show modules for two floating piers: a 1,200-foot (366 meter) pier and a 720-foot (220

meter) pier. Also seen are associated cargo ferries and barges, as well as warping tugs that maneuver pier modules into place. The Chinese system, especially with its associated ferries and warping tugs, appears similar to the U.S. Navy's Improved Navy Lighterage System (INLS).[22]

In 2001, China's National Defense Mobilization Committee reportedly ordered the development of an "offshore mobile unloading platform" as one of the major projects under "Project 019" (019工程). The PLA Military Transportation University's Military Transportation Research Institute (军事交通研究所) was tasked to develop a prototype offshore-unloading platform. The expressed purpose of the project was to create a capability for at-sea transfer and unloading of vehicles and matériel when ports had been destroyed by "blue forces." To design the unloading platform, "more than 20,000 pages of foreign-language materials were collected, translated and sorted."[23] Design specifications for the American INLS almost certainly were among those foreign-language materials.

The prototype system comprised "square" or intermediate pontoon modules, bow-stern modules, ramp modules, propulsion modules, and electrical-supply modules. These are the same types of modules that make up the Navy's INLS. The Chinese offshore mobile unloading platform that eventually was built appears to be just a causeway, without propulsion or electrical-supply modules. Patent documents indicate that the proposed system can operate in sea state 3 (wave height up to four feet), which is identical to the advertised operating limit of the INLS.[24]

The offshore mobile unloading platform first was shown publicly in a television news report highlighting a 2014 Guangzhou Military Region exercise. The exercise reportedly marked the first time the PLA used a civilian RO/RO ferry to off-load a PLA unit using the system. As the ferry made its way from the southern port city of Zhanjiang, the embarked PLA mechanized infantry company received word from exercise coordinators that its destination terminal was damaged, so it was ordered to off-load over the beach using the floating-pier system that was being assembled.[25]

Commercial satellite imagery indicates that the two floating piers used in the 2020 exercise were very similar to the offshore mobile unloading platform used in 2014. They were assembled and disassembled several times at the southern end of the Lanshan exercise beach. The longer floating pier normally was used in conjunction with the semisubmersible barge (described in the next section). AIS tracking data indicate that LCUs frequently shuttled between RO/RO ships or cargo-unloading areas offshore and the shorter floating pier. LCU operations appeared to be independent of RO/RO off-loading operations using the longer pier and semisubmersible barge.[26]

Fishing boats may have been used to assist in the assembly of the offshore mobile unloading platforms. Satellite imagery shows pier modules interspersed with what appears to be fishing vessels in the harbor where the pier modules were staged.[27]

Semisubmersible Barge Forming an Artificial Port

The 2020 exercise included a large, semisubmersible barge identified as *San Hang Gong 8* (三航工8). When the barge was attached to the floating pier, the combination formed an artificial port (人工港) where ships could be moored, off-loaded, and resupplied. In comments to the media, one of the PLA exercise participants stated that the semisubmersible barge served as a temporary marine dock and was used for berthing and unloading RO/RO ferries.[28]

Video from the 2014 amphibious exercise in the Guangzhou Military Region (discussed previously) shows a semisubmersible barge very similar to *San Hang Gong 8* submerging to off-load a warping tug and then being maneuvered into place at the end of the floating pier. The barge's freeboard (its height above water) can be adjusted to accommodate different types of vessels. In the video, a civilian RO/RO ferry, *Nan Fang 6,* docked with the barge and quickly discharged armored vehicles and trucks that then proceeded to the beach over the floating pier.[29]

Identical unloading activities apparently took place during the 2020 logistics exercise in Lanshan. The video of the 2020 exercise shows tanks and armored vehicles exiting from *Sheng Sheng 1* and crossing *San Hang Gong 8* onto the floating pier in the foreground.[30]

Mat Roadway for Beach Access

Satellite imagery shows a dark strip running between the end of the floating pier and a parking lot on the other side of the beach. While this strip cannot be identified positively in imagery, it is probably a metal- or synthetic-mat roadway that was laid down to prevent heavy wheeled or tracked vehicles from sinking into soft sand or mud. The 2014 Guangzhou Military Region exercise video shows a metal-mat roadway being laid to the end of the floating pier.[31] Harzone, the division of the China Shipbuilding Industry Corporation responsible for manufacturing military bridging equipment and pontoon bridges, produces a "fast hard road paver" that deploys a roll of aluminum matting and a "fast soft road paver" that deploys a roll of reinforced polyester fabric as a mat roadway.[32]

Floating Crane for Offshore Loading/Unloading

Throughout the 2020 exercise, a floating crane was anchored in the center of the harbor approximately 1.2 nm east of the landing beach. From commercial satellite imagery, this appears to have been a civilian harbor crane, a ninety-foot (twenty-seven meter) crane mounted atop a deck barge measuring 265 by 80 feet (80 by 24 meters).[33] AIS tracking data indicate that two different general-cargo ships came alongside this crane several times during the exercise, presumably to load or unload cargo.

In 17 August 2020 imagery, six vehicles appear to be parked on the deck of the crane barge. These vehicles may have been staged for loading onto a ship during operations that would take place two days later. Alternatively, the vehicles may have been there to receive cargo from a ship. In the latter case, the vehicles then would have driven onto an LCU for transport to the floating pier, where they could be discharged quickly. During what probably was cargo-off-loading operations, LCUs ran between the crane's location and the short floating pier assembled at the south end of the beach.[34]

RO/RO Offshore Unloading Platform

For several seconds during the video report on the 2020 exercise, two PLA officers are seen examining a display that presumably shows capabilities demonstrated during the exercise. According to text visible on the display, the capability being discussed involved two large engineering side barges (大型工程方驳), four Type 271 LCUs, and one "pier ferry" (栈桥渡船), which may be the current term used for the floating pier system. Other text visible in the display indicates that the barges, which together measure 427 by 49 feet (130 by 15 meters), may be used to unload wheeled and tracked vehicles from RO/RO ferries.[35]

Two 213-foot (65 meter) deck barges were seen in satellite imagery linked together as one 427-foot (130 meter) barge.[36] Ramps appear to have been affixed to the sides of the barges, probably to allow LCUs to come alongside the barge for loading. During the exercise, tugs maneuvered the barge behind RO/RO ferries anchored approximately two nautical miles offshore, presumably to facilitate loading or off-loading of vehicles. AIS tracks indicate that Type 271 and Type 067 LCUs moved between the location of the barge and the short floating pier at the southern end of the exercise beach during these operations.[37]

PLAN Landing Craft

Type 271 and Type 067 LCUs' deployed to Lanshan for the exercise from bases in southern Fujian Province. These LCUs operated in the Lanshan

harbor and beach areas throughout the exercise period. Commercial satellite imagery from 17 August 2020 shows eight LCUs in the fishing harbor south of the exercise beach.[38] Recognition features and measurements establish that four Type 271 LCUs and three Type 067 LCUs are present. Another possible LCU, with what appears to be a more substantial superstructure, and longer than the Type 067s at approximately 145 feet (44 meters), is moored alongside the other LCUs. An LCU of this size could not be identified in the PLA inventory from available sources. The LCUs conducted multiple landings directly onto the beach during the exercise.[39]

In addition to the LCUs' using the short floating-pier system to off-load vehicles and equipment, dredging of select areas appears to have allowed LCUs to land directly on the beach without concern for getting stranded on the mudflats at low tide. Cargo ferries associated with the floating-pier system also conducted beach landings. Satellite imagery shows a cargo ferry that probably had just discharged vehicles onto the beach. It also shows an apparent mat roadway crossing the beach.[40]

The apparent use of the short floating-pier system by landing craft across the mudflats at Lanshan Beach is notable. Much of Taiwan's shoreline has been deemed unsuitable for amphibious landings because of tidal ranges similar to Lanshan's (approximately twelve feet). Mudflats in northwest Taiwan extend several hundred feet from the shore, allowing only a narrow window for landing at high tide before receding water levels would strand LCUs or larger landing ships on the flats.

Figure 1. Observed Timeline for Exercise Eastern Transportation-Projection 2020A

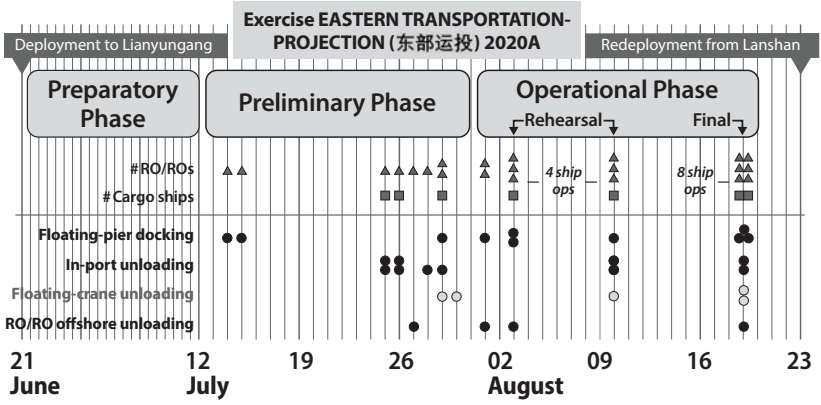


Table 2. Observed Timeline for Exercise Eastern Transportation-Projection 2020A

Exercise Phase	Dates (2020)	Major Events
Deployment	13–21 June	RO/RO ferry transports JLSF and forces to Lianyungang
Preparatory	21 June–13 July	Probable unit-level training of cargo/vehicle loading, crane operations, etc.; LCUs conduct landings at Lanshan Beach
Preliminary	14–31 July	Commercial ships observed individually practicing capabilities, including docking with the barge / floating pier, off-loading in port, and off-loading at floating crane and offshore platform
Operational	1–20 August	
1st half rehearsal	2–3 August	Four-ship ops: three RO/RO ferries off-load at floating pier and with offshore platform; one cargo ship off-loads at floating crane
2nd half rehearsal	9–10 August	Four-ship ops: three RO/RO ferries off-load at floating pier and in port; one cargo ship off-loads at floating crane
Final evolution	18–20 August	Eight-ship ops: three RO/RO ferries dock with floating pier; one RO-RO ferry off-loads with offshore platform; two RO/RO ferries off-load in Lanshan Port; two cargo ships off-load at floating crane
Redeployment	21–25 August	RO/RO ferry transports JLSF and equipment back to port of origin; semisubmersible barge redeploys to southern Taiwan Strait area

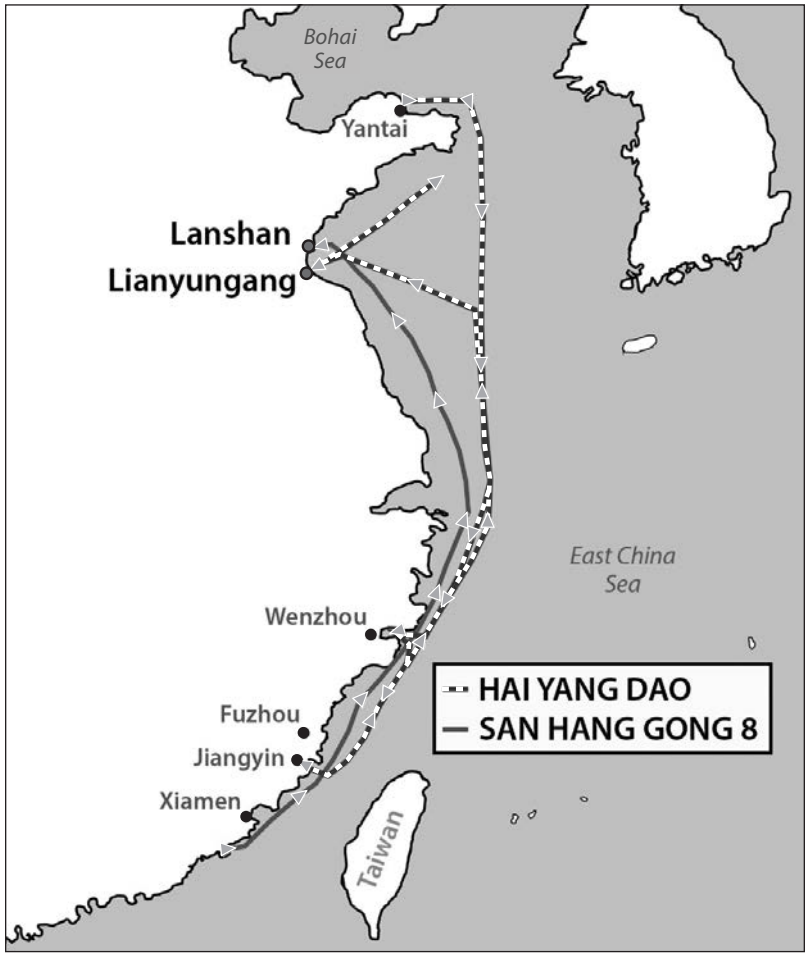
Exercise Summary

Exercise Eastern Transportation-Projection 2020A took place from mid-June to late August 2020. The exercise progressed in increasingly complex stages over two months. Figure 1 and table 2 outline the exercise timeline, highlighting exercise events organized around notional exercise phases.

Deployment

On 13 June 2020, *Hai Yang Dao* left its normal route ferrying passengers across the mouth of the Bohai Sea. The 15,500-ton RO/RO ferry then traveled nine hundred nautical miles south to a nondescript container terminal in Jiangyin Town (江阴镇), Fujian Province, 35 nm south of Fuzhou and

Figure 2. Transits of *Hai Yang Dao* and *San Hang Gong 8,* 13–21 June 2020



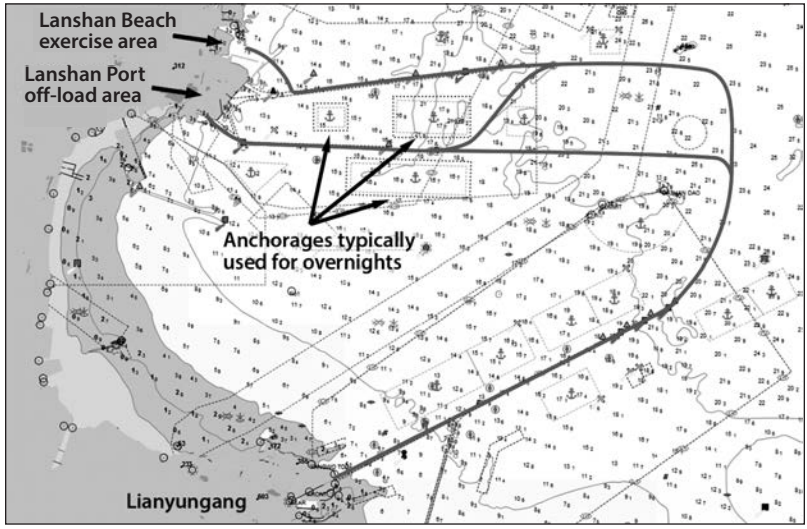
just across the harbor from Putian. There, on 19 June, *Hai Yang Dao* probably picked up staff from the JLSF Eastern Theater Dispatch Center, as well as equipment, vehicles, and cargo that would be used in the exercise. Two days later, *Hai Yang Dao* called in the exercise embarkation port of Lianyungang for five hours, probably to off-load the exercise participants. The ship then immediately returned to its regular ferry route across the Bohai Sea (see figure 2).[41]

About the time that *Hai Yang Dao* left the Shandong Peninsula, the large semisubmersible construction vessel *San Hang Gong 8,* probably towed by the tug *San Hang Tuo 4007,* began its long march from a port-construction project south of Xiamen, Fujian. The two vessels made between five and

eight knots over the course of a week, arriving in Lanshan on 19 June.[42] The long (and probably expensive) transit of this heavy, semisubmersible barge to and from southeastern China is curious—especially considering that a very similar semisubmersible vessel was already in Lanshan at the time of the exercise.[43]

For all exercise events, participating ships transited from the port of embarkation, Lianyungang, to the exercise objective, Lanshan. All ships followed established routes for entering and exiting those ports and harbors. The majority of exercise events happened during daylight hours. For each

Figure 3. Typical Track of Exercise Ships, Driven by Navigation Constraints



major training evolution, ships loaded or unloaded in Lianyungang on one day and departed before nightfall. The ships then stopped overnight at an anchorage, usually near Lanshan. They departed the anchorage in the morning and proceeded either to the port or to the beach area, arriving around the time of high tide. The typical route each ship took between Lianyungang and Lanshan is shown in figure 3.

Preparatory Phase

Given the movement of commercial ships and the timing of the arrival of JLSF and other forces in Lianyungang, as well as some speculation about necessary exercise preparations, the first three to four weeks of the exercise probably focused on preparing and staging equipment. Unit-level training on logistics operations and ship loading also probably occurred. Training with the mobile floating piers and the semisubmersible barge appears to

have been a focus during the first weeks of the exercise. Satellite imagery and AIS tracks indicate that pier modules were assembled, docked with *San Hang Gong 8,* and disassembled several times. LCUs appeared to conduct independent training, including beach landings, throughout this period.[44]

Preliminary Phase

The preliminary phase of the exercise took place 14–31 July. During this phase, individual technologies and capabilities were tested and exercised. This methodical, building-block approach saw individual ships, or sometimes pairs of ships, conducting operations such as docking with the semisubmersible barge / floating pier and conducting port and offshore loading/unloading operations.

Floating-pier docking operations: The first major exercise event and the first noted participation of a civilian RO/RO vessel occurred in mid-July. *Sheng Sheng 1* arrived directly from its ferry route in the Bohai on 14 July and docked with *San Hang Gong 8* and the floating pier for four hours. *Sheng Sheng 1* may have embarked vehicles, but other than the long mooring time there were no outward indications that this occurred. *Sheng Sheng 1* proceeded to Lianyungang Port, then returned to Lanshan to dock with the semisubmersible barge again on 15 July.[45] This event probably was intended to test procedures for docking with the floating pier, barge, and ferry. Another docking evolution took place on 29 July when the RO/RO ferry *Bang Chui Dao* docked with *San Hang Gong 8,* likely in preparation for the operational phase of the exercise.[46]

Port operations: Loading and unloading operations in port involved RO/RO ferries and general-cargo ships calling at Lanshan's dry-bulk-cargo terminal. For scenario purposes, this cargo area probably represented an austere or damaged port facility.

From 25 to 27 July, the 24,000-ton RO/RO ferry *Bo Hai Bao Zhu* and the general-cargo ship *Tian Zhu Shan* operated between Lianyungang and Lanshan, again probably conducting preliminary training in advance of more-complex exercise evolutions. Probable loading or unloading activity occurred on the quayside at the Lanshan terminal.[47] A review of commercial satellite imagery indicates that no special modifications were made to the area where ships moored during the exercise.[48] However, a review of historical images available on Google Earth shows that this corner of the terminal previously had hosted containerships and general-cargo vessels. Therefore, it is possible that Lanshan's port infrastructure and cranes were used to off-load cargo for the exercise. Lanshan's twelve-foot tidal range and the operating limits of the ferries' ramps probably drove the RO/RO ferries to dock on the quayside only at high tide.

All Chinese ferries used in this exercise—in fact, most Chinese ferries—have ramps that extend from the ships, allowing them to embark vehicles from or discharge them onto any suitable pier or quay. This design feature differs from commercial ferries that have no ramps but rely instead on ramps at ferry terminals that lower to the ship. Even with ramps integrated onto the ships, Chinese RO/RO ferries on established routes usually call at terminals that feature docking platforms that rise and fall with the tide. Lianyungang has such a platform at its ferry terminal. For a fixed pier or quay, however, its height likely must be at or below the level of the ramp on the ferry. This would be problematic if a very low tide put the ferry's deck below the height of the pier or quay. However, as long as the tides do not exceed the operating limits of the RO/RO ferry's ramp, the ship can embark or off-load vehicles in virtually any port, including damaged port facilities where specialized docks to accommodate ferries are unavailable.

Offshore loading/unloading operations: Preliminary offshore training evolutions took place immediately after in-port loading/off-loading operations concluded. During the preliminary phase of the exercise, participants worked methodically through single-ship operations (e.g., a RO/RO ferry docking at the floating pier); then two-ship operations (e.g., RO/RO and cargo ships off-loading in port); and finally three-ship operations, with the added complexity of exercising offshore loading and unloading.

27 July 2020: The RO/RO ferry *Bo Hai Zhen Zhu* arrived at the south anchorage early and remained there for over seven hours. Tugs approached the ferry's stern, marking the first use of the offshore RO/RO unloading platform (the two modified deck barges). The ship likely arrived empty from its regular route on the Bohai, then may have conducted on-load operations before transiting to Lianyungang.

28 July 2020: The general-cargo ship *Tian Zhu Shan* arrived at the north anchorage in the morning, probably to initiate offshore crane operations. Concurrent with the crane-barge evolution, the RO/RO ferry *Bang Chui Dao* arrived and docked with the semisubmersible barge. During these operations, *Bo Hai Zhen Zhu* also returned from Lianyungang and probably off-loaded equipment at the dry-bulk-cargo terminal in Lanshan Port. The two RO/RO ferries departed Lanshan and returned to their respective routes on the Bohai Sea.

30 July 2020: *Tian Zhu Shan* returned to the north anchorage, probably to continue practicing offshore loading or unloading with the floating crane.[49]

Operational Phase

The operational phase of the exercise took place 1–20 August 2020. It included four-ship groups in two different rehearsal events performing the evolutions practiced in the preliminary phase. The final exercise event, occurring 18–20 August, involved all eight ships conducting loading operations in Lianyungang and unloading operations in Lanshan, at either the port or the exercise beach.

1 August 2020: Exercise Eastern Transportation-Projection 2020A entered its final phase with an offshore-loading evolution. *Wish Way,* a large, semisubmersible, heavy-lift ship, arrived and anchored in the exercise harbor within twenty minutes of the arrival of the 45,000-ton RO/RO ferry *Zhong Hua Fu Xing*—the crown jewel of the Bohai Ferry Group, and in August 2020 the largest ferry in Asia.[50] As it had not yet entered regular commercial service on a ferry route, this ship's first operation apparently was in service of its military obligations.[51]

It is not clear what role *Wish Way* played in the exercise, but the coincident arrival of a ship of this type is interesting. Semisubmersibles such as *Wish Way,* which is owned by CCCC, have supported other PLA amphibious operations. These highly versatile ships may act as mobile sea bases, enabling the transfer of forces and equipment.[52] That said, for the most part *Wish Way* remained at its anchorage for the remainder of the exercise. In the few commercial satellite images available for 1–20 August, *Wish Way*'s deck is clear in each image.[53]

The RO/RO ferry *Hai Yang Dao* arrived shortly after *Wish Way* and *Zhong Hua Fu Xing* on 1 August 2020 and proceeded to dock with *San Hang Gong 8*.[54] Commercial satellite imagery shows that the floating piers were not present, and *San Hang Gong 8* sat alone offshore. What appear to be vehicles were located on its deck, probably to be loaded on *Hai Yang Dao,* which was arriving directly from its ferry route on the Bohai Sea.[55]

Following the 1 August loading event in Lanshan, all that remained for the exercise was a single, large-scale evolution. The final event first was rehearsed in two parts.

2–3 August: A group of four ships (three RO/RO ferries and a cargo ship) rehearsed their part of the final training event. Weather throughout the exercise, and specifically for the final training events, appeared to be unremarkable.[56] Figures 4 and 5 show the roles of the ships involved in this first rehearsal.[57] The graphics categorize the ships according to whether they performed beach-landing operations, offshore off-loading, or in-port off-loading in Lanshan. For docking operations, the dotted line indicates the time in the harbor, while the solid block indicates the time docked with the semisubmersible barge and floating pier.

Figure 4. Loading Operations Timeline, Lianyungang, 2 August 2020

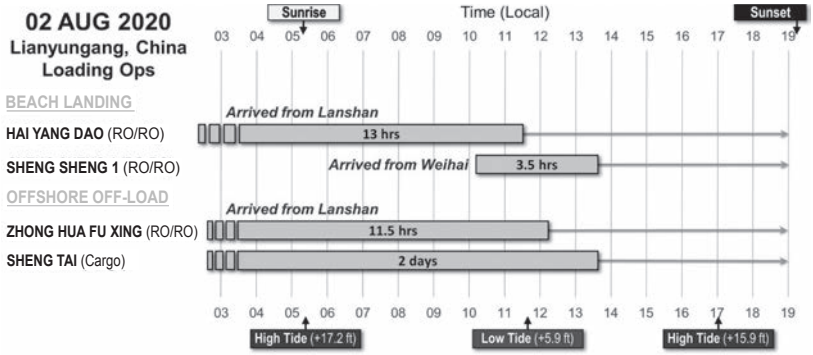


Figure 5. Unloading Operations Timeline, Lanshan, 3 August 2020

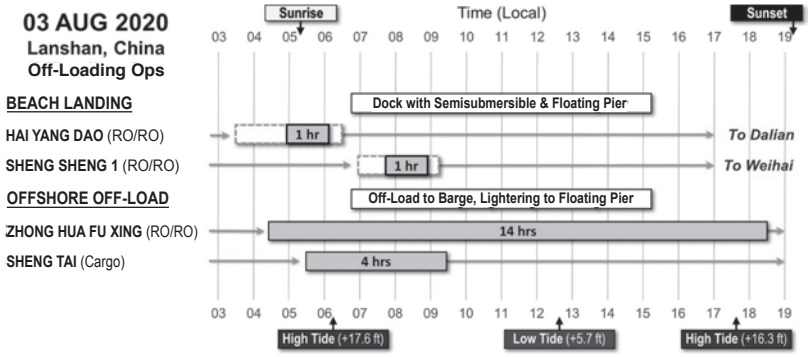


Figure 6. Loading Operations Timeline, Lianyungang, 9 August 2020

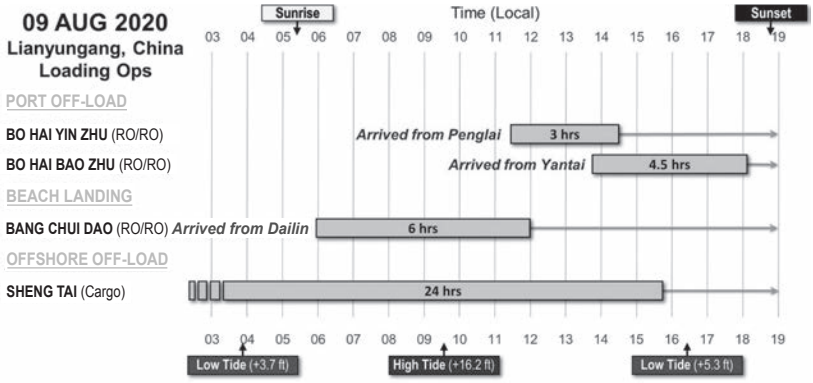
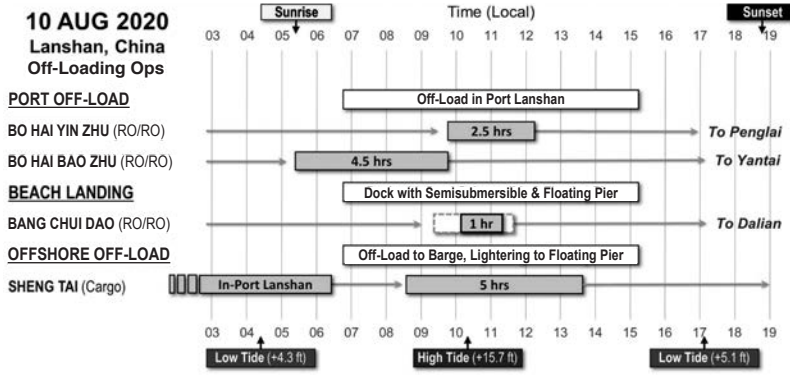


Figure 7. Unloading Operations Timeline, Lanshan, 10 August 2020



9–10 August: A week after the first rehearsal, a different set of RO/RO ferries executed their part of the final event. Figures 6 and 7 show the roles of the ships involved in this second rehearsal.[58] The general-cargo ship *Sheng Tai,* of the same class as *Tian Zhu Shan,* acted as the cargo ship for both rehearsals. *Tian Zhu Shan* joined the group only for the final training event.

18–20 August: All eight ships conducted their respective operations together in the final training event. In this culmination of the exercise, the structure and pace of training appeared to reflect a real-world operations tempo, but one that still was extremely conservative and deliberate. In the final rehearsal and the final exercise event, RO/RO ships deployed directly from their home ports to load in Lianyungang. As mentioned previously, exercise participants loaded on one day, departed Lianyungang before nightfall, and remained overnight at an anchorage. The ships then proceeded to Lanshan the following morning, to arrive around high tide. Following the final off-load events, the ships immediately returned to their home ports on the Bohai Sea.

The floating piers were disassembled in advance of the final exercise event, from 18 to 19 August. On 17 August, the semisubmersible barge *San Hang Gong 8* withdrew a couple of nautical miles offshore. Curiously, *Wish Way* also left the inner harbor on 17 August and stayed overnight at an anchorage before returning to the same spot in the Lanshan Beach harbor the next morning. Again, *Wish Way*'s withdrawal and its return to coincide with the final training event indicate that it likely had some role in the exercise. The other unique element in this final training event involved *Hai Yang Dao* arriving in the harbor to dock with *San Hang Gong 8* at approximately 0300 local time on 19 August—the only nighttime evolution

Figure 8. Loading Operations Timeline, Lianyungang, 18 August 2020

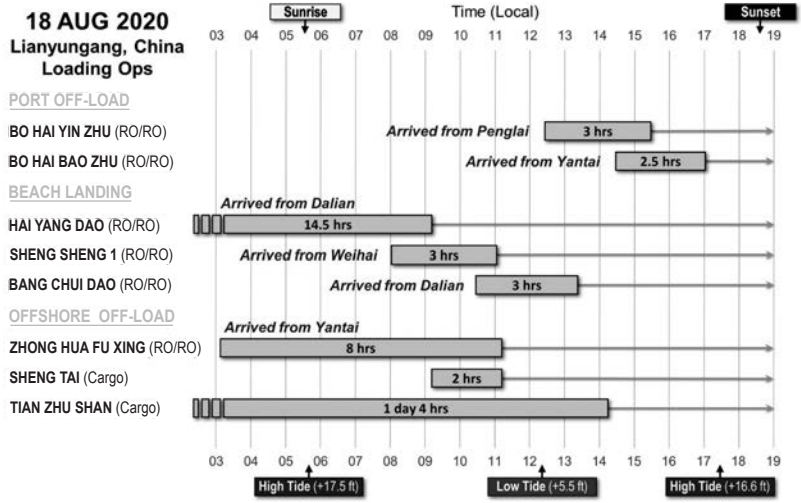
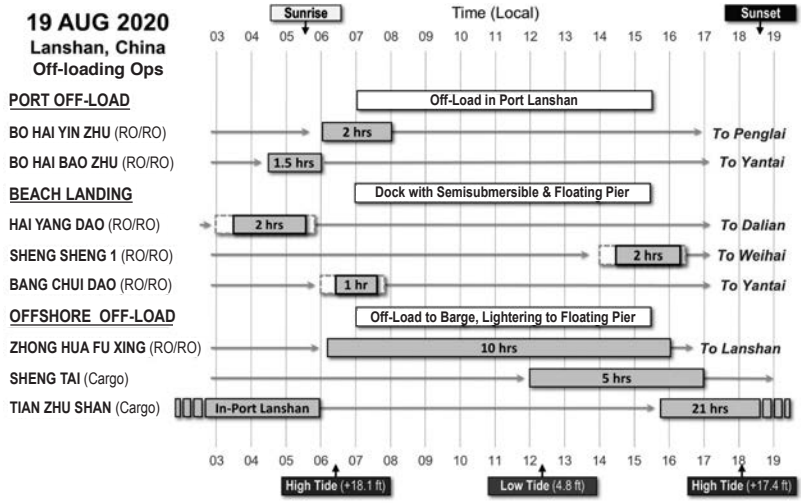


Figure 9. Unloading Operations Timeline, Lanshan, 19 August 2020



observed during this exercise. Figures 8 and 9 show the roles of the ships involved in the final exercise event.[59]

The general-cargo ship *Tian Zhu Shan* arrived in the Lanshan Beach exercise area late in the day on 19 August. It replaced the cargo ship *Sheng Tai* at the floating crane in the middle of the harbor. After *Tian Zhu Shan*'s arrival, no LCU activity was noted to indicate off-loading. *Tian Zhu Shan* remained moored at the crane until the next morning, when off-loading operations with the LCUs recommenced. The cargo ship departed the

harbor at approximately 1300 local time on 20 August, apparently bringing the exercise to a close.[60]

Wish Way departed its anchorage at 1800, just five hours after the final off-load event. The reasons for the presence of the semisubmersible ship and its activities during the exercise remain unknown. This semisubmersible would be an excellent means by which to transport and deploy the floating-pier system to its operating area, but there are no indications that occurred. Following the exercise, *Wish Way* proceeded to Qingdao, a major commercial port and home to the PLAN's North Sea Fleet.[61] The ship may have gone to Qingdao to off-load exercise equipment but, again, not the floating pier; that system remained in Lanshan until at least November 2020. The semisubmersible barge *San Hang Gong 8* departed on 27 August and returned to port-construction projects in southern Fujian Province, directly across the strait from Taiwan.[62]

Redeployment

The 33,000-ton RO/RO ferry *Bo Hai Ma Zhu,* which had not been involved in any other exercise evolutions, arrived in Lanshan on 23 August 2020, probably to collect exercise participants and their equipment. Two days later, the ship called in Jiangyin Town, Fujian, where the deployment to Lianyungang had originated two months earlier.[63]

Exercise Analysis

Eastern Transportation-Projection 2020A was a military-civil training event that exercised amphibious over-the-shore logistics capabilities. The June–August 2020 exercise involved over sixteen civilian ships, a variety of amphibious-logistics equipment, and a handful of PLAN landing craft. Eight large civilian RO/RO ferries played a significant role, off-loading vehicles directly onto a beach-landing area via a floating pier, matériel offshore onto a floating platform for transfer to the beach, and vehicles and equipment into an austere port facility. Two general-cargo ships also off-loaded cargo offshore using a floating crane before LCUs transferred the matériel to shore.

The exercise reviewed here, conducted off a relatively small beach in a protected harbor, appears to demonstrate limited, although in some cases novel, capabilities. It did not demonstrate the capacity to support a major maritime lift as part of a cross-strait invasion. With one exception, all civil-maritime exercise operations were conducted during daylight hours, and events were timed for when tides and weather conditions were favorable as well. Most evolutions took place in the sheltered waters of an inner harbor that is not representative of likely real-world environments in which these

capabilities would be operationalized. That said, the likely overarching objective of the exercise was to test equipment and procedures. In that regard, the exercise almost certainly met its goals, and the JLSF probably regarded it as a success.

Other than a handful of utility landing craft and the armor elements that were transported by civilian ships, PLA combat forces did not participate in this exercise. Any coordination by and with the PLAN was not evident. Admittedly, detailing a PLAN combatant to escort the civilian ships, albeit through busy waterways filled with other Chinese ships, oblivious to the exercise, likely was deemed unnecessary. Similarly, it would have been difficult to justify having an entire amphibious-infantry brigade sitting around a port for a month waiting to be transported from point A to point B while the JLSF worked through checklists and procedures with civilian exercise participants.

Table 3. Timeline of 2021 Military-Civil Fusion Amphibious and Logistics Exercise Activity

Activity	Dates (2021)	Major Events
Unit-level training/ exercises—Southern Theater Command	22 July–11 August	Two RO/RO ferries conducted apparent amphibious-assault training with PLA marine or amphibious-infantry units and participated in at least two military exercises
Large exercise—Eastern Theater Command	2–8 September	At least eight civilian vessels participated in what was probably a large, multifaceted PLA exercise
Logistics operations	2–8 September	Four RO/RO ferries and two general-cargo ships conducted coordinated operations in four civilian ports in eastern China known to be used by the PLA, in a likely large intratheater mobility exercise
Amphibious-assault operations	2–4 September	Two RO/RO ferries conducted offshore operations deploying PLA assault boats and armor, probably with PLAN amphibious-assault ships
Floating-causeway test and evaluation	11–25 September	Two RO/RO ferries conducted testing and evaluation of the PLA's new floating-causeway system

2021 Military-Civil Fusion Amphibious and Logistics Exercise Activity

There are no indications that the PLA conducted a large-scale, over-the-beach logistics exercise in 2021 similar to Exercise Eastern Transportation-Projection 2020A. However, between July and September 2021, seven of

the vessels that had participated in the 2020 exercise participated in direct beach-assault operations and experimented with new amphibious-logistics technologies. In total, fourteen civilian vessels, including eight civilian RO/RO ferries, participated in military-exercise activity during the summer of 2021. The 2021 MCF exercise event timeline is shown in table 3.

Unit-Level Training/Exercises—Southern Theater Command

Two RO/RO ferries were observed conducting amphibious-landing training in the PLA's Southern Theater from 22 July to 11 August 2021. This activity involved the RO/RO ferries' operating offshore over several days, probably deploying and recovering amphibious-assault boats and possibly amphibious armor. Exercising RO/RO ferries as auxiliary amphibious-landing ships to deploy PLA combat units offshore represents a significant evolution in the combat-support role of these civilian ships in PLA operations. Civilian vessels that participated in the July–August 2021 amphibious exercises appear in table 4.

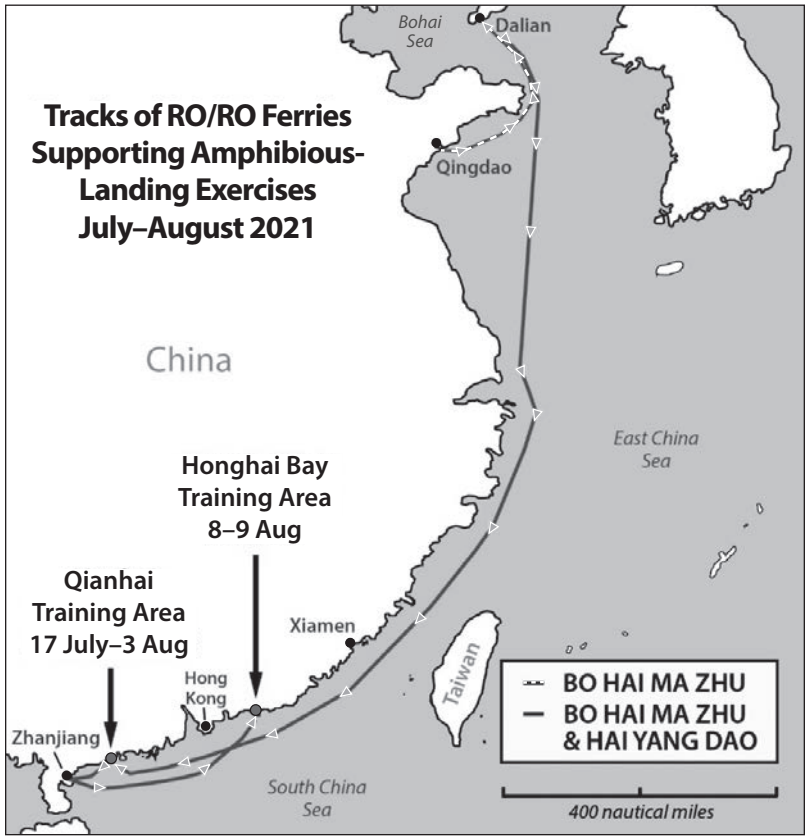
Table 4. RO/RO Ferries Participating in Amphibious-Landing Training, July–August 2021

Ex. 2020A	Ship Name	Length / Gross Tonnage	Owner
Yes	*Bo Hai Ma Zhu*	590 ft. / 33,400 t	Shandong Bohai Ferry Co. (BFG)
No	*Hu Lu Dao*	443 ft. / 15,500 t	China Shipping Passenger Liner Co. (COSCO)

Notes: BFG = Bohai Ferry Group; COSCO = China Ocean Shipping Company. The column "Ex. 2020A" indicates whether the ship participated in Exercise Eastern Transportation-Projection 2020A.

On 12 July 2021, the civilian RO/RO ferry *Bo Hai Ma Zhu* collected a PLAN Marine Corps (PLANMC) armored-infantry unit from a civilian quay adjacent to the PLAN base in Qingdao, China.[64] The ship then returned to its ferry terminal in Dalian. The PLANMC unit may have disembarked in Dalian for training in the Northern Theater, or the unit may have been split between *Bo Hai Ma Zhu* and *Hu Lu Dao* to proceed for training in the Southern Theater. According to their AIS tracks, both RO/RO ferries departed Dalian on 13 July en route to southern China. They arrived off Qianhai (Yangjiang), Guangdong Province, on 17 July 2021 (see figure 10). Commercial satellite imagery indicates that PLAN tank landing ships (LSTs) probably conducted amphibious-landing operations at Qianhai Beach just prior to the ferries' arrival.[65]

Figure 10. Tracks of RO/RO Ferries Supporting Amphibious-Landing Exercises, July–August 2021



Bo Hai Ma Zhu and *Hu Lu Dao* remained in the vicinity of Qianhai Beach for eighteen days, usually positioned two to four nautical miles offshore. Twice, each ship made a short call in the nearby ports of Maoming and Shuidong, probably to off-load or on-load equipment, to refuel, or to resupply.[66]

Throughout this time, these RO/RO ferries probably deployed and recovered PLA assault boats (冲锋舟). The PLA uses these high-speed, ten-person, steel-hull craft equipped with outboard motors to deploy infantry rapidly in amphibious-landing areas. Enough of such boats to land over a thousand infantry troops ashore—about 120—were seen in high-resolution satellite imagery off Qianhai Beach on 23 July 2021.[67] Other than in this image, the boats were missing from available high-resolution satellite images. They may have been stored under what appear to be canopies immediately to the east of where the boats were imaged.

A 26 July 2021 medium-resolution satellite image shows what are probably assault boats and amphibious armor operating miles off Qianhai Beach. Over ninety wakes appear in the image, their sizes indicating that these probably were made by a mix of the small assault boats and the limited numbers of larger amphibious armored vehicles noted at Qianhai Beach. Dozens of the wakes were heading toward the two ferries, indicating the possible on-loading of boats or vehicles. Other wakes, northeast of where the ferries were on-loading, appear to be headed into the amphibious-training area. The boats or vehicles follow in each other's wakes, as opposed to assuming a line-abreast formation.[68] Many amphibious-exercise areas in China, as well as prospective beach-landing sites in northern Taiwan, are relatively narrow. The beachfront constraint lends itself to "follow the leader" beach-landing tactics that allow large numbers of forces to land in a relatively small area.

There is evidence that *Bo Hai Ma Zhu* and *Hu Lu Dao* may have deployed and recovered amphibious armor offshore. In 2020, Chinese media reports revealed that the RO/RO ferry *Bang Chui Dao,* of the same ship class as *Hu Lu Dao,* had been modified with a reinforced ramp for deploying amphibious armored vehicles at sea.[69] On 26 July 2021, high-resolution satellite imagery taken thirty-six minutes after the medium-resolution image mentioned above shows both RO/RO ferries offshore with their vehicle ramps down. Three rectangular objects, possibly amphibious armor, are inbound to *Bo Hai Ma Zhu*. At the same moment, half a dozen amphibious vehicles were imaged landing at Qianhai Beach.[70]

Given the limits of available imagery, it is possible that the rectangular objects that appear to be loading onto the ferries are in fact small boats, not amphibious armor. PLA amphibious armored vehicles have been noted doing "out and back" training from beaches without deploying from a landing ship. This chapter could not determine whether these ferries' ramps were built or reinforced to accommodate the weight of armored vehicles entering or exiting in offshore waters.

The dual-ferry operations with assault boats and amphibious armored vehicles likely culminated in an exercise involving PLAN ships and possibly other military elements in the waters off Qianhai Beach. The Yangjiang Maritime Safety Administration (MSA) issued a closure notice for an operating area that included Qianhai Beach for a military exercise occurring from 31 July to 3 August 2021.[71] During that time, *Bo Hai Ma Zhu* and *Hu Lu Dao* operated in the closure area between a nearby anchorage and the Qianhai Beach landing area, probably deploying and recovering amphibious elements as part of the exercise.[72]

Following the exercise at Qianhai, the two ferries transited to the PLAN South Sea Fleet naval base at Zhanjiang, arriving on 4 August 2021. *Bo Hai Ma Zhu* and *Hu Lu Dao* probably loaded military equipment overnight; they departed the next morning. The ships proceeded to Honghai Bay, 69 nm east of Hong Kong, to participate in a two-day amphibious-landing evolution (8–9 August).[73] The Guangdong MSA issued a notice for a large closure area that encompassed Honghai Bay for a military exercise occurring 5–12 August.[74]

Medium-resolution satellite imagery on 8 August shows *Bo Hai Ma Zhu* and ships that measure approximately 390 feet (120 meters)—the same length as PLAN Type 072 LSTs—departing what probably had been their off-load area at high speed. *Bo Hai Ma Zhu* had stopped four nautical miles offshore for ninety minutes, probably to deploy assault boats, or amphibious armor, or both. Wakes of probable amphibious armor and assault boats can be seen in the image. Concurrent with this activity, *Hu Lu Dao* apparently was conducting similar off-loading operations to the east. *Hu Lu Dao* was stationary for approximately thirty minutes three nautical miles offshore, outside the frame of the available satellite image.[75]

After their likely at-sea off-load operations, the ships withdrew several miles offshore at approximately twelve knots—a relatively high speed for these RO/RO ferries.[76] This maneuver likely simulated a tactical withdrawal following off-loading to mitigate any threats to the civilian ferries from adversary forces onshore. The withdrawal tactics observed at Honghai Bay indicate that the RO/RO ferries likely were exercised in a direct combat-support role with enemy threats in mind, as opposed to the unopposed logistics-support activity observed in the 2020 JLSF exercise.

AIS tracks on 8 August indicate that after several hours both RO/RO ferries moved back within a few miles of the shore landing site, possibly to on-load troops and equipment that had been deployed hours earlier. Late on 8 August, *Hu Lu Dao* started its return journey to the Zhanjiang naval base. *Bo Hai Ma Zhu* remained in Honghai Bay; on 9 August, it executed the same offshore maneuvers, indicating another amphibious-landing evolution. *Bo Hai Ma Zhu* then also returned to the Zhanjiang naval base, probably to off-load the military equipment with which it had been exercising. Following their off-loads in Zhanjiang, both ships began the 1,500 nm trek back to their ferry routes across the Bohai Sea.[77]

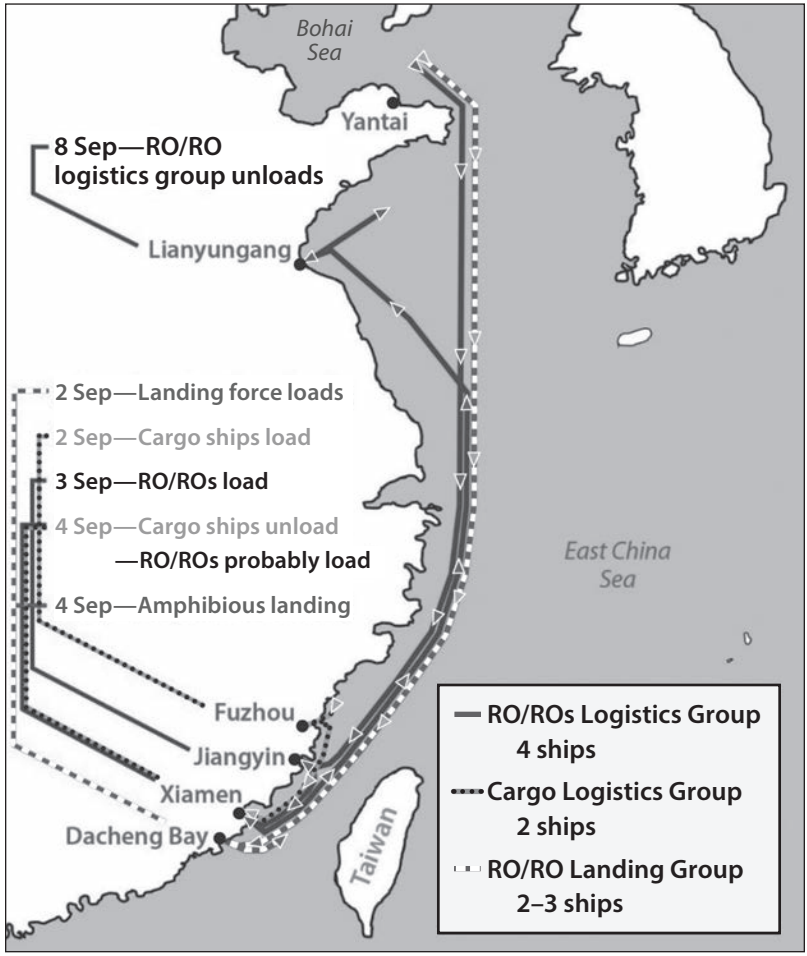
Large Exercise—Eastern Theater Command

In September 2021, at least seven RO/RO ferries and two general-cargo ships participated in what likely was a large-scale PLA exercise. Notable activities

included a large-scale mobility evolution that was synchronized with other RO/RO ferries supporting amphibious beach landings. Test and evaluation with the new-type floating causeway (discussed below) occurred following the operational phase of the exercise. This September MCF training likely was the capstone event for civilian shipping integration in summer 2021 PLA exercises.

The exercise spanned the length of the coastline in the Eastern Theater Command's area of responsibility. Civilian-ship exercise activity stretched from Dacheng Bay, which sits on the border with the Southern Theater Command, to the port of Lianyungang, 670 nm north and only a few miles

Figure 11. Tracks of Civilian Ships Supporting PLA Exercises, September 2021



from the border with the Northern Theater Command. Lianyungang was also the embarkation port for the 2020 JLSF exercise. Figure 11 shows the tracks of the RO/RO ferries and cargo ships that supported PLA exercises in September 2021.[78]

Three different groups of vessels were identified in the early-September PLA exercise: a RO/RO logistics group, consisting of four large RO/RO ferries; a cargo logistics group, consisting of two general-cargo ships; and a RO/RO ferry landing group, consisting of two RO/RO ferries that conducted amphibious-landing operations. Half the merchant ships identified in these groups had participated in the 2020 JLSF logistics exercise. Additionally, in late September two RO/RO ferries, probably constituting a test-and-evaluation group, practiced docking with a new floating-causeway system.

RO/RO and General-Cargo Logistics Operations

From 31 August through 8 September 2021, four RO/RO ferries and two general-cargo ships conducted an Eastern Theater intratheater mobility exercise, what the PLA calls a "cross-sea projection" (跨海投送) exercise. Information on logistics-group ships appears in table 5.

Three large RO/RO ferries from the Bohai Ferry Group departed their routine routes on 31 August and proceeded to the Taiwan Strait. A fourth

Table 5. Merchant Ships Participating in Logistics Training, September 2021

Ex. 2020A	Ship Name	Type	Length / Gross Tonnage	Owner
Yes	*Zhong Hua Fu Xing*	RO/RO	696 ft. / 45,000 t	Weihai Haida Passenger Transportation Co. (BFG)
Yes	*Bo Hai Zhen Zhu*	RO/RO	538 ft. / 24,000 t	Shandong Bohai Ferry Co. (BFG)
No	*Bo Hai Zuan Zhu*	RO/RO	590 ft. / 33,400 t	Shandong Bohai Ferry Co. (BFG)
No	*Da Feng Gang Li Ming Hao*	RO/RO	538 ft. / 34,000 t	Weihai Sheng'an Shipping Co.
Yes	*Sheng Tai*	General cargo	323 ft. / 4,000 t	China COSCO Shipping Corp. (COSCO)
Yes	*Tian Zhu Shan*	General cargo	323 ft. / 4,000 t	Shanghai Changjiang Shipping (Sinotrans)

Notes: BFG = Bohai Ferry Group; COSCO = China Ocean Shipping Company.

RO/RO ship that had not been observed supporting the PLA previously joined the three ferries in the East China Sea on their southward trek. On 3 September 2021, all four ships arrived in Jiangyin, the port from which JLSF elements likely had deployed for Exercise Eastern Transportation-Projection 2020A. Here, the RO/RO ships again may have picked up JLSF staff, depot personnel, and equipment to facilitate logistics training during the exercise. All four RO/RO ships departed Jiangyin on the morning of 3 September.[79]

The fourth ship in the RO/RO group, *Da Feng Gang Li Ming Hao,* operated by Weihai Sheng'an Shipping, is a large RO/RO ship that normally transports volumes of commercial vehicles; it generally does not operate on a regular ferry route.[80] A different RO/RO ship of this type, operated by the Chinese conglomerate Sinotrans, was featured in a June 2020 Chinese media report on a cross-sea projection exercise in which the ship transported a PLA armored brigade.[81]

On 1–2 September 2021, two general-cargo ships supporting the exercise arrived at adjacent berths in Fuzhou, China. These two vessels, *Sheng Tai* and *Tian Zhu Shan,* also had participated in the 2020 JLSF exercise. Both probably loaded vehicles and cargo; they then departed within minutes of each other on the morning of 3 September.[82]

All four RO/RO ships arrived in the port of Xiamen within three hours of each other, early on 4 September 2021. The two general-cargo vessels arrived a few hours later and by midday had berthed adjacent to the RO/RO ships. Satellite imagery is not available to indicate whether the cargo off-loaded from the ships was vehicles or equipment; however, satellite imagery does appear to indicate that columns of military trucks and armor probably were staged for loading onto the ships in areas normally left clear for the port's container cranes. *Bo Hai Zhen Zhu* was berthed at a ferry terminal 1.5 nm south of the area covered by this satellite image.[83]

It is unlikely that the large RO/RO ferries were loaded to capacity for this exercise. These classes of ferries have multiple decks and can accommodate 300–50 vehicles, which normally would include a large number of smaller automobiles.[84] Maximum numbers of military utility vehicles, trucks, and tracked vehicles probably range from 75 to 150, depending on the mix. Each ferry also can transport up to two thousand troops for relatively short at-sea periods; the ships likely do not have the facilities to feed and support thousands of personnel for extended voyages.

The two general-cargo ships may have cross-decked cargo and equipment to the RO/ROs before they departed on 5 September 2021. The cargo ships appeared to return to normal commercial activity after

departing Xiamen. The four RO/RO ships also departed Xiamen on 5 September within two hours of each other and proceeded north to Lianyungang, arriving in Lianyungang within a few hours of each other on the morning of 8 September. The RO/RO ships were only in port for between three and five hours, probably off-loading equipment and vehicles. All the ships departed Lianyungang by midday on 8 September to return to ferry service on the Bohai Sea.[85]

RO/RO Ferry Amphibious-Landing Operations

On 30 August 2021, one day prior to the RO/RO logistics ferries getting under way from the Bohai Sea, two other ferries from the Bohai Ferry Group deployed to the vicinity of the Taiwan Strait to participate in an amphibious-landing exercise. *Bo Hai Ma Zhu,* which had concluded its amphibious-landing training in southern China only two weeks earlier, was accompanied by one of its sister ships, *Bo Hai Cui Zhu*.[86] *Bo Hai Cui Zhu* had made a run to Qingdao on 20 August, just as *Bo Hai Ma Zhu* had done in July 2021, probably to pick up troops and equipment. The ferries may have embarked this force to deploy to the Taiwan Strait for the exercise. RO/RO ferries that may have participated in amphibious-landing exercises are listed in table 6.

Bo Hai Ma Zhu and *Bo Hai Cui Zhu* conducted an amphibious-landing exercise that appeared to be executed in a single morning. To participate in this one-day event, the two RO/RO ferries sailed over a thousand nautical miles each way, without stopping in a port. They arrived east of Dongshan Island on 2 September 2021 and anchored a thousand yards off a rocky shore, then apparently took on fuel. The ships also may have on-loaded exercise forces; or, more likely, they already had forces on board and were waiting for the exercise to commence. They departed their anchorage on the evening of 3 September, sailed in a 200 nm circle, and arrived in Dacheng Bay on the morning of 4 September (see figure 12).[87]

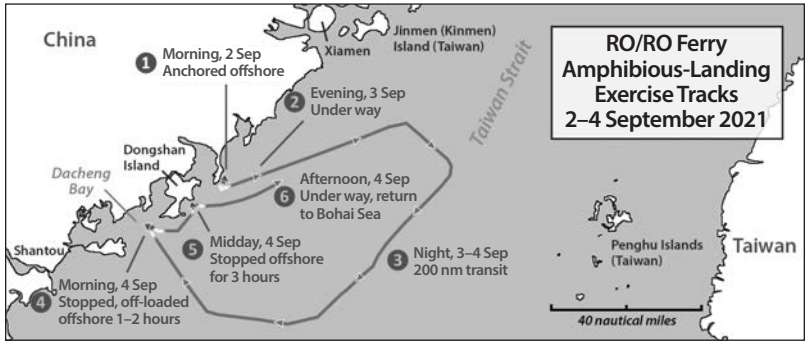
Table 6. RO/RO Ferries Participating in Amphibious-Landing Exercises, September 2021

Ex. 2020A	Ship Name	Length / Gross Tonnage	Owner
Yes	*Bo Hai Ma Zhu*	590 ft. / 33,400 t	Shandong Bohai Ferry Co. (Bohai Ferry Group)
No	*Bo Hai Cui Zhu*	590 ft. / 34,200 t	Shandong Bohai Ferry Co. (Bohai Ferry Group)

Bo Hai Ma Zhu arrived first in Dacheng Bay and stopped six nautical miles offshore for about an hour. As *Bo Hai Ma Zhu* withdrew to an anchorage a few miles away to wait for its sister ship, *Bo Hai Cui Zhu* arrived at the same off-load point and stopped for over two hours. AIS weather data indicate there was little to no wind at the time of the likely off-load activity.[88]

The PLA released photographs of amphibious-assault vehicles deploying from LSTs in relatively calm waters in what was identified as a 4 September 2021 Eastern Theater amphibious-assault exercise. That exercise likely was the same landing event in which the RO/RO ferries

Figure 12. RO/RO Ferry Amphibious-Landing Exercise Tracks, 2–4 September 2021



participated.[89] Medium-resolution satellite imagery taken during *Bo Hai Cui Zhu*'s stop appears to show several boats or amphibious vehicles departing from the ferry's stern ramp. A stream of boats and vehicles seen in the image apparently is proceeding to the landing beach. The RO/RO ferries' off-load area is over five nautical miles offshore, behind a line of ships—probably the PLAN LSTs in the photograph deploying amphibious armor.[90]

After off-loading, both ferries stopped offshore near Dongshan Island for several hours. This could have been to off-load additional equipment or personnel or to on-load the forces they had just deployed to the exercise area. Both ships departed the anchorage on the afternoon of 4 September 2021 and proceeded directly back to the Bohai Sea, arriving on 7 September.[91]

Floating-Causeway Test and Evaluation

From 12 to 25 September 2021, two RO/RO ferries, *Sheng Sheng 2* and *Bo Hai Zhen Zhu,* conducted docking and probable test-and-evaluation procedures with a new-type floating-causeway system in Dacheng Bay, on

the border between Fujian and Guangdong Provinces. The list of vessels that participated in the causeway test and evaluation—the two RO/RO ferries, a semisubmersible barge, and three tugs—appears in table 7.

New-Type Floating Causeway

The September 2021 Dacheng Bay event revealed a new system, referred to here as a *floating-causeway system* to distinguish it from the *floating-pier system* used in the 2020 exercise.[92] This new floating-causeway system bears a much closer resemblance to the U.S. Navy's INLS than does its predecessor. Longer than the PLA's original floating-pier system, it extends approximately 1,475 feet (450 meters) from the shore. Like INLS and the PLA's floating-pier system, the causeway is modular. The new system still appears to rely on a large semisubmersible barge at the head of the causeway for RO/RO ships to dock. The same semisubmersible barge that participated in Exercise Eastern Transportation-Projection 2020A,

Table 7. Civilian Vessels Participating in New-Type Floating-Causeway Test and Evaluation

Ex. 2020A	Ship Name	Type	Length / Gross Tonnage	Owner
No	*Sheng Sheng 2*	RO/RO	541 ft. / 20,400 t	Weihai Haida Passenger Transportation Co. (Bohai Ferry Group)
Yes	*Bo Hai Zhen Zhu*	RO/RO	538 ft. / 24,000 t	Shandong Bohai Ferry Co. (Bohai Ferry Group)
Yes	*San Hang Gong 8*	Heavy lift	213 ft. / Unknown	CCCC
Yes	*San Hang Tuo 4007*	Tug	147 ft. / 842 t	CCCC
No	*Gu Gang Tuo 1*	Tug	125 ft. / Unknown	Unknown
No	*Jin Sheng Tuo*	Tug	174 ft. / Unknown	Unknown

San Hang Gong 8, was noted operating with the floating-causeway system in Dacheng Bay in 2021.[93]

Unlike the older PLA floating-pier system, the new-type floating-causeway system appears to be self-propelled. Medium-resolution satellite imagery on 10 September 2021 shows six sections of the floating causeway apparently moving toward the semisubmersible barge under their own

power.[94] Forty minutes later, a high-resolution satellite image captures the six modules adjacent to the semisubmersible barge. Propulsion units appear to be affixed to the sides of the causeway modules. A tug apparently is preparing to tow the barge toward the shoreline, where the causeway later was assembled.[95]

New-Type Landing Platform

August and September 2021 commercial satellite imagery of the PLA's Dacheng Bay amphibious-training area also reveals what is likely a new type of landing platform. Like the floating-pier systems, this platform may solve the previously mentioned challenges of large tidal ranges and mudflats in amphibious-landing areas. The landing platform probably allows shallow-draft amphibious-assault ships and landing craft to dock with and unload at the platform. By using the platform to transfer vehicles and equipment to the beach, amphibious ships would not need to beach themselves to load or unload, lessening the risk that they would end up stranded on the flats at low tide.[96]

The platform measures approximately 215 by 98 feet (65 by 30 meters). It appears to have four vertical posts that may house pilings that would extend to the sea bottom to provide stability when the platform is positioned in the surf zone. The 270-foot (82 meter) ramp extends from the platform to the beach.[97] No vessels were noted docking with the landing platform in August and September 2021 commercial satellite imagery.

Event Summary

Sheng Sheng 2 left the Bohai Sea and headed south on 7 September 2021; *Bo Hai Zhen Zhu* concluded its participation in the 2–8 September mobility exercise, departed Lianyungang on 8 September, and followed *Sheng Sheng 2* to Dacheng Bay. *Sheng Sheng 2* arrived at an anchorage off Dongshan Island on 10 September; *Bo Hai Zhen Zhu* arrived on 12 September, after a brief stop for fuel in Xiamen.[98]

Commercial satellite imagery indicates that the new floating-causeway system was set up and taken down several times on the beach in Dacheng Bay from 6 to 14 September 2021. This likely provided training for the causeway operators. The causeway sections can be seen maneuvering near or assembled with the semisubmersible barge *San Hang Gong 8,* which acted as a head for the causeway.[99] If *Sheng Sheng 2* was supposed to have docked with the barge and the floating causeway during this week, it failed to achieve that objective. The ferry left the Dongshan Island anchorage and took up position nine nautical miles offshore in Dacheng Bay on 13 September; however, there are no indications that the ship approached the

floating causeway. *Sheng Sheng 2* returned to the Dongshan anchorage on 14 September, then departed two days later to make the thousand-nautical-mile trek back to the Bohai Sea.[100]

Bo Hai Zhen Zhu did complete docking evolutions with the semisubmersible barge and the floating causeway. Details of these events, including the number of docking attempts and the length of time docked, could not be determined from available AIS data—it appears that *Bo Hai Zhen Zhu* turned off its AIS terminal from 12 to 25 September 2021.[101] However, commercial satellite imagery captured what almost certainly was *Bo Hai Zhen Zhu* a thousand yards from the floating causeway on 16 September.[102] AIS data indicate that the tug next to the RO/RO ferry maneuvered to the semisubmersible barge ninety minutes after this image was taken. This may have been the first time a RO/RO ship docked with the barge and causeway during this evolution.[103]

Bo Hai Zhen Zhu moored at an undeveloped quay on Huyetuo Island, just east of Dongshan Island, from 20 to 21 September 2021. Satellite imagery does not indicate any activity on the quay, but the ship may have taken on personnel or vehicles for docking maneuvers with the barge and causeway.[104] Despite the lack of AIS data after the ship departed the quay, other evidence indicates that the ferry proceeded back to Dacheng Bay and docked with the semisubmersible barge and floating causeway several times from 22 to 25 September. In medium-resolution commercial satellite imagery, *Bo Hai Zhen Zhu* can be seen backed into the semisubmersible barge on 22, 23, and 25 September. *Bo Hai Zhen Zhu*'s wake in the 25 September image likely indicates that the ship was backing into the semisubmersible barge when the image was taken.[105] Following these docking evolutions, *Bo Hai Zhen Zhu* departed Dacheng Bay on 25 September 2021 and proceeded back to its home port on the Bohai Sea, arriving on 29 September.[106]

San Hang Gong 8, towed by its tug, *San Hang Tuo 4007,* departed Dacheng Bay on 26 September 2021 and returned to Xiamen on 27 September.[107] The floating causeway was missing from commercial satellite imagery of Dacheng Bay after 25 September; it probably was disassembled and moved out of the area. Neither the floating causeway's home port nor its storage location could be determined.

Exercise Analysis

The scope and diversity of the 2021 military-civil fusion exercises involving civilian shipping were on par with what was observed in the JLSF Exercise Eastern Transportation-Projection 2020A. Apart from tugs and smaller craft, the 2020 and 2021 exercise series employed the same number

of major civilian vessels: eight large RO/RO ferries and two general-cargo ships. Five of the merchant ships participated in both the 2020 and 2021 exercise activities identified in this chapter.[108] Combining ships and crews from previous exercises into current and future exercises represents a characteristic pattern of Chinese military training in which experience is passed from units and organizations to others through practice rather than transferring knowledge through formal training. Seeing the same ships from the same companies in follow-on exercises should be expected as the PLA seeks to pass on and build on the experiences that each crew acquired in the 2020 and 2021 exercises.

The 2021 exercise activity expanded the use of civilian shipping to include direct combat-support roles for the RO/RO ferries: off-loading amphibious forces offshore for beach landings. While being used as auxiliary landing ships in the 2021 exercises, the civilian RO/RO ferries demonstrated defensive tactics that might mitigate potential adversary threats; in contrast, reactions to simulated enemy threats were not detected in the 2020 over-the-shore logistics exercise. In July and August 2021 training, RO/RO ferries in Qianhai and Honghai Bay took up off-load positions three to four nautical miles offshore. In the Honghai Bay exercise, ferries rapidly withdrew from the off-load areas after apparently deploying amphibious forces. In the September 2021 exercises, RO/RO ferries took up off-load positions more than five nautical miles offshore, behind a line of PLAN amphibious ships that might screen the civilian vessels from threats.

The September amphibious-landing exercises appear to have been synchronized with mobility exercises. External observations of events indicate that the RO/RO ferry landing group supported a beach assault with PLAN amphibious ships on 4 September 2021. Concurrently, military-civilian logistics forces loaded on 4 September and departed Xiamen on 5 September. Those ships off-loaded a few days later hundreds of miles away, possibly simulating an off-load in a captured foreign port. Later, experimentation with the types of over-the-shore logistics technologies observed in 2020 continued in 2021 with the test and evaluation of the PLA's new floating-causeway system.

The apparent delays in test and evaluation of the floating causeway may have revealed some issues with the new system. In September 2021, *Sheng Sheng 2* waited offshore for several days without approaching the beach where the causeway was being assembled and taken down. Eventually, the RO/RO ferry departed the area and returned to the Bohai Sea, having spent twelve days away from its home port with little to no exercise activity to show for it. Later, *Bo Hai Zhen Zhu* did dock successfully with the causeway

and semisubmersible barge. Whatever the specific cause of the delays in docking with the causeway system, the events underscore the general difficulties in employing new technologies and procedures in a challenging maritime environment.

Many of the large Bohai Sea–based RO/RO ferries reportedly are built to national military standards expressly to contribute to military operations. It nevertheless is noteworthy that these ferries deployed from northern to southern China when other large ferries that service routes to and from Hainan Island might have been used to support PLA exercises.

As of 2021, the PLA and its reserve civilian merchant fleet probably are unable to provide, in austere or challenging environments, the maritime logistics necessary to support a cross-strait invasion of Taiwan. Although the 2021 exercises employed RO/RO ferries as reserve amphibious-landing ships, deploying infantry in assault boats or amphibious armor, this likely represents a very modest augmentation for a potential PLA landing force. Despite concerns that China could bring its vast fleet of merchant ships to bear on an operation to invade Taiwan or to conduct some other military operation, there are practical realities that should limit such concerns. The complexity of amphibious operations appears to have limited military-civil fusion to a handful of select ships that provide the PLA with relatively modest capacities.

The apparent increase in civilian ship participation in PLA amphibious exercises simply may reflect the PLA taking advantage of excess RO/RO ferry availability during the COVID-19 pandemic; however, the appearance of new amphibious-logistics technologies—probably years in the making—suggests otherwise. Any continuation of the integration of civilian ships into PLA operations will be telling, especially as exercise participation extends to ships other than the large Bohai Sea–based ferries. Once procedures have been established and the PLA has gained some experience integrating civilian vessels into amphibious operations, there may be great potential to scale up rapidly the use of civilian ships in combat-support or amphibious-logistics roles. The expanding roles for merchant ships in military operations may present challenges for China's adversaries in terms of detecting, targeting, and countering these civilian vessels.

However, scaling up combat and logistics operations can be a challenge that increases geometrically in complexity as numbers of participating forces and volumes increase. Loading and moving eight civilian ships once is very different from loading and moving eighty ships once—or, more likely, coordinating dozens of ships to load and move matériel,

equipment, and personnel for days or weeks, all while taking enemy fire. In the 2020 over-the-shore logistics exercise, the landing and unloading operations appear to have been completely unopposed. In the 2021 logistics operations as well, no evidence was observed in the tracks of the ships or satellite imagery that the exercise sought to simulate the presence of an enemy force. No defensive actions (e.g., convoying, escorting, evasion, or diversion) were observed. However, given observations of defensive actions taken in the 2021 landing exercises, the PLA and its merchant support fleet may be changing their mind-set about putting these ships in harm's way.

The appearance of a new floating-causeway system and landing platform in 2021 indicates that the PLA is investing in better over-the-shore logistics technologies. These platforms could provide the PLA with significant capabilities and access to beach-landing areas with military or civilian ships. Project 019 was initiated in 2001, heralded by the PLA as a major (if not widely known) project to create a capability for at-sea transfer and unloading of matériel and equipment in austere conditions. Prototype capabilities appeared over a decade later. By 2020, it appeared that the PLA still was using those same prototype capabilities in Exercise Eastern Transportation-Projection 2020A. Given these long timelines for development and the challenges the PLA may be experiencing with its new floating-causeway system, it is unlikely the PLA will increase its over-the-shore logistics capability rapidly in the next several years.

A group of Chinese military authors affiliated with the PLA's Military Transportation University and the JLSF Transportation and Projection Bureau provide some insights about the state of PLA over-the-shore logistics capabilities. In January 2020, they wrote that the Chinese military's "dockless unloading equipment" (无码头卸载装备) is essentially a "technical reserve." Most of the specialized equipment consists of prototypes, according to these PLA authors. They observe that dockless unloading equipment usually is kept in storage and seldom used—which presents significant challenges for conducting training and for procuring the necessary volume of equipment that otherwise might support large-scale operations. In their critique, they conclude, "[The Chinese] military's dockless unloading is still in its infancy. There are still many weak links."[109] That January 2020 assessment likely is accurate, on the basis of detailed observations of Exercise Eastern Transportation-Projection 2020A and 2021 exercise activity. How those nascent capabilities grow in the coming years should be watched closely.

The 2020 and 2021 exercises integrating civilian shipping, especially large RO/RO ferries, may have provided the PLA and its JLSF with a

baseline assessment for where the Chinese military is with regard to large-scale amphibious operations and logistics. The lessons learned from the JLSF's experience over the summer of 2020 may provide a road map for the types of capabilities and capacities the JLSF and the larger PLA joint force may need for future operations. Depending on the PLA's takeaways, one might expect to see what probably still are prototypes, such as the floating-pier system, the new floating causeway, and the new landing platform, go through additional experimentation and exercises, possibly leading to large-scale production of these types of capabilities to support multiple landing points in a Taiwan invasion. Similarly, ad hoc capabilities such as multiple deck barges modified into an at-sea RO/RO-unloading platform may evolve into tailored systems with features supporting the unique requirements for loading and unloading military equipment from both naval vessels and civilian ships at sea.

Despite these seemingly negative critiques of PLA amphibious-landing capabilities in general, and over-the-shore, "dockless" logistics capabilities in particular, it would be a mistake to underestimate the ingenuity and tenacity of the PLA. Any evaluation of these 2020 and 2021 exercises should consider the context of the Chinese approach to problem solving rather than a Western opinion about how amphibious logistics *should* be done. At present the PLA's reserve merchant fleet probably does not have the capabilities and capacities to support a disciplined, effective, and efficient amphibious operation with over-the-shore logistics in support of a Taiwan invasion. However, efficiency is not necessarily a prerequisite for success, especially for the PLA. Clearly, the PLA has started to work through what may be required to support an invasion of Taiwan and how exactly that will be done. The Chinese Communist Party can leverage a national mobilization of maritime shipping on a massive scale, and the PLA clearly intends to exploit that capability. Such a mobilization of civilian shipping to contribute to cross-strait operations may be very high risk and could result in extremely high losses. However, there is a certain "quality in quantity." There are few challenges related to efficiency and attrition that the Chinese military could not address simply by applying overwhelming mass and a tolerance for loss. Future exercises like those explored in this chapter merit close scrutiny to provide indications of the trajectory of PLA amphibious and logistics capabilities.

Notes

1. This chapter fuses a variety of publicly and commercially available sources to develop detailed insights into often complex military activity and capabilities. Analysis is supported with AIS data from "MarineTraffic: Global Ship Tracking Intelligence," *MarineTraffic,* www.marinetraffic.com/. Google Earth images are attributed to the commercial satellite provider. The chapter also features commercial satellite imagery from Planet Labs, the leading provider of global daily Earth data. Medium-resolution satellite imagery from the PlanetScope constellation (ground sample distance [GSD] ~3.7 meters) was obtained through Planet's Education and Research Program. "Education and Research Program," *Planet Labs,* www.planet.com/markets/education-and-research/. High-resolution satellite imagery from Planet's SkySat constellation (GSD ~0.5 meters) was purchased by the author through SkyWatch Space Applications. *SkyWatch,* www.skywatch.com/. The SkyWatch team's advice and assistance in accessing archived imagery and tasking satellite collection was greatly appreciated.
2. U.S. Defense Dept., *Joint Logistics,* Joint Publication 4-0 (Washington, DC: Joint Chiefs of Staff, 4 February 2019, incorporating change 1 of 8 May 2019), pp. H-1 to H-2.
3. 吴刚 [Wu Gang], 岸滩联合后勤军交运输保障研究 ["Study on Military Transportation Support of Joint Logistics Over-the-Shore Operations"], 军事交通学院学报 [*Journal of Military Transportation University*] 16, no. 7 (July 2014), pp. 9–12.
4. 汪欣 [Wang Xin] and 王广东 [Wang Guangdong], 运输投送力忧在跨海登岛作战登陆桔地开设中的运用研究 ["Application of Transportation and Projection Power to the Opening of Landing Bases in Sea-Crossing Landing Operations"], 国防交通工程与技术 [*National Defense Transportation Engineering and Technology*] 17, no. 5 (September 2019), p. 14.
5. For a masterful analysis that draws on authoritative Chinese writings to assess this and other 1949–50 island-seizure campaigns by the Chinese Communist Party's nascent navy and affiliated maritime forces, see Toshi Yoshihara, *Mao's Army Goes to Sea: The Island Campaigns and the Founding of China's Navy* (Washington, DC: Georgetown Univ. Press, 2023).
6. 黄谦 [Huang Qian] and 王红旗 [Wang Hongqi], 两栖重型合成旅登陆作战后勤保障 ["A Probe into the Logistical Support of the Amphibious Heavy Synthetic Brigade"], 国防科技 [*National Defense Technology*] 40, no. 3 (June 2019), p. 89.
7. 罗雷 [Luo Lei] et al., 诺曼底登陆人工港的建设与启示 ["Construction and Enlightenment of Normandy Landing Artificial Port"], 军事交通学院学报 [*Journal of Military Transportation University*] 22, no. 1 (January 2020), pp. 15–17.
8. "跨海投送" *(cross-sea projection)* is a term that has been used to describe these types of civil-military operations since at least 2015. See, for example, 李开强 [Li Kaiqiang] and 吴俊伟 [Wu Junwei], 空军跨海远程投送 横跨渤黄东南海四大海域 ["Air Force Cross-Sea Long-Distance Projection across the Four Great Seas—Bohai, Yellow, South, and East Seas"], 新华网 [*Xinhuanet*], 12 June 2015, www.xinhuanet.com//mil/2015-06/12/c_127908248.htm.
9. 陈炫宇 [Chen Xuanyu], 任聪 [Ren Cong], and 王凤忠 [Wang Fengzhong], 渡海登岛运输勤务保障面临的问题和对策 ["Countermeasures for Problems in

Logistical Support in Cross-Strait and Beach Landing Transportation"], 物流技术 [*Logistics Technology*] 35, no. 10 (2016), p. 168.

10. Wang and Wang, "Application of Transportation and Projection Power," p. 13.
11. 陈发智 [Chen Fazhi] and 李晓楠 [Li Xiaonan], 登岛作战中军交运输保障几个问题的探讨 ["Research into Problems of Military Transportation Support in an Island Operation"], 国防交通工程与技术 [*National Defense Transportation Engineering and Technology*], no. 1 (2005), p. 4. See also Wang and Wang, "Application of Transportation and Projection Power," p. 13.
12. The Chinese term "运投" appears to be uniformly translated into English by Chinese military authors as "transportation and projection." "军地" refers to "军方-地方" (military force and local [civilian] force). "联合训练" means "joint training."
13. 央视军事 [CCTV Military], 东部战区军地联合演练跨海投送 ["Eastern Theater Command Military-Civil Joint Exercise [of] Cross-Sea Projection"], 13 August 2020, Bilibili video, www.bilibili.com/s/video/BV1va4y1J7aU/.
14. 张飞 [Zhang Fei] and 周鹏 [Zhou Peng], 联合投送能力的增长点在哪里—东部战区运输投送座谈交流发言集锦 ["Where Are the Growth Points for Joint-Projection Capabilities—a Collection of Speeches and Exchanges on Transportation and Projection in the Eastern Theater"], 解放军报 [*PLA Daily*], 22 November 2019, p. 3, available at www.81.cn/gfbmap/content/2019-11/22/content_248065.htm.
15. CCTV Military, "Eastern Theater Command Military-Civil Joint Exercise [of] Cross-Sea Projection," 0:38–0:57.
16. Lanshan is just across the border in Shandong Province, placing it in the PLA's Northern Theater. Maxar Technologies satellite view of Lanshan, China, 35.123° N, 119.378° E, *Google Earth Pro,* v. 7.3.3.7786, 27 September 2020 (Google, 2020).
17. Ownership and registration information for commercial vessels was obtained from *MarineTraffic,* www.marinetraffic.com/. The purported affiliation of the LCUs with the PLAN Eastern Theater is based on an analysis of AIS position data that indicates the LCUs likely are homeported in Nan'ao Island (难熬岛), Niushiwan (牛屎湾), Qinying'ao (亲营澳), and Xiamen (厦门).
18. 全国国防动员工作先进个人颁奖仪式在烟台举行 ["National Defense Mobilization Advanced Individual Award Ceremony Held in Yantai"], 渤海轮渡集团股份有限公司 [*Bohai Ferry Group*], 4 July 2020, www.bhferry.com/e/action/ShowInfo.php?classid=11&id=81/.
19. 何国本 [He Guoben] et al., 战略投送支援船队训练现状及对策 ["Current Situation and Countermeasures of Strategic Projection Support Fleet Training"], 军事交通学院学报 [*Journal of Military Transportation University*], no. 5 (May 2017), p. 1, as cited in Conor M. Kennedy, *Civil Transport in PLA Power Projection,* China Maritime Report 4 (Newport, RI: U.S. Naval War College, December 2019), p. 7, available at digital-commons.usnwc.edu/cmsi-maritime-reports/4.
20. 汤金荣 [Tang Jinrong], 周鹏 [Zhou Peng], and 陈峰 [Chen Feng], 跨海投送 ["Cross-Sea Projection"], 中国青年报 [*China Youth Daily*], 27 August 2020, m.cyol.com/yuanchuang/2020-08/27/content_18752048.htm.

21. Maxar Technologies satellite view of Lanshan, China, 35.137° N, 119.378° E, *Google Earth Pro,* v. 7.3.3.7786, 27 September 2020 (Google, 2020).
22. "Improved Navy Lighterage System," *Fincantieri Marine Group,* 27 April 2020, fincantierimarinegroup.com/products/navy/improved-navy-lighterage-system/.
23. 叶贵先 [Ye Guixian], 解放军装备海上机动卸载平台增强后勤保障能力 ["The PLA Is Equipped with an Offshore Mobile Unloading Platform to Enhance Logistics Support"], 光明日报 [*Guangming Daily*], 27 April 2005, available at jczs.sina.com.cn/2005-04-27/1823283991.html.
24. Wang Guangdong, in association with the Military Transportation Research Institute, appears to hold dozens of patents for various marine-logistics-related inventions and devices, many of which are related to the floating-pier system. See, for example: 王广东 [Wang Guangdong] et al., 复合滚装/滚卸跳板 [composite roll-on/roll-off gangplank], PRC Patent CN2915928Y, filed 13 June 2006, and issued 27 June 2007, patents.google.com/patent/CN2915928Y/zh; 王广东 [Wang Guangdong] et al., 海上多用途浮箱 [offshore multiuse buoyancy tank], PRC Patent CN101209746A, filed 25 December 2007, and issued 9 June 2010, patents.google.com/patent/CN101209746A/zh; and 王广东 [Wang Guangdong] et al., 海上箱系统的刚性连接接头 [rigid connector of offshore floating casing system], PRC Patent CN2871946Y, filed 15 March 2006, and issued 21 February 2007, patents.google.com/patent/CN2871946Y/zh.
25. 广州军区首次民船成建制实兵装卸演练 ["Guangzhou Military Region's First Civilian Ship Full-Scale Loading and Unloading Exercise"], *CCTV,* 20 June 2014, news.cctv.com/2014/06/20/VIDE1403241489289947.shtml.
26. See AIS position data citations for LCUs and crane off-loads (note 34) and offshore RO/RO off-loads (note 37). See also Planet Labs SkySat satellite view of Lanshan, China, 35.141° N, 119.379° E, image ID 20200811_053052_ssc8_u0001, *SkyWatch EarthCache,* 11 August 2020, www.skywatch.com/.
27. Planet Labs SkySat satellite view of Lanshan, China, 35.141° N, 119.379° E, image ID 20200811_053052_ssc8_u0001, *SkyWatch EarthCache,* 11 August 2020, www.skywatch.com/.
28. Tang, Zhou, and Chen, "Cross-Sea Projection."
29. "Guangzhou Military Region's First Civilian Ship Full-Scale Loading and Unloading Exercise."
30. "Eastern Theater Command Military-Civil Joint Exercise [of] Cross-Sea Projection," 0:53–0:57. The video of the tanks off-loading likely was shot on 3 August 2020.
31. "Guangzhou Military Region's First Civilian Ship Full-Scale Loading and Unloading Exercise."
32. China Harzone Industry, *Harzone Catalogue* (Wuhan, PRC: 2018), pp. 27–30.
33. Planet Labs SkySat satellite views of Lanshan, China, 35.148° N, 119.401° E, image ID 20200715_053516_ssc8_u0001, 15 July 2020, and image ID 20200817_023322_ssc12_u0001, 17 August 2020; both *SkyWatch EarthCache,* www.skywatch.com/.
34. For example, AIS position data, probable LCU (MMSI 413469786), 3 August 2020, and probable LCUs (MMSI 412357406, 412175175), 10 August 2020, and probable LCUs (MMSI 412175175, 412170701), 19 August 2020; all *MarineTraffic,* www.marinetraffic.com/.

35. A better Chinese term, used in the maritime industry for what the PLA is calling a "型工程方驳" *(engineering side barge),* is probably "甲板驳船" *(deck barge).*
36. Planet Labs SkySat satellite views of Lanshan, China, 35.147° N, 119.409° E, image ID 20200801_053655_ssc10_u0001, 1 August 2020, and 35.138° N, 119.383° E, image ID 20200811_053052_ssc8_u0001, 11 August 2020; both *SkyWatch EarthCache,* www.skywatch.com/.
37. For example, AIS position data, probable LCUs (MMSI 412175175, 412357400, 412357406, 412357407), 3 August 2020, and probable LCUs (MMSI 413366060, 412175175, 413469786, 412357400, 412357406, 412357407), 19 August 2020; all *MarineTraffic,* www.marinetraffic.com/.
38. Planet Labs SkySat satellite views of Lanshan, China, 35.138° N, 119.383° E, image ID 20200817_023322_ssc12_u0001, *SkyWatch EarthCache,* 17 August 2020, www.skywatch.com/.
39. For example, AIS position data, probable LCU (MMSI 412357407) and probable LCU (MMSI 412170701), *MarineTraffic,* 7, 22, and 24 July and 5 August 2020, www.marinetraffic.com/.
40. Planet Labs SkySat satellite view of Lanshan, China, 35.138° N, 119.383° E, image ID 20200817_023322_ssc12_u0001, 17 August 2020.
41. AIS position data, *Hai Yang Dao* (MMSI 412468000), *MarineTraffic,* 13–21 June 2020, www.marinetraffic.com/.
42. AIS position data, *San Hang Gong 8* (MMSI 413378280) and *San Hang Tuo 4007* (MMSI 412704260), *MarineTraffic,* 13–19 June 2020, www.marinetraffic.com/.
43. For the entire exercise period, a semisubmersible barge virtually identical to *San Hang Gong 8* loitered in the northern part of the Lanshan Beach inner harbor. This barge was identified as *Zhong Jian Ban Qian Bo 1* (MMSI 413326830), which appears to be homeported in Lanshan. Other than its presence in the exercise beach area, nothing indicated it participated in the exercise.
44. AIS position data, *San Hang Gong 8* (MMSI 413378280) and probable LCUs (MMSI 412175175, 413469786, 412170701, 413666669, 412357400, 412357406, 412357407), *MarineTraffic,* 21 June–12 July 2020, www.marinetraffic.com/.
45. AIS position data, *Sheng Sheng 1* (MMSI 412328670), *MarineTraffic,* 14–16 July 2020, www.marinetraffic.com/; Planet Labs SkySat satellite view of Lanshan, China, 35.146° N, 119.380° E, image ID 20200715_053516_ssc8_u0001, *SkyWatch EarthCache,* 15 July 2020, www.skywatch.com/.
46. AIS position data, *Bang Chui Dao* (MMSI 412450000) and *San Hang Gong 8* (MMSI 413378280), *MarineTraffic,* 29 July 2020, www.marinetraffic.com/.
47. AIS position data, *Bo Hai Bao Zhu* (MMSI 412330020) and *Tian Zhu Shan* (MMSI 412076010), *MarineTraffic,* 25–27 July 2020, www.marinetraffic.com/.
48. Planet Labs SkySat satellite view of Lanshan, China, 35.096° N, 119.370° E, image ID 20200817_023322_ssc12_u0001, *SkyWatch EarthCache,* 17 August 2020, www.skywatch.com/.
49. This entire subsection covered by AIS position data, *Bo Hai Zhen Zhu* (MMSI 413409000), *Bang Chui Dao* (MMSI 412450000), and *Tian Zhu Shan* (MMSI 412076010), *MarineTraffic,* 27–30 July 2020, www.marinetraffic.com/.

50. AIS position data, *Wish Way* (MMSI 371578000) and *Zhong Hua Fu Xing* (MMSI 412283000), *MarineTraffic,* 1 August 2020, www.marinetraffic.com/.
51. "Asia's Largest 'ro-ro' Passenger Cruise Ship Sets on Maiden Voyage in East China," *Xinhua,* 7 October 2020, www.xinhuanet.com/english/2020-10/07/c_139424514.htm.
52. Kennedy, *Civil Transport in PLA Power Projection,* pp. 15–17.
53. E.g., Planet Labs SkySat satellite view of Lanshan, China, 35.156° N, 119.402° E, image ID 20200811_053052_ssc8_u0001, *SkyWatch EarthCache,* 11 August 2020, www.skywatch.com/.
54. AIS position data, *Hai Yang Dao* (MMSI 412468000), *MarineTraffic,* 1 August 2020, www.marinetraffic.com/.
55. Planet Labs SkySat satellite view of Lanshan, China, 35.147° N, 119.395° E, image ID 20200801_053655_ssc10_u0001, *SkyWatch EarthCache,* 1 August 2020, www.skywatch.com/.
56. Additional research is required on matters of meteorology, as archived records of neither weather forecasts nor actual weather conditions for the Chinese coast were found. Some information on wind conditions was available through AIS data, which seemed to indicate that winds were light during exercise events.
57. AIS position data, *Hai Yang Dao* (MMSI 412468000), *Sheng Sheng 1* (MMSI 412328670), *Zhong Hua Fu Xing* (MMSI 412283000), and *Sheng Tai* (MMSI 412081630), *MarineTraffic,* 1–3 August 2020, www.marinetraffic.com/.
58. AIS position data, *Bo Hai Yin Zhu* (MMSI 412328370), *Bo Hai Bao Zhu* (MMSI 412330020), *Bang Chui Dao* (MMSI 412450000), and *Sheng Tai* (MMSI 412081630), *MarineTraffic,* 8–10 August 2020, www.marinetraffic.com/.
59. AIS position data, *Hai Yang Dao* (MMSI 412468000), *Sheng Sheng 1* (MMSI 412328670), *Zhong Hua Fu Xing* (MMSI 412283000), *Sheng Tai* (MMSI 412081630), *Bo Hai Yin Zhu* (MMSI 412328370), *Bo Hai Bao Zhu* (MMSI 412330020), *Bang Chui Dao* (MMSI 412450000), and *Tian Zhu Shan* (MMSI 412076010), *MarineTraffic,* 18–20 August 2020, www.marinetraffic.com/.
60. AIS position data, *Tian Zhu Shan* (MMSI 412076010) and *Sheng Tai* (MMSI 412081630), *MarineTraffic,* 18–20 August 2020.
61. AIS position data, *Wish Way* (MMSI 371578000), *MarineTraffic,* 20–27 August 2020, www.marinetraffic.com/. *Wish Way* was in Qingdao Harbor from 24 to 26 August 2020 for unknown reasons, but it did not appear to go pierside.
62. AIS position data, *San Hang Gong 8* (MMSI 413378280) and *San Hang Tuo 4007* (MMSI 412704260), *MarineTraffic,* 20–28 August 2020, www.marinetraffic.com/.
63. AIS position data, *Bo Hai Ma Zhu* (MMSI 414211000), *MarineTraffic,* 23–25 August 2020, www.marinetraffic.com/.
64. 海军陆战队某旅组织联合跨海投送演练 ["Marine Corps Brigade Organized Joint Cross-Sea Projection Exercise"], 中国军视网 [*China Military Television Network*], 22 July 2021, www.js7tv.cn/video/202107_253134.html.
65. AIS position data, *Bo Hai Ma Zhu* (MMSI 414211000) and *Hu Lu Dao* (MMSI 413134000), *MarineTraffic,* 11 July–11 August 2021, www.marinetraffic.com/; Planet Labs PlanetScope satellite view of Qianhai (a.k.a. Fuhu Harbor [福湖港]),

China, 21.492° N, 111.527° E, image ID 20210717_024745_1035, *Planet,* 17 July 2021, www.planet.com/.

66. AIS position data, *Bo Hai Ma Zhu* (MMSI 414211000) and *Hu Lu Dao* (MMSI 413134000), *MarineTraffic,* 17 July–3 August 2021, www.marinetraffic.com/.
67. Planet Labs SkySat satellite view of Qianhai (a.k.a. Fuhu Harbor [福湖港]), China, 21.523° N, 111.535° E, image ID 20210723_055645_ssc9_u0001, *SkyWatch EarthCache,* 23 July 2021, www.skywatch.com/.
68. Planet Labs PlanetScope satellite view of Qianhai (a.k.a. Fuhu Harbor [福湖港]), China, 21.495° N, 111.524° E, image ID 20210726_021919_86_245a, *Planet,* 26 July 2021, www.planet.com/.
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70. Planet Labs SkySat satellite view of Qianhai (a.k.a. Fuhu Harbor [福湖港]), China, 21.521° N, 111.536° E, and 21.463° N, 111.528° E, image ID 20210726_025513_ssc12_u0001, *SkyWatch EarthCache,* 26 July 2021, www.planet.com/.
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PART V

Implications

Sam J. Tangredi

17. Trading Places

U.S. Marine Corps and PLAN Amphibious Forces in the 2020s

In 2019, the U.S. Marine Corps commenced its most significant change of doctrine and force structure in seven decades. Gen. David H. Berger, Commandant of the Marine Corps, directed a shift away from the previous doctrine of "large-scale amphibious forcible-entry and sustained operations ashore" toward an archipelagic maneuver force designed to conduct littoral, sea-denial operations against China's People's Liberation Army Navy (PLAN).[1] These operations would be conducted within the range of the People's Liberation Army's (PLA's) long-range missile forces. To fund this change, the Marine Corps is "divesting to invest," allowing a decrease in the number of large amphibious warships and shedding tanks and significant elements of its amphibious-landing and helicopter- and tiltrotor-lift capabilities.[2]

Meanwhile, the PLAN is moving in an opposite direction. In 2019, the PLAN launched its first Yushen-class amphibious-assault ship (Type 075 LHD) derived from the design concept of the U.S. Navy's *Wasp*-class LHD warships.[3] LHDs are capable of operating both aircraft and air-cushion landing craft (LCACs), because they have both a flight deck and a well deck. The first Yushen was commissioned (full operational capability) in 2021. A second Yushen-class warship was commissioned and a third was launched the same year. Although slightly smaller than ships of the *Wasp* class (of

which six remain in service), Yushen-class ships are built (similarly to *Wasp*) to conduct amphibious forcible entry and sustained operations ashore. These ships join eight Yuzhao-class (Type 071) amphibious transport docks (LPDs)—analogues of the U.S. Navy's *San Antonio*–class LPD—capable of embarking both helicopters and LCACs.[4]

Although—as the other chapters in this volume make clear—the PLA is developing capabilities necessary to assault Taiwan, large oceangoing amphibious-assault ships potentially can conduct amphibious operations on a global basis, euphemistically phrased by the People's Republic of China (PRC) as "far seas protection." PLAN amphibious warships have deployed to the Horn of Africa to participate in antipiracy patrols.[5] Conor Kennedy notes that PLAN Marine Corps (PLANMC) "forces are now regularly deployed to China's first overseas base in Djibouti and will eventually embark on future amphibious strike groups deployed in the far seas."[6]

Given the trends in development of Chinese amphibious warships, it would appear that the PLA is attempting to duplicate the (previous) USN/USMC amphibious- and expeditionary-warfare model. The PLAN continues to operate smaller amphibious warships, such as tank landing ships (i.e., LSTs). However, the investment in large amphibious-assault ships indicates that the Chinese Communist Party (CCP) envisions a future in which it can deploy expeditionary strike groups similar to those the United States has employed for the past fifty years. A globally deployable amphibious/expeditionary group is a far cry from the humble origins of the PLA amphibious force and a considerable leap from the PLAN capabilities that existed in the first years of this century.

For an invasion of Taiwan across a strait of approximately a hundred nautical miles (nm), LHDs are not necessarily the optimal (or the most cost-effective) platforms when numerous smaller warcraft are available (including civilian commercial craft). They are, however, optimal for spearheading the transport of marines to conduct operations at distances out to the Horn of Africa, islands in the eastern Pacific, or—with suitable future logistics support—the Mediterranean. To invest in building LHDs—even when Taiwan remains the most significant objective for PLA amphibious forces—is surely not without meaning.

Considering that the U.S. Marine Corps is divesting parts of its global expeditionary-warfare platforms and weapon systems to fund "stand-in" forces to conduct kinetic fires from islands in the western Pacific, and the PLA slowly is building a globally deployable amphibious capability, one could say that the two forces are "trading places" in doctrine and force structure.

In past years, PLA amphibious forces were judged to have only a

"coastal" capability—they even were repulsed in their efforts to capture Kinmen (Quemoy), a Republic of China (Taiwan)–held island located less than 5.3 nm (ten kilometers [km]) from the PRC coastline. Instead, the PLA had to be content with shelling the island periodically with artillery, when coercive diplomacy was required. The new USMC doctrinal concepts, Littoral Operations in a Contested Environment (LOCE) and Expeditionary Advanced Base Operations (EABO), call for the development of littoral land units for the conduct of sea-denial missions—what in past years might have been called "coastal defense." Understanding the irony in this exchange of roles requires a brief examination of history.

Evolution of the U.S. Marine Corps

The Marine Corps formally was established on 10 November 1775 as the Continental Marines, on the basis of the model of the British Royal Marines.[7] As colonials fighting for independence from Britain, it was natural that they emulated British practices. Marines operated as "soldiers of the sea" aboard naval vessels, acting as sharpshooters and boarders in battles at sea (and for other naval tasks as necessary) and conducting amphibious raids ashore and "cutting out" expeditions in enemy ports. They were also useful in putting down mutinies, for which they often were derided as "the Navy's police force."

In the lead-up to the twentieth century, coordination of amphibious operations (called "conjunct operations" at that time) between armies and navies of most nations was uniformly abysmal. Although administrative (unopposed) landings of army troops were used in many wars (originally, marines stayed with the ships in major campaigns when other soldiers were available), experience taught military planners the common wisdom that landing under enemy fire was dangerous to the point of impossible. Unexpected raids could be managed and there were infrequent successful landings on contested beaches, but to land an army in force from the sea against a determined enemy was not countenanced. Since such raids as were attempted were on a small scale, they largely were assigned to marines already aboard naval warships.[8]

Slowly, U.S. Marines (and those of other nations) took on other related missions ashore such as guarding naval bases, particularly coaling stations and bases overseas—often called "advanced bases." From there it was but a small step to use Marines to fight "small wars"—essentially special operations–type combat—particularly during those crises in Caribbean nations in which U.S. presidential administrations decided to intervene

(often referred to as "banana wars"). In some cases, Marines remained in country for some time as gendarmerie, maintaining peace and performing such tasks as managing customs duties for insolvent governments.[9]

In the 1920s, the Marine Corps started to develop doctrine to seize advanced overseas bases in the event of war rather than only guarding bases obtained by treaty or other diplomatic means.[10] A particularly influential study in this practice was "Advanced Base Operations in Micronesia" (Operations Plan 712) by Lt. Col. Earl Hancock "Pete" Ellis, USMC, which focused on requirements for a potential war against imperial Japan.[11] Through a series of exercises conducted in the 1920s and '30s, the Marine Corps (with some participation by the Army) developed the doctrine, expertise, and eventually the specialized amphibious craft to conduct large-scale amphibious assaults on enemy shores. Procedures for such assaults were detailed in the publication *Tentative Manual for Landing Operations.* This was the doctrine for the famed Marine Corps (and Army) amphibious operations in World War II. (Imperial Japan adopted some of these same tactics in its invasions in Southeast Asia.)[12]

The Marine amphibious assault at Inchon, the port of Seoul, in the Korean War—after allied forces had been pushed into a small enclave in the south (the "Pusan perimeter")—is credited with "turning the tide" of the war and leading to the liberation of South Korea from communist forces. As the supreme commander, Gen. Douglas MacArthur, USA—never a particular fan of the Marine Corps—stated: "The Navy and Marines have never shone more brightly than this morning." To reinforce the assault, the Marine Corps sailed an additional expeditionary force originally deployed to the Mediterranean Sea to Korea instead—covering a distance of over 6,000 nm (11,112 km)—and into the subsequent battles. Reportedly, MacArthur considered the war practically won after the successful landing at Inchon.[13]

The historical evolution in doctrine and force structure of the Marine Corps was from an expeditionary force capable of defending overseas ("advanced") naval bases to a force capable of conducting amphibious assaults against entrenched opposing militaries—a capability thought impossible but a few decades before, particularly in light of the Allied failure at Gallipoli in 1915. This mission remained the primary role of the Marine Corps for seventy years after Inchon.

Critics, including many retired USMC generals and past leaders, view General Berger's decision for change as giving up significant segments of USMC amphibious-assault capability in exchange for a "stand-in" force posture similar to the previous defense of advanced bases—with some additional offensive sea-denial weaponry.[14] This stand-in posture is to be the Marine Corps's primary joint force war-fighting contribution in any potential conflict against the CCP/PRC in the western Pacific.[15]

Evolution of PLA Amphibious Forces

Instead of possessing an evolutionary development similar to that of the U.S. Marine Corps, PLA amphibious forces were created ad hoc for two specific tasks: the capture of Nationalist-held islands, including Hainan Island, and the anticipated assault that would lead to the civil war–ending occupation of Taiwan.

Although islands with very small Nationalist garrisons were overrun, the October 1949 amphibious assault on the Kinmen (Quemoy) island group, fifty-nine square miles (152 square km) in size, was a bloody defeat for the PLA. One authority suggests that not only did this defeat expose "the PLA's inability to conduct naval and amphibious warfare," but it also "marked a turning point [in the Chinese Civil War], the final halting of the momentum of the PLA assault against Taiwan."[16] Reportedly, "Mao Zedong admitted that the battle of Quemoy was the biggest loss to the PLA during the Chinese Civil War."[17]

As Xiaobing Li shows in his chapter in this volume, the PLA learned lessons from the defeat. The assault of Hainan—second only to Taiwan in size of islands held or claimed by Beijing at 13,124 square miles (33,991 square km)—in April 1950 was a victory for the PLA; it used 2,135 civilian junks to land an army of more than 115,000 troops, assisted by approximately fifteen thousand guerrillas (the Qiongya Column). The initial landing of a regimental-size unit was a disaster, but it focused Nationalist attention away from the main landings, which required twenty hours to complete. Poor intelligence—which prevented the Nationalist navy from engaging the transiting junks—also contributed to the Nationalist defeat. The remaining Nationalist forces withdrew to Taiwan. Despite still having limited knowledge of and experience with amphibious tactics, the PLA was able to use brute force to conduct the assault successfully. But the strait separating Hainan from mainland China, while wider than the Quemoy Strait, averages only nineteen miles (30 km) across—an extremely short distance by the standards of U.S. expeditionary warfare.

PLA amphibious forces were not successful in assaulting the smaller nearby islands in the Taiwan Strait (Kinmen [Quemoy] and Matsu [Mazu]), and both sides considered the approximately one-hundred-mile transit to Taiwan to be impossible to conduct without supporting (and dominant) airpower and naval power—which the CCP/PRC did not possess until the first decade of the twenty-first century. Since then, it has continued to increase such military and naval power.

Previous chapters have detailed the expansion of the overall amphibious forces of the PLA. Additionally, they have discussed extensive PLA analytical

examination of successful amphibious operations of the past, both foreign and Chinese. These have been combined in a way that can be described only as emulation of pre-2019 USN and USMC capabilities. It would appear that the PLA is attempting to make up for limited experience by studying the intensive doctrinal and force development that the Marine Corps commenced in the 1920s—adding the employment of emerging technologies.

Doctrinal Shift: What Does the Marine Corps Intend to Do?

As General Berger describes, his goal is to develop a "littoral maneuver force that can operate within range of an enemy's sensors and weapons," primarily "to conduct sea control missions in support of the Navy and the Joint Force."[18] While operating on islands, this infantry force will be equipped with long-range sensors (unmanned aerial vehicles, etc.) and ground-based, antiship missiles, quickly maneuvered on land via light vehicles and between islands aboard a not-yet-designed "light amphibious warship" (LAW). Speed of maneuver would be the key to avoiding the enemy's counterbattery fire.

These littoral battalions, forming the 3rd Marine Littoral Regiment, would not be optimized for amphibious assaults or combat against enemy forces ashore but would use previously unoccupied territory to conduct attacks on warships and aircraft—essentially, naval combat from the land.[19] (An additional irony is that military analyses of the CCP/PRC prior to its recently extensive buildup of warships referred to the PLA strategy in the western Pacific as "using the land to control the sea.")[20]

Since General Berger's focus for USMC doctrine and force structure is on the potential for conflict with the PLA/PLAN in the western Pacific, the obvious deployment areas for the littoral regiment would include the islands of the Philippines. When questioned about how such operations would be conducted in the event that the Philippines did not allow entry of the Marines into its territory (despite a mutual-defense treaty with the United States), Berger replied that they then would be conducted "from a sea base of amphibious ships" such as the larger warships currently comprising the globally deployable expeditionary strike groups that are centered on an LHD.[21]

The shift in doctrine, which is expected to be followed by force-structure changes, is outlined in two USMC "concepts": LOCE and EABO.

In the service's public concept paper (akin to a white paper), LOCE is described as providing "a framework for naval integration" of the Navy and

the Marine Corps.[22] The premise of LOCE is that the primary mission of the Marine Corps in a near-term war with the CCP/PRC is not to conduct an amphibious assault ("forcible entry") but to assist the Navy in asserting sea control in the East and South China Seas.[23] Marines would operate as part of a littoral combat group, with the Navy having overall command, supplying the warships (and necessary support vessels), and providing most of the group's firepower. Armed with land versions of the Navy's antiship missiles, Marine units would maneuver constantly while ashore by ground vehicles or from island to island using the proposed LAW. In essence, the Marine littoral units would operate as if they were warships ashore, taking advantage of the concealment and confusing radar picture that the land might provide.

The LOCE concept was under development in the early 2010s and was released publicly in 2017, a period during which Department of Defense (DoD) decision makers believed (or at least stated) that U.S. naval and joint forces could achieve "sea control" against PLA opposition.[24] *Sea control* is the ability to dominate an area of ocean so that operations can be carried out without effective enemy opposition.[25] The Marine Corps's unclassified version of the LOCE document formally defines *sea control* as "the condition in which one has freedom of action to use the sea [including the airspace above] for one's own purposes in specified areas and for specified periods of time and, where necessary, to deny or limit its use to the enemy."[26]

However, since 2017, many analyses have considered it improbable that sea control could be achieved in the seas close to the Chinese mainland.[27] Rather, the United States can achieve *sea denial,* in which neither side can operate in those waters. Indeed, the LOCE document includes in its description of the "desired end state" the objective of establishing "persistent sea denial capabilities forward to deter aggression in the littorals."[28]

EABO can be described best as the methodology for implementing LOCE. Headquarters, USMC issued a *Tentative Manual for Expeditionary Advanced Base Operations* in February 2021 "as part of an iterative process to test, refine and codify" the EABO concept (and thereby the LOCE concept).[29] It "intentionally emulates the evolution of 'Advanced Base Operations in Micronesia,' a concept written in 1921, into a *Tentative Manual for Landing Operations* generated by the Marine Corps in 1934 and then into a shared naval product, *Landing Operations Doctrine,* Fleet Training Publication 167, in 1938."[30]

Given the specific requirement of a conflict engagement in the South or East China Sea, as conceived today by Commander, U.S. Indo-Pacific Command (often referred to as "the fight tonight"), the employment of Marines at advanced bases along the first island chain under the LOCE concept does

make considerable sense. Analysts do not conceive of the potential for a successful amphibious assault against mainland China. In the case of the Taiwan Strait, effective sea denial would put an attempt to occupy Taiwan at risk, presumably deterring such a threat. Whether a Marine Corps littoral maneuver group actually would have an effect on the CCP/PRC decision to conduct an amphibious assault against Taiwan or have any effects on an actual Taiwan Strait operation is a question worth examining.

Applicability to the Taiwan Scenario

Would the 3rd Marine Littoral Regiment have a role in defeating a PLA attempt to cross the Taiwan Strait to occupy Taiwan?

The answer depends on force positioning and range of weapons. The most effective position for the Taiwan scenario would be on Taiwan-held islands. Of course, that placement is unlikely, for both political and survivability reasons. The Marine Corps is primarily the equivalent of light infantry (as is the PLANMC). To defend Taiwan from a full amphibious and airborne assault would require the air-defense weaponry and heavy armor of the Army, and if any U.S. forces were to be emplaced on Taiwan prior to an invasion it likely would be Army units.

If U.S. decision makers decided to emplace U.S. ground forces on Taiwan *after* the commencement of an invasion, the initial cadre would need to be delivered by air transport, as the fastest method. Transporting troops by this method is relatively easy; transporting heavy equipment is not. During the Cold War, U.S. plans for air transport of troops called for heavy weapons to be pre-positioned in allied nations, such as the members of NATO. Thus far, the United States has not pre-positioned its own equipment on Taiwan.

With the availability of U.S. amphibious warships on deployment nearby, the Marine Corps *would* be able to transport a limited amount of heavy weaponry. However, this is the type of weaponry for which General Berger plans to make deep cuts in inventory. Yet a USN expeditionary/amphibious strike group would be the fastest response.

The United States does maintain heavy equipment on board its U.S. Military Sealift Command's maritime pre-positioning force (MPF) ships, which are maintained in condition of readiness, with some being capable of immediate sortie. Most ships embark thirty-day supplies of USMC equipment and heavy weaponry. In the western Pacific, elements of a maritime pre-positioning squadron are stationed at the islands of Guam and Saipan. The distance between Guam and Taiwan is 1,447 nm (2,680 km). Once under

way at an average speed of seventeen knots, MPF ships would take approximately eight days to arrive; however, that arrival likely would happen amid active combat. Although amphibious warships have self-defense weapons, MPF ships do not. They would need to be escorted and protected by surface combatants (cruisers and destroyers)—almost all of which already would be engaged in battle and unavailable for that mission. In any event, it likely would be the 4th Marine Regiment, stationed on Okinawa, that would use the MPF equipment. The 4th Marines presumably will retain the expeditionary/amphibious skills and capabilities that the 3rd (Littoral) Marine Regiment will forgo, although without the divested systems.

As previously stated, the most likely locale for the 3rd Marine Littoral Regiment to operate is in the Philippine Islands, of which the closest islands to the southernmost tip of Taiwan are approximately 104 nm (193 km) away. Currently, USMC littoral forces are to be equipped primarily with the Naval Strike Missile (NSM)—the shore-launched version titled Navy Marine Expeditionary Ship Interdiction System. NSM's publicly reported range is 100 nm (185 km). Although it can be used against PLAN ships in the eastern section of the South China Sea and the Luzon Strait south of Taiwan, it would not be able to disrupt a cross–Taiwan Strait transit. Besides preventing a PLA invasion of the Philippines, the most useful role of the 3rd Marine Littoral Regiment is in attempting to interdict PLAN vessels from transiting the many Philippine straits to break through the first island chain into the Pacific.

Another option would be to emplace part of the 3rd Marine Littoral Regiment in Japan's Senkaku Islands (also called the Diaoyu, Diaoyutai, or Pinnacle Islands), which Taiwan and the PRC also claim. The nearest Senkaku island is within 100 nm (185 km) of the city of Keelung, Taiwan's northern port. Therefore, NSM could reach across the strait between them. However, the majority of the seventy-one supposed features are rocks, with only five islands and three reefs of any substance. The largest island, Uotsuri, is but 1.7 square miles (4.32 square km), providing very little room to maneuver Marines. None of the islands has any tall vegetation for cover, and much of the land area is barren or steep. In the face of a PLA ballistic-missile attack or attrition battle, survivability would be low.

Although designed for a regional war with the PRC within the first island chain, USMC littoral forces and other new force-structure elements of EABO would not play a significant role against a direct PLA assault across the Taiwan Strait.

Emulation and Convergence

Criticisms of LOCE, EABO, and General Berger's shift center on the belief that the Marine Corps is giving up too much of its global expeditionary capabilities to focus on a strategy appropriate to a single conflict scenario: war against the PLA.[31] The Marine Corps has divested itself of its entire inventory of four hundred tanks (transferred to the Army) and many of its tracked amphibious vehicles. Several helicopter squadrons that normally deploy with expeditionary (amphibious) strike groups have been placed in storage.[32]

Unlike previous commandants, General Berger does not seem inclined to fight USN leadership to ensure that the Navy maintains what was considered the minimal number of amphibious warships (amphibs) that compose the expeditionary strike groups needed for global operations. If unchallenged, the Navy is inclined to cut amphibs not only because of shrinking resources within the Department of the Navy (DON) overall but also because of the traditional prejudice of the surface navy (whose sailors maintain and operate the amphibs) against constructing any ships other than cruisers or destroyers. As one surface navy admiral remarked to this author, "Why should we care about amphibs? They are the Marine Corps's ships."

It often has required the political power and prestige of the Marine Corps Commandant—as a coequal with the Chief of Naval Operations within the DON—to ensure that prejudice does not control the department's shipbuilding plans. In recent decades, the analytically determined minimal number of large, armed amphibs (these include LPDs and dock landing ships [i.e., LSDs] as well as the LHDs) considered necessary for transporting the Fleet Marine Force has shrunk from forty-five to forty-three to forty-one.[33] Instead of pressuring the Navy to ensure the maintenance of this number of globally deployable ships in the face of ship decommissionings, General Berger has opted to request the construction of the fast LAWs designed for archipelagic maneuver of the littoral combat regiment(s). This is one of the decisions that have inflamed critics. Additionally, the Navy has been slow, perhaps reluctant, to include the LAWs in shipbuilding plans.[34] More recently, the Marine Corps has admitted that it could be some time until the LAW program is budgeted.[35]

As the *Tentative Manual* states, EABO still is considered to be in a developmental phase, and the optimal configuration of the Marine Corps and Navy amphibs still is to be determined. However, the trends are toward a service in which at least one-third of the force is *not* designed to be

a globally deployable, multimission, expeditionary force; rather, it is optimized as an archipelagic maneuver force to conduct sea-denial missions against the PLAN from the territory of the Philippines or similar locations within the first island chain.

Since LOCE and EABO now are considered the force-shaping USMC doctrine, the question remains regarding whether a bigger proportion of the force will be reconfigured into littoral combat regiments. The Marine Corps has not abandoned the amphibious-warfare doctrine it developed through experimentation and experience—sweat and blood—during the past century; however, that is not its current focus. Rather, the focus is on a potential war with the CCP/PRC within the first island chain of the western Pacific, possibly as early as 2027.

As Jennifer Rice shows in chapter 7, the PLAN now is constructing and commissioning amphibious warships similar to USN designs. Although the PLAN's classes of LHDs and LPDs are smaller and less capable than their U.S. counterparts, the PLA's patient emulation is evident. However, in the event of a Taiwan operation, the CCP/PRC can call on a prodigious civilian fleet to provide supporting transports to be escorted and protected by surface combatants. With but a small number of MPF ships and an economically hollowed-out merchant fleet, the United States cannot do the same.

When a convergence in globally deployable, amphibious-warfare capability between the PLA and the Navy / Marine Corps will occur is difficult to determine. A potential PLAN goal may be 2049, the hundredth anniversary of the PRC, cited by General Secretary Xi Jinping as the objective date for the CCP/PRC to achieve "world-class" military power.[36] However, this trend toward convergence may be hastened by the dismissive attitude of high-level defense decision makers of the United States. As then–Secretary of Defense Mark Esper stated in September 2020, "I want to make clear that China cannot match the United States when it comes to naval power. Even if we stopped building new ships, it would take the PRC years to close the gap when it comes to our capability on the high seas."[37] Esper may have served in the past administration of Donald J. Trump, but that perspective on relative naval (including expeditionary amphibious) power does not appear to have changed substantially.

The manner in which the PLA has invested resources into increasing its amphibious capabilities and the Marine Corps's shift in doctrine have led to a number of questions that cannot yet be answered fully, because there is

a lack of incontrovertible evidence—evidence that exists only in the minds of the decision makers. However, it is important to identify the range of possibilities for strategists to assess their likelihood and plan accordingly.

Several of this volume's earlier chapters (as well as this one) point to the considerable degree to which the PLA has adopted American-style, pre-2019 amphibious-warfare doctrine and platforms. Although platforms such as LHDs enhance PLA lift capabilities, as previously observed, they are not necessarily optimized for an approximately 100 nm cross-strait Taiwan operation; rather, they are optimized for global-range expeditionary missions.

This raises the question: If the Taiwan scenario is the primary purpose in mind, why is the PLA building amphibious warships that are optimized for global operations? The logical answer is that the CCP/PRC sees global expeditionary/amphibious operations as part of the country's future military requirements. In an October 2021 essay on the future of amphibious warfare, the PLANMC deputy chief of staff, Sr. Capt. Chen Weidong, suggested that the PLAN intends to use amphibious ships to create "floating bases at sea" to support assault forces in regions much farther away than the seas surrounding Taiwan.[38] "Floating bases at sea" parallels the U.S. concept of "sea basing," which guided USN/USMC planning in the 1990s and into the early twenty-first century.[39]

Missions could range from relief of their overseas bases—current (such as Djibouti) or future (the Solomon Islands?)—in the event of a regional or global conflict, to conducting forcible entry / amphibious assault against another state. It is possible that, under long-range CCP/PRC planning, these missions are conceived as being *more important* than a near-term amphibious assault on Taiwan.

Although there is no incontrovertible evidence, this conclusion is supported in part by other chapters of this book that point to a slow approach to building up the amphibious-transport forces most appropriate to a cross–Taiwan Strait "dash" followed by steady transit of supporting logistics. Additionally, since the bulk of amphibious forces are PLA ground-force troops not under the command of the PLAN, resources may not be prioritized toward amphibious operations in comparison with land-warfare specialties (such as armor or artillery brigades/divisions). As previously suggested, PLANMC capabilities appear to be oriented toward global deployments—hence the construction program for globally deployable amphibious warships such as LHDs.

Regarding U.S. planning, three questions stand out. First, what will be the mission of the 3rd Marine Littoral Regiment if the Philippine

government refuses entry?[40] The United States and the Philippines are bound by a mutual-defense treaty. However, past Philippine governments have pondered accommodation with the CCP/PRC, and in June 2022 Philippine president-elect Ferdinand "Bongbong" Marcos Jr. described China as the Philippines' "strongest partner."[41] To enact a radical force-structure change whose employment would hinge on a decision by a foreign government (even if an ally) might not strike most strategists as prudent.

A prudent future forecast dictates that perhaps after 2049, Guam and the Marianas, Japan, or even Midway and the northern islands of the Hawaiian island chain might need littoral combat regiments for defense, and the USMC doctrine shift is the result of such forecasting.

Second, would PLAN ships even need to operate within the 100 nm range of the weapons deployed to the Philippines? It is possible that the 3rd Marine Littoral Regiment will acquire longer-range, antiship missiles in the future. Without longer-range weapons, it would be difficult for littoral combat forces in the Philippines to have any effect on a trans–Taiwan Strait operation.[42] At the same time, it is difficult to foresee an operational mission that would require the PLAN to venture into the easternmost reaches of the South China Sea in support of an amphibious assault on Taiwan. As Michael McDevitt states in the following chapter, amid an invasion of Taiwan, "beating up PLA island bases [on artificial features in the South China Sea] is not much of a consolation prize."

Marines stationed in the Philippines and Japan could help prevent the PLAN from accessing the broader Pacific Ocean to counter U.S. naval intervention in a Taiwan invasion scenario. By helping to bottle up the PLAN within the first island chain, the Marine Corps could reduce the threats that PLAN surface combatants can pose to U.S. surface and submarine forces supporting Taiwan's defense from locations in the Philippine Sea. Although such a capability indeed would be useful in a global conflict with the PRC, it is unlikely to play a significant role in hindering an assault directly across the Taiwan Strait, owing to weapons' ranges and likely forces' disposition.

Third is the question whether the Marine Corps will retain enough of the existing force structure to complete expeditionary amphibious missions successfully (such as seizing overseas PLA bases) on a global basis.[43] In effect, PLA capabilities in that mission set—admittedly currently small—are increasing while USMC capacity is decreasing.

Until Marine Corps and DoD decision makers answer these questions fully, it is logical to postulate that USMC and PLA amphibious forces—particularly the PLANMC—are indeed "trading places."

Notes

1. David H. Berger [Gen., USMC], *Force Design 2030* (Washington, DC: U.S. Marine Corps, March 2020), p. 2, available at www.hqmc.marines.mil/Portals/142/Docs/CMC38%20Force%20Design%202030%20Report%20Phase%20I%20and%20II.pdf.
2. Ibid., pp. 7–8.
3. Several official publications, including DoD's annual report to Congress *Military and Security Developments Involving the People's Republic of China 2021,* use the ship designation "LHA" for the Yushen class. This is the same designation used by the *Tarawa* class, whose five ships are now decommissioned. The LHD designation was assigned to the follow-on *Wasp* class, of which six are in service and two decommissioned. The LHD designation was used instead of LHA for *Wasp* because (unlike the *Tarawa* class), its well deck was designed to carry LCAC hovercraft. *Wasp* also was modified to operate AV-8 Harrier vertical and short takeoff and landing aircraft (V/STOL) in addition to helicopters. Although Yushen thus far has operated only helicopters and may or may not be able to handle V/STOL, its well deck also is designed to accommodate hovercraft. For that reason, I use the designation LHD for Yushen. U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China 2021* (Washington, DC: Office of the Secretary of Defense, 3 November 2021), p. 51, available at media.defense.gov/2021/Nov/03/2002885874/-1/-1/0/2021-CMPR-FINAL.PDF.
4. Ibid.
5. The United States and other nations typically have deployed destroyers and frigates for the antipiracy mission. PRC deployment of amphibious warships likely is intended to use the opportunity to train that part of the PLAN in a "nonthreatening" manner.
6. Conor Kennedy, *The New Chinese Marine Corps: A "Strategic Dagger" in a Cross-Strait Invasion,* China Maritime Report 15 (Newport, RI: U.S. Naval War College / China Maritime Studies Institute, October 2021), available at digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1014&context=cmsi-maritime-reports.
7. The history that follows is a grossly condensed overview, eliminating the details (some of which are nuanced adjustments to the overview) that military and naval historians would consider essential. Since it is for illustrative purposes, it is in essence a caricature.
8. Jack Shulimson, "U.S. Marines in Panama, 1885," in *Assault from the Sea: Essays on the History of Amphibious Warfare,* ed. Merrill L. Bartlett [Lt. Col., USMC (Ret.)] (Annapolis, MD: Naval Institute Press, 1983), p. 108.
9. U.S. State Dept., "U.S. Invasion and Occupation of Haiti, 1915–34," *U.S. Department of State Archive,* 2001-2009.state.gov/r/pa/ho/time/wwi/88275.htm.
10. Gunther E. Rothenberg, "From Gallipoli to Guadalcanal," in Bartlett, *Assault from the Sea,* pp. 177–78.
11. John J. Reber [Lt. Col., USMC (Ret.)], "Pete Ellis: Amphibious Warfare Prophet," U.S. Naval Institute *Proceedings* 103/11/897 (November 1977), pp. 58–64; Dirk Anthony Ballendorf and Merrill L. Bartlett, *Pete Ellis: An Amphibious Warfare Prophet, 1880–1923* (Annapolis, MD: Naval Institute Press, 1997).

12. Hans G. von Lehmann, "Japanese Landing Operations in World War Two," trans. Michael C. Halbig, in Bartlett, *Assault from the Sea,* pp. 195–201.
13. Robert L. Durham, "MacArthur's Brilliant Landing at Inchon, Korea," *Military Heritage* 22, no. 3 (Fall 2020), available at warfarehistorynetwork.com/2021/09/01/macarthurs-brilliant-landing-at-inchon-korea/.
14. Jim Webb, "Momentous Changes in the U.S. Marine Corps' Force Organization Deserve Debate," *Wall Street Journal,* 25 March 2022, www.wsj.com/articles/momentous-changes-in-the-marine-corps-deserve-debate-reduction-david-berger-general-11648217667.
15. The awkward *CCP/PRC* acronym is used in this chapter as a reminder that the PLA is pledged to the Chinese Communist Party, not the state. For that reason, PLA forces are also the ultimate tool for domestic security and preservation of party control of the state.
16. Maochun Miles Yu, "The Battle of Quemoy: The Amphibious Assault That Held the Postwar Military Balance in the Taiwan Strait," *Naval War College Review* 69, no. 2 (Spring 2016), pp. 92, 103, available at digital-commons.usnwc.edu/nwc-review/vol69/iss2/8/. This is also the conclusion of Ronald Spector. See Spector, "The Battle That Saved Taiwan," *MHQ: The Quarterly Journal of Military History* 25, no. 1 (Autumn 2012), pp. 98–104.
17. Yu, "The Battle of Quemoy," p. 103. This is a reference to remarks from Mao Zedong to key PLA field army commanders, 29 October 1949, found in Xiao Feng, "My Recollection of the Battle of Quemoy" [in Chinese], in *Recollections of the Amphibious Battle of Quemoy,* ed. Xiao Feng et al. (Beijing: People's Press, 1994), p. 42.
18. David H. Berger [Gen., USMC], "Comments at Current Strategy Forum" (8 June 2022, Naval War College, Newport, RI).
19. Justin Katz, "Marines to Stand Up First Littoral Regiment, Eyeing More Agile Deployments," *Breaking Defense,* 28 February 2022, breakingdefense.com/2022/02/marines-to-stand-up-first-littoral-regiment-eyeing-more-agile-deployments/.
20. Andrew S. Erickson and David D. Yang, "Using the Land to Control the Sea? Chinese Analysts Consider the Antiship Ballistic Missile," *Naval War College Review* 62, no. 4 (Autumn 2009), pp. 53–86, available at digital-commons.usnwc.edu/nwc-review/vol62/iss4/6/.
21. Berger, "Comments at Current Strategy Forum."
22. U.S. Navy and U.S. Marine Corps, *Littoral Operations in a Contested Environment,* unclassified ed. (Washington, DC: 2017), approval page, available at www.hqmc.marines.mil/Portals/160/LOCE%20full%20size%20edition.pdf.
23. *Littoral Operations in a Contested Environment* does not specify the PRC by name, because President Barack Obama's administration wanted to avoid a potential verbal confrontation. However, the concept would be difficult to apply to anywhere other than the western Pacific. By 2022, it was associated almost exclusively with a potential conflict with the PRC.
24. U.S. Navy and U.S. Marine Corps, *Littoral Operations in a Contested Environment,* p. 9.

25. Sam J. Tangredi, "Sea Power: Theory and Practice," in *Strategy in the Contemporary World: An Introduction to Strategic Studies,* ed. John Baylis et al. (Oxford, U.K.: Oxford Univ. Press, 2002), p. 123; Milan Vego, "Getting Sea Control Right," U.S. Naval Institute *Proceedings* 139/11/1,329 (November 2013), pp. 64–69, available at www.usni.org/magazines/proceedings/2013/november/getting-sea-control-right. Such does not mean that the enemy does not attempt to oppose these operations, only that the opposition is strategically ineffective.
26. U.S. Navy and U.S. Marine Corps, *Littoral Operations in a Contested Environment,* p. 26.
27. Hannah Beech, "China's Sea Control Is a Done Deal, 'Short of War with the U.S.,'" *New York Times,* 20 September 2018, www.nytimes.com/2018/09/20/world/asia/south-china-sea-navy.html; Daniel E. Ward, "Going to War with China? Dust Off Corbett!," U.S. Naval Institute *Proceedings* 146/1/1,403 (January 2020), available at www.usni.org/magazines/proceedings/2020/january/going-war-china-dust-corbett; Victor Duenow [Cdr., USN], "Disputing Chinese Sea Control through Offensive Sea Mining," U.S. Naval Institute *Proceedings* 148/6/1,432 (June 2022), pp. 54–59, www.usni.org/magazines/proceedings/2022/june/disputing-chinese-sea-control-through-offensive-sea-mining.
28. U.S. Navy and U.S. Marine Corps, *Littoral Operations in a Contested Environment,* p. 9.
29. Headquarters, U.S. Marine Corps, *Tentative Manual for Expeditionary Advanced Base Operations* (Washington, DC: February 2021), p. iii, available at mca-marines.org/wp-content/uploads/TM-EABO-First-Edition-1.pdf.
30. Ibid.
31. Paul McLeary and Lee Hudson, "How Two Dozen Retired Generals Are Trying to Stop an Overhaul of the Marines," *Politico,* 1 April 2022, www.politico.com/news/2022/04/01/corps-detat-how-two-dozen-retired-generals-are-trying-to-stop-an-overhaul-of-the-marines-00022446.
32. Frank G. Hoffman [Lt. Col., USMCR (Ret.)], "Still First to Fight? Shaping the 21st Century Marine Corps," *Marine Corps Gazette,* June 2020 (web edition), pp. WE16–WE20.
33. *Analytically determined* is a flexible description. Many competing analyses inform the defense-resource debates of a democratic nation. The determination of a "minimal number" of amphibious warships obviously is affected by bureaucratic politics within DoD, as well as the legislative politics that impact the funding.
34. Megan Eckstein, "The Light Amphibious Warship Is Delayed, but the Marine Corps Has a Temporary Solution," *Defense News,* 10 May 2022, www.defensenews.com/naval/2022/05/10/the-light-amphibious-warship-is-delayed-but-the-marine-corps-has-a-temporary-solution/.
35. Caleb Larson, "Marine Corps Puts the Light Amphibious Warship on Ice," *The Buzz* (blog), *National Interest,* 11 May 2022, nationalinterest.org/blog/buzz/marine-corps-puts-light-amphibious-warship-ice-202379.
36. "Xi Jinping Wants China's Armed Forces to Be 'World-Class' by 2050," *The Economist,* 27 June 2019, www.economist.com/china/2019/06/27/xi-jinping-wants-chinas-armed-forces-to-be-world-class-by-2050.

37. David Vergun, "Esper Describes Steps to Maintaining Future Maritime Superiority," *U.S. Department of Defense,* 16 September 2020, www.defense.gov/News/News-Stories/Article/Article/2350204/esper-describes-steps-to-maintaining-future-maritime-superiority/.
38. 陈卫东 [Chen Weidong], 透视两栖作战新特点 ["A Perspective on the New Characteristics of Amphibious Operations"], 人民海军 [*People's Navy*], 8 October 2021, p. 3. Chen's article was translated into English at the Naval War College's China Maritime Studies Institute.
39. Sam J. Tangredi, "Sea Basing: Concept, Issues, and Recommendations," *Naval War College Review* 64, no. 4 (Autumn 2011), pp. 28–41, available at digital-commons.usnwc.edu/nwc-review/vol64/iss4/5/.
40. This issue is raised, although not discussed in detail, in Walker D. Mills, "The U.S. Marine Corps and Advanced Base Operations: Past, Present, and Future," in *On Contested Shores: The Evolving Role of Amphibious Operations in the History of Warfare,* ed. Timothy Heck and B. A. Friedman (Quantico, VA: Marine Corps Univ. Press, 2020), p. 390.
41. Anna Felicia Bajo, "Marcos Calls China 'Our Strongest Partner,'" *GMA News Online,* 10 June 2022, www.gmanetwork.com/news/topstories/nation/834541/marcos-calls-china-our-strongest-partner/story/.
42. A stumbling block to the Marine Corps obtaining longer-range missiles is that the Army intends to use its current monopoly on land-based, conventionally armed, long-range missiles to justify its existing share of DoD resources. It is possible that littoral combat forces will rely exclusively on Navy weapons (such as the Tomahawk, with which it has not yet exercised). On the Army's potential resource conflict with the Marine Corps, see, for example, Rajiv Chandrasekaran, "Army's 'Pacific Pathways' Initiative Sets Up Turf Battle with Marines," *Washington Post,* 29 December 2013, www.washingtonpost.com/world/national-security/armys-pacific-pathways-initiative-sets-up-turf-battle-with-marines/2013/12/29/11.
43. Mark Cancian writes, "If the Marine Corps has misjudged the future, it will fight the next conflict at a great disadvantage or, perhaps, be irrelevant." Cancian, "The Marine Corps' Radical Shift toward China," *Center for Strategic and International Studies,* 25 March 2020, www.csis.org/analysis/marine-corps-radical-shift-toward-china.

Michael McDevitt

18. If China Invades, How Should the U.S. Navy Respond?

What should the U.S. Navy do to prepare to help Taiwan thwart a cross-strait assault, should the service be ordered to intervene? The answer is straightforward: prevent the People's Liberation Army (PLA) from achieving air and sea control over the Taiwan Strait. Twenty-five years ago, it would have been assumed that America's joint force readily could do this because the U.S. Navy already would possess "sea and associated air control," or could achieve it quickly. The U.S. Seventh Fleet was considered the most capable naval force in East Asia, and U.S. bases in Japan were relatively secure from attack—but none of this is true today. Then the People's Republic of China (PRC) could threaten Taiwan with missile attacks, as it demonstrated in 1995–96, but no serious analyst thought it could launch a successful invasion, because U.S. reinforcements could rush to East Asia to overwhelm any assault the PLA was foolish enough to launch. In fact, it became common to ridicule the very possibility as "the million-man swim."[1]

The hubris of yesterday has disappeared as the military balance in East Asia has flipped, thanks to well-considered Chinese military modernization. Today, no one talks about the U.S. Navy having, or gaining, *sea control* in the Taiwan Strait. Instead, the mission today is *sea denial*—a mission that would prevent the PLA from controlling the Taiwan Strait long enough to conduct a successful amphibious invasion.

U.S. policy for assisting Taiwan in the event of a PRC invasion is rooted in the Taiwan Relations Act of 1979. It does not direct the United States to defend Taiwan should China use force to end Taiwan's current de facto independence; however, it does state the following: "It is the policy of the United States . . . to *maintain the capacity of the United States to resist any resort to force or other forms of coercion* that would jeopardize the security, or the social or economic system, of the people on Taiwan."[2]

In early 2021, both the incumbent commander of the U.S. Indo-Pacific Command (INDOPACOM) and his designated successor made news during congressional hearings by opining that the PRC might attempt to force Taiwan to unify with the mainland within the next six years.[3] I question whether government officials in Beijing will be ready for war with the United States by 2027, if ever. If, however, a war over Taiwan is only a few years away, Beijing has a wide spectrum of military options available short of actually mounting an amphibious assault. The fact that the PLA has yet to build a credible invasion force is an important indication of whether an amphibious assault is in the offing.[4] The dozen or so large amphibious ships that Beijing has commissioned or launched over the past fifteen years seem to have been focused more on expeditionary operations, although they certainly could contribute to an assault.

Nonetheless, this chapter assumes that the PRC does attempt an amphibious assault against Taiwan in the near future (by 2027) and details USN options to help Taiwan "resist" the invasion.

Framing the Challenge

Should China start the war, I think the White House would assign the joint force a limited mandate: prevent a successful invasion of Taiwan. I doubt it would craft an "unlimited mandate" that, for example, sought regime change in Beijing or attempted to collapse China's economy or to starve the PRC into submission. Even with a more limited aim, it is possible that a Sino-American war over Taiwan could escalate to nuclear war. This danger exists from the moment shots are fired in anger, but at least initially both sides would shrink from actions that would expand the conflict in directions that could cause unlimited escalation. Accordingly, for the purposes of this chapter, I am not going to address the frequently mentioned vulnerability of China's long sea-lanes to a distant blockade that would threaten General Secretary Xi Jinping's position. As a practical matter, a successful blockade would take too long to help Taiwan. It is worth noting that the combined merchant fleet of China and Hong Kong numbers somewhere north of eight

thousand ships, raising questions about actual U.S. capacity to conduct such an operation.[5]

Nor will I address recently discussed notions of a "cost imposing" strategy, such as sinking the PLA Navy (PLAN). As a discrete mission, it does not make much sense if, at the end of the day, China has no navy but is sitting in Taipei; as far as Beijing is concerned, that would be a strategic victory. Having built a formidable navy in less than two decades, Beijing understands how quickly its navy could be replaced. Sinking Chinese ships certainly will be necessary to defend Taiwan, but making that the primary mission gives the impression that Washington is looking for a consolation prize because saving Taiwan might be too difficult.

We cannot forget that the Republic of China (ROC) government on Taiwan has agency. It can, and very well may, decide that enough is enough. Rather than see its society and economy totally destroyed under a relentless missile and air bombardment, it may decide that discussing unification with Beijing is the least bad outcome.

No one other than PLA war planners knows precisely how the PLA would choose to attack Taiwan if Beijing's patience becomes exhausted or if Taipei crosses a mainland redline.[6] Over the past five years, a number of interesting studies have explored how Beijing might execute an attack. I have found a 2021 Council on Foreign Relations report—*The United States, China, and Taiwan: A Strategy to Prevent War,* by Robert Blackwill and Philip Zelikow—and Ian Easton's 2017 book *The Chinese Invasion Threat* to be particularly helpful in exploring this possibility.[7]

It is important to keep in mind that if it comes to war, both the PRC and the United States each intend to fight joint campaigns. This type of campaign is something for which the United States is prepared, but the PLA still is working hard to master it. Naturally, the PLA does not have a static plan. As its capabilities increase and improve; as Taiwan's ability to resist evolves; and, of course, as U.S. capabilities and concepts develop—such as current ideas regarding dispersed presence—the PLA will adjust its plans.

In deciding to use force against Taiwan, Beijing does not need, and probably would not attempt, to launch an amphibious assault from a standing start—a so-called bolt from the blue—because it cannot conceal preparations to do so. Activities such as troop movements, truck convoys to embarkation ports, and the sending of ships and submarines to sea all can be detected by today's reconnaissance and early-warning systems. The pretext for such movements probably would be an announcement that the PLA was about to conduct a major exercise, or series of exercises—something for which Taiwan's military is on guard.

This chapter assumes that Beijing would opt for a sequenced (phased escalation) three-step operation consisting of a coercion phase; an attack phase, to neuter Taiwan and other regional airpower; and, if necessary, an invasion phase. This is an artificiality, but it is the best way to help illuminate critical issues; in practice, a PLA campaign against Taiwan is likely to have many overlapping activities.

The Coercion Phase

The PLA Eastern Theater Command, with headquarters in Nanjing, along with the Southern Theater Command would be responsible for executing the operation against Taiwan. However, it is likely that given the stakes involved for Xi and the Central Military Commission in Beijing, they would provide close oversight and ensure proper coordination among the involved theater commands.[8] By starting with coercive measures that do not kill or maim people directly or physically destroy property and infrastructure, the PLA has the ability to inflict grievous economic harm through large-scale cyberattacks aimed at shutting down the banking system, stock market, selected power grids, and airports on Taiwan. To isolate Taipei further and damage the Taiwanese economy, Beijing could cut the undersea cables that connect the island to the global Internet and other high-speed digital data networks associated with financial transactions.

Maritime Aspects

With airports operationally limited, physical isolation of Taiwan could be expanded by a declaration of a maritime exclusion zone (MEZ) or quarantine of perhaps a fifty-mile radius around the island. The goal would be to keep commercial shipping from bringing fuel, military supplies, and other necessary resources to Taiwan. Beijing's hope would be that this first coercive step might be enough for the people of Taiwan to demand that its government agree to conduct exploratory discussions about unification with the mainland—that is, to bring the population and politicians "to their senses."

In this phase, the China Coast Guard (CCG) could be assigned to form a "picket line" to warn approaching merchant ships bound for Taiwan. The PLAN also might be so assigned, and in any circumstances it certainly would be an over-the-horizon standby force, but giving the space of the MEZ or quarantine to the CCG initially reduces escalation potential. Obviously, in attempting to execute a coercive plan such as this the PLAN must be prepared for the possibility of shots being fired. For example, Taiwan's small navy might be ordered to deploy and escort Taiwan-owned merchant ships

to port, and the PLAN could be ordered to help the CCG prevent this. This means that combat at sea could break out against the ROC navy.

At this point, before a direct kinetic attack on Taiwan proper, it is uncertain what the U.S. government would do other than mount a full-court diplomatic effort—including the involvement of the United Nations, provided the PRC did not exercise a Security Council veto—to calm tensions and forestall the outbreak of shooting. This could, but not necessarily would, include encouraging the authorities in Taipei at least to agree to engage Beijing quietly. Would Beijing want Taiwan figuratively to "come out with its hands up," or would it be satisfied with something less than complete surrender, such as a discussion of what formulation a modified (i.e., post–Hong Kong repression) "one country, two systems" plan would mean for Taiwan?

The U.S. Department of Defense (DoD) presumably would be taking important readiness and posture moves, directing all Pacific forces, especially those in Japan (America's erstwhile "first responders"), to move to an extremely high readiness condition. That could include directing ships to get under way and land-based airpower to disperse. To avoid triggering conflict, DoD also might direct U.S. forces to stay out of the PRC exclusion zone around Taiwan and to do nothing that could provoke actual use of weapons. Washington probably would be at pains to avoid being put in a position of firing the first shot. At this point, DoD also, one hopes, would direct naval forces from the U.S. Atlantic Fleet to execute an operational "swing" of naval units to the Pacific as reinforcements. Attack submarines should be the first to be dispatched.

Whether Tokyo also elects to improve the readiness condition of its forces would be of great importance to both Beijing and Washington. Washington depends on Japanese air defenses for the protection of U.S. air bases on Japanese territory—specifically, Kadena Air Base and Marine Corps Air Station (MCAS) Futenma on Okinawa and MCAS Iwakuni in southern Honshu. U.S. defense officials would be very anxious, and likely diplomatically insistent, that Tokyo increase its readiness posture in step with U.S. readiness upgrades. After all, as will be discussed in more detail below, planning and preparation for the defense of Japan are linked inextricably to the defense of Taiwan. Beijing, on the other hand, would hope that Japan was more worried about provoking China than preparing for conflict, and it diplomatically and publicly would warn Tokyo to mind its own business and stay out.

Implications for the U.S. Navy

(1) Before the shooting starts, the U.S. Navy needs to be a firm supportive voice backing a U.S. government announcement that declares the South China Sea and East China Sea potential war zones and strongly advises

commercial shippers to use alternative sea routes to Northeast Asia. For example, ships could sail via the Lombok Strait, Makassar Strait, Celebes Sea, and Philippine Sea, then on to Northeast Asia. Furthermore, once the shooting starts and the U.S. government decides to intervene, it should announce that the South China Sea, East China Sea, Yellow Sea, and Taiwan Strait are all considered war zones and that ships may be vulnerable to attack without warning.

(2) If the ROC navy does attempt to contest a PRC MEZ or quarantine and shooting breaks out, Taipei likely would request U.S. assistance. If the United States agreed, it likely would result in the first direct involvement of U.S. forces. From a planning perspective, it seems essential to gain an understanding of how the Taiwan government would respond to an MEZ or quarantine. Would it choose to contest it militarily?

(3) In any issue regarding the potential for combat with China over Taiwan, currently the commander of INDOPACOM would be designated the supported commander, while other joint and specified commands would be designated supporting commanders. Whether any serious discussions among INDOPACOM and likely supporting commands have taken place is unknown to this author. Clearly, however, the Pacific and Atlantic Fleet commanders and their staffs need to be engaged in discussions regarding the deployment of Atlantic Fleet ships, aircraft, and especially submarines to the Pacific theater. In view of the warnings of two USN four-star admirals who are the responsible commanders, one hopes that this discussion is ongoing; but if not, then the office of the Chief of Naval Operations should take the lead in making it happen.

Capturing Taiwan's Offshore Islands

Should MEZ and cyber coercion fail, the PRC's next step likely would be a missile and air bombardment of Taiwan. This step would attempt to eliminate ROC airpower; destroy its command, control, and surveillance capability; and attack other facilities to emphasize the island's helplessness militarily.

Maritime Aspects

It also seems likely that in this phase the PLA would capture or neutralize Taiwan's offshore island holdings.[9] Available PLA studies on a Taiwan campaign highlight the importance of addressing Taiwan's outer islands. Kinmen (Quemoy) is an archipelago of fifteen granite islands that the mainland routinely shelled during the 1950s and 1960s. One of the islands

is only a few miles from the commercial area of the port of Xiamen.[10] Another of Taiwan's holdings, 125 miles farther north along the Chinese coast, is the Matsu (Mazu) group of twenty-eight granite features. These are also well fortified and cover the approaches to Fuzhou, which, like Xiamen, is an important commercial port. These two archipelagoes sit squarely in the likely assembly areas for the PLA's amphibious-assault forces, and obviously once the mainland begins to attack Taiwan, Taipei's garrisons could use these strongpoints to attack two important Chinese cities and interfere with key shipping areas.[11]

Farther afield, the PLA also could tighten its grip on the South China Sea by seizing Itu Aba (Taiping) Island in the Spratlys and Pratas Island in the northeast area of the South China Sea. Pratas is strategically important to the PLAN; Taiping is not. The combination of Woody Island airfield in the Paracel chain and Pratas Island would create a mutually supporting network of airfields. This network would give Beijing the ability to control the northeast entrance to / exit from the South China Sea while flanking Taiwan from the southwest. PLAN maritime-patrol aircraft flying from these air bases could help to locate any U.S. attack submarines attempting to trail PLAN ballistic-missile submarines (i.e., SSBNs) en route from their Yulin home port in Hainan to the open ocean of the Philippine Sea and central and northern Pacific Ocean.

Finally, capturing all Taiwan's offshore islands would give the PRC a useful hedge against disaster if a landing is executed but fails. They also provide a useful off-ramp for Beijing if it decides to stop short of invasion because the probability of success suddenly decreases. With these features in hand, Xi Jinping could declare victory and argue that Taipei, and perhaps Washington, had been taught a lesson because the PLA had been able to recover more of China's lost territory.

Implications for the U.S. Navy

(4) For the purposes of this chapter, I assume that the United States will be permitted to engage PLA forces wherever they are found. (Djibouti could be an exception.) Seventh Fleet submarines presumably could be sent to patrol southwest and northeast of Taiwan to attack PLAN destroyers that are deployed around Taiwan as a seaward extension of the PRC's air-defense network.

(5) What about the U.S. Marines on Okinawa? At this point, other than moving Marines to the Senkakus (see below), it is not clear how they best could be employed in these early days. This is under debate at this writing, as U.S. Marine Corps (USMC) Commandant Gen. David H. Berger is looking into new posture concepts. His April 2021 article in *Military Review*

provides a conceptual template for the future of Marines in the western Pacific (WESTPAC).[12]

(6) What about the WESTPAC Carrier Task Force (CTF) 70? Unless organic tanking is available to enable one-thousand-nautical-mile (nm) sorties, CTF 70 should not join the early air battle over Taiwan, because it would be at a serious firepower disadvantage. Presumably, the Fifth Air Force also will be moving to dispersal sites at this time.

(7) The 1954 Mutual Defense Treaty between the United States and the ROC was focused expressly on protecting only Taiwan and the Penghu Islands; other offshore ROC holdings were not covered specifically. The unwillingness of the administration of Dwight D. Eisenhower—in power during a time when the United States was very much stronger than the PRC—to commit the United States to fighting for these features is a cautionary tale. U.S. contingency planning, in which the Navy will have a voice, needs to assess carefully whether any military assistance to Taipei in case of a PRC attack will include recovery of captured Taiwanese offshore islands. At issue is whether scarce U.S. resources should be expended on trying to hold, or recapture, offshore islands. Seventy years ago, President Eisenhower thought not, and that remains wise today.

(8) Taiwan's South China Sea islands were not a serious issue in the 1950s; today, that remains partly true. Occupying Itu Aba (Taiping) does not appreciably improve PLA posture in the Spratlys, but control of Pratas does improve PLA capabilities in the northern reaches of the South China Sea, as discussed above. However, infrastructure would have to be improved. The airfield is basic, with no fuel storage and a C-130-capable 5,100-foot concrete runway. With improvements, it would present a threat to U.S. submarine operations.[13]

The Importance of the Senkakus in a Taiwan Scenario

It is a mistake to consider the Senkaku Islands as something akin to a "lesser included case" when compared with a Taiwan scenario. The location of the Senkakus—just 100 nm northeast of Taiwan's major port of Keelung—makes the largest, Uotsuri-shima, a potential cruise-missile facility for the PLA.

Maritime Aspects

More importantly, in allied hands it would allow Japan and potential USMC or U.S. Army missile forces to flank possible avenues of assault that the PLA might use. Potential amphibious assembly areas off Xiamen and Fuzhou are also credible targets, since they are within 250 nm of Uotsuri.

Recommendation for the U.S. Navy

(9) The locational advantages of the Senkakus strongly suggest that Tokyo, perhaps with USN amphibious-lift assistance, should move quickly to secure, fortify, and harden Uotsuri and associated features once shooting seems imminent. The tactical advantages these otherwise useless features provide probably have not been lost on the PLA, and it is imperative that Japan beat China to the punch by occupying its own claimed territory first.

The Central Importance of Japan

Beijing has had years to weigh the costs versus the benefits of attacking U.S. facilities on Japanese soil when it begins an attack on Taiwan. It is increasingly clear that Japan absolutely has to be "all in from the get-go" in any contingency involving Taiwan. Despite what former prime minister Yoshihide Suga said in 2021 about no Japanese involvement in a mainland-Taiwan conflict, the reality is that Tokyo must develop an internal political consensus recognizing that a Chinese attack on Taiwan directly affects the defense of Japan.[14] To this end, the administration of Joseph R. Biden should convince Japanese officials that they can improve deterrence of the PRC by declaring *that an attack on U.S. forces located in Japan will be considered an attack on Japan.*

Maritime Aspects

On the minus side of the ledger, such an attack, especially if any Japanese citizens were killed, likely would bring Tokyo's very capable navy—the Japan Maritime Self-Defense Force (JMSDF), with its forty-odd destroyers/frigates and twenty or so submarines—into the fight. In addition, the country's air force, the Japan Air Self-Defense Force (JASDF), is well trained in air-to-air combat and would be ready to contribute to the overall air-defense equation in the southern half of the East China Sea. By conducting what essentially would be a surprise attack on Japan, the PRC also would incur significant global opprobrium.[15]

On the plus side of the ledger, after moving to the attack phase the PLA would have a particularly good opportunity to hamstring severely a significant portion of U.S. airpower in the region. By attacking air bases and defensive surface-to-air missile systems with conventionally armed ballistic missiles and land-attack cruise missiles (LACMs), it potentially could ground or destroy large numbers of U.S. Air Force and USMC fighter and support aircraft.

Finally, should Tokyo veto planning for its military involvement in a Taiwan scenario, it would have to consider seriously how interested Washington would be in becoming involved in a PLA attack on the Senkakus. Should a PLA invasion of Taiwan be successful because Japan stayed out of the conflict, Tokyo then could find itself on its own when the PRC turned its attention to the Senkakus and the forty-four tiny islands of the Sakishima Islands.

Recommendations for the U.S. Navy

(10) The U.S. Navy should make its voice heard regarding the establishment of a combined U.S.-Japan forces command to plan for and, if necessary, to lead the fight in Northeast Asia contingencies involving China. The easiest approach would be to separate the currently "double hatted" U.S. Forces Japan (USFJ) and command of the Fifth U.S. Air Force in Japan, then transform USFJ into a subunified combined combatant command. This is not going to happen overnight unless Beijing does something to frighten Tokyo outright. In the meantime, however, a consensus should be reached within the U.S. government—especially among DoD, the Chairman of the Joint Chiefs of Staff (CJCS), the combatant command, and, of course, Congress—on an acceptable command structure, since this likely would involve a significant realignment of extant command relationships.

(11) A crucial step the U.S. Navy should take is to develop a Taiwan-conflict submarine-water-space-management plan with the JMSDF for the area around Japan, especially the East China Sea, the Luzon Strait, and the southern approaches of Taiwan, so that from the early days of a conflict both U.S. and JMSDF submarines can deploy to attack PLAN ships.

(12) The U.S. Air Force is pursuing a concept of operations named "Agile Combat Employment" that involves dispersing Fifth Air Force assets to bases around Japan or elsewhere in the WESTPAC region.[16] Presumably the JASDF is aware of the concept and even may be considering dispersing as well. The same is true for USMC fighters at Iwakuni and V-22s located at Futenma. If aircraft dispersal is going to be the answer for U.S. land-based airpower in Japan, there needs to be some sort of a combined dispersal plan, because there are only so many airfields available and logistics preplanning is necessary. Clearly, the carrier-based air wing (CVW-5) assigned to USS *Ronald Reagan* also needs to be involved, because should the PLA choose to attack while *Reagan* is in port, its air wing could be off the ship at Iwakuni.

(13) The JMSDF and U.S. Seventh Fleet also must develop coordinated plans for escorting CTF 70. The JMSDF's historical mission focus on and skill in antisubmarine warfare (ASW) would be an important contribution to the survivability of CTF 70. Additionally, JMSDF prowess in ASW is

an essential component of a coordinated regional ASW campaign in the Philippine Sea. It seems probable that the PLA would dispatch a large number of its submarines (perhaps as many as twenty-five) to form wolf packs. Their mission would be to attack U.S. seaborne reinforcements from Hawaii and the West Coast of the continental United States.

(14) Once the shooting starts during a PLA Taiwan campaign, no USN ship operating in the East China Sea or South China Sea is likely to survive long once discovered. The combination of PLA antiship cruise missiles (ASCMs), land-based aircraft, submarines, and antiship ballistic missiles will be overwhelming. The U.S. Navy and the JMSDF should discuss an agreement detailing that none of their surface ships operate farther west than fifty miles from the Ryukyu Islands. Not only would this be sensible, but it also would make it simpler for "blue" forces to blaze away at ships located in the East China Sea. Both the Marines and Army seem to be keen to participate in the mission of shooting at PLAN ships. The U.S. Navy has learned from long and often unhappy experience that over-the-horizon targeting of long-range ASCMs is not as easy as it sometimes is perceived to be. Eliminating, to the degree possible, the difficulty in sorting out "noncooperative targets" (electronically silent) by keeping "blue" out of most of the East China Sea altogether would simplify shooting at ships that cannot be identified positively.

(15) The III Marine Expeditionary Force (MEF) must develop a coordinated operation plan with the Japan Ground Self-Defense Force for defense/occupation of the Senkakus. It is important to have a plan for moving Marines from Okinawa to the Senkakus if Futenma is destroyed early in the fighting. To this end, combined planning should include the option of prompt Japanese, and potentially USMC, occupation of the Senkakus if China attacks Taiwan.

The Antiaccess Fight in the Philippine Sea

At this point in the chapter, the assumption is that Taipei did not submit to nonlethal coercion, and the PLA missile and air bombardment of Taiwan is ongoing. Serious fighting has broken out along the Ryukyu chain, where U.S. first responders and U.S. air bases in the Ryukyus have been attacked, with the goal of taking U.S. land-based aircraft out of the airpower equation. This attack resulted in Japan joining the military campaign.

Maritime Aspects

The geographic focus now shifts away from the East China Sea and first island chain to the PRC's eastward maritime approaches in the Philippine

Sea. The emphasis for the U.S. Navy is twofold: it needs to be doing battle successfully with both the PLA surveillance system and the PLAN submarine presence. The PLA objective is straightforward: keep U.S. forces that are moving west toward China as far away from Taiwan and the first island chain as possible. In DoD jargon, this is known as antiaccess. It has received voluminous public commentary because PLA Rocket Force (PLARF) ballistic missiles—and, potentially over the longer term, its missiles with hypersonic glide vehicles—are purported to be able to hit moving ships, especially U.S. aircraft carrier strike groups sailing west to join the fight to roll back Chinese aggression.

The PLA concept is a derivative of the Soviet concept that combined open-ocean surveillance; long-range, land-based aircraft carrying ASCMs; and nuclear-powered submarines with large loads of ASCMs to form an imposing capability, largely aimed at defeating nuclear-armed U.S. carrier battle groups.[17] In comparison with the Soviets' situation, modern technology has eased greatly the open-ocean surveillance problem for the PLA. Ideally, the PLA plans for its surveillance system to find approaching naval forces so that PLA commanders can direct at-sea submarines to "ambush" approaching U.S. naval forces or vector land-based aircraft to the attack, and so they can aim and launch antiship missiles. *Without surveillance, the PLA cannot do any of these tasks effectively.* As a result, it has made a serious investment in creating an overlapping land-, air-, and space-based ocean-surveillance system, with the apparent goal of providing reliable ocean surveillance out to at least 2,000 nm from China's coast. It is prudent to assume that China keeps track of U.S. carrier movements globally. When a carrier is headed toward China and gets within approximately 2,000 nm, Chinese intelligence, surveillance, and reconnaissance (ISR) systems are able to provide an updated position on the ship every few minutes, and if the carrier is not operating in an electronically silent mode, position information may be available almost continuously.[18]

Recommendation for the U.S. Navy

(16) Ocean surveillance is both the strength and the Achilles' heel of PLA hopes to defeat the U.S. Navy. Virtually all the PLA's precision weapons about which we worry are targeted by China's space-based systems. If we take these systems down, the PLA will have a much harder time locating moving targets on land and at sea. Yes, it is true that the joint force is also dependent on space-based systems, and if we disrupt PLA surveillance China certainly will respond. In fact, the PLA already may plan to initiate attacks on U.S. space systems. The joint force simply must learn to do without them and rely on ISR derived from unmanned aerial vehicles

and microsatellite communications. It will come down to which joint force will be better at space-deprived combat. Presumably, the U.S. lead in long-endurance drone surveillance is an advantage. It seems that the only sensible way to tilt the military advantage toward the United States is to nullify the PLA's firepower advantage and make it extremely hard, if not impossible, for it to aim its missiles.

Stopping the Taiwan Invasion Amphibious Force

Eliminating China's ocean-surveillance system and equipping U.S. joint forces with long-range systems are the two keys to fighting China in East Asia, and specifically to stopping an invasion fleet. Air Force bombers with long-range, antiship missiles and access to tanking are likely to join U.S. attack submarines as the most important capabilities. The bombers' ability to take off from widely dispersed airfields and launch antiship missiles from long range at targets on the Taiwan Strait, particularly an amphibious force, would be crucial.

Maritime Aspects

Carrier-based Navy fighters also would be important, *provided the carriers can get close enough to the Taiwan Strait to engage an amphibious force without being put out of action by missiles or torpedoes.* U.S. carrier forces, no matter the size of the carrier, have to be able to thwart both PLA missiles and a lot of PLAN submarines to be able to contribute to the fight. The JMSDF must be an essential partner in the ASW contest.

It is also important to remember that the Seventh Fleet, Fifth Air Force, and III MEF likely are to be involved in combat from the first shot in a Taiwan or Senkaku scenario. These first responders have to be able to stay in the fight well enough to preclude quick Chinese successes. U.S. aircraft must have access to hardened shelters, including at dispersal airfields. If first responders survive and remain effective, they will be able to contribute to the attacks on amphibious shipping. Similarly, if the Marines and Army have missiles with 500 nm range or better, they can contribute to the antiassault shoot-out. Potentially, the most effective way to hamstring an amphibious assault would be submarine attacks. But the PLAN surely recognizes this; the entire Taiwan Strait and approaches from either its northeast or southwest entrance likely will be swarming with PLA ASW forces, making it difficult for USN attack submarines (SSNs) alone to have a decisive impact.

Recommendations for the U.S. Navy

(17) Too much of the discussion regarding the USN carrier force and China has revolved around the size of the aircraft carrier and how that relates to vulnerability. The current trendy idea is that many small F-35B carriers would be more survivable, and therefore that they represent the answer to this potential problem. This is fatuous. Not only are such ships far less capable of defending themselves and surviving battle damage (and thus less survivable), but, as CJCS Mark A. Milley recently pointed out, if a military unit can be seen, it can be shot.[19] Small carriers are still relatively large ships, and they can be seen as easily as bigger ones, especially if they are operating around the first island chain. For the Navy's carrier force to be able to contribute to the fight to save Taiwan, or defend Japan, four things must happen promptly.

- First, the Navy must develop capabilities to seriously degrade, deceive, and confuse the PRC surveillance system.
- Second, the Navy needs to be able to operate without friendly space-based ISR.
- Third, the Navy must field organic air-wing tanking as soon as possible. Navy fighters have to be able to conduct long-range sorties.
- Fourth, the Navy has to expedite the introduction of long-range (500–600 nm) ASCMs and LACMs that can be launched by F-18s and F-35Cs.

(18) It is imperative that once the PLA begins to attack Taiwan, the United States declares the Taiwan Strait something akin to a "free-fire zone." U.S. forces are not going to be able to obtain a positive identification on every ship running around the Taiwan Strait area.

(19) Arguably, the most important additional capability that our first responders need today is more submarines. Four are stationed in Guam, and rotational deployments add to the current Seventh Fleet total. Nonetheless, the Navy needs to work with Tokyo to add as many SSNs as possible to our forward-stationed forces *in Japan*. Because it is inherent in submarine operations to generate uncertainty in the enemy's mind, a very robust SSN presence in and around the first island chain on a day-to-day basis will make a strong contribution to deterrence.

While it does seem possible that with attack submarines and long-range, air-launched ASCM strikes the U.S. military could stop a PLA amphibious-invasion force heading for Taiwan, that is no cause for self-congratulation.

What this chapter does not address, except by implication, is that it does not seem possible for the U.S. joint force to bring a halt to the PLA missile and air bombardment that would be preliminary to any invasion. Taiwan would be forced to absorb serious punishment from the air, probably for a considerable period, with little help from the United States before the PRC concluded, probably reluctantly, that it needed to mount an invasion.

U.S. thinking on how to ameliorate the PLARF piece of this problem seems to be betting a lot of its chips on the concept of small, distributed forces being able to survive in what General Berger has called the "weapons engagement zone (WEZ) of a peer adversary."[20] The current focus on dispersed forces—both land-based fighters and small groups of land forces with ASCMs and medium-range missiles of all sorts—hopping and skipping around scattered islands in the WESTPAC has to be tempered by the reality that the latitude and longitude of every likely dispersal airfield, island, islet, and rock can be, and probably has been, determined and measured by the PLA. Dispersion is a great idea, but even dispersed forces can be seen, which is the primary problem. Daring the PLARF to play whack-a-mole in the hope that it runs out of missiles before the United States runs out of dispersed forces seems problematic. Once the PLA concludes that dispersion is definitely part of U.S. strategy, it will have lots of time to crank up the production rates of its missile forces to build as much inventory as necessary. I suspect China can build enough missiles to service all the likely aim points along and around the first island chain. Dispersal sites have to be made survivable if the concept is to be militarily credible, and that must start with making sure *they cannot be seen.*

Finally, I have not mentioned any objectives for naval forces in the South China Sea. That is intentional. Geographically, the South China Sea simply does not have enough navigable water space for major surface ships to operate in dispersed formations. Shoal water has the effect of canalizing avenues of approach. It is true that U.S. airpower and submarines could plaster PLA bases in the Spratlys with LACMs. But at the expense of shooting a lot of cruise missiles at targets, that would have little impact on saving Taiwan from invasion. A South China Sea campaign against PRC holdings as another so-called cost-imposing effort would have little real effect in deflecting Beijing from its only real reason for initiating a war: forcing Taiwan to unify with the mainland. Again, beating up PLA island bases is not much of a consolation prize.

Notes

1. For a good synopsis of views at the time, see Patrick E. Tyler, "China's Military Stumbles Even as Its Power Grows," *New York Times,* 3 December 1996, available at www.nytimes.com/1996/12/03/world/china-s-military-stumbles-even-as-its-power-grows.html. The "million-man swim" quote is found in Eric McVadon, "PRC Exercises, Doctrine and Tactics toward Taiwan: The Naval Dimension," in *Crisis in the Taiwan Strait,* ed. James R. Lilley and Chuck Downs (Washington, DC: National Defense Univ. Press, 1997), p. 255. It specifically refers to the likely result of a PLA attempt to invade Taiwan using thousands of fishing boats. In subsequent usage, the phrase became a popular way to dismiss the success of any PLA invasion attempt.
2. Taiwan Relations Act, 22 U.S.C. §§ 3301–16 (2018), available at www.ait.org.tw/our-relationship/policy-history/key-u-s-foreign-policy-documents-region/taiwan-relations-act/. Emphasis added.
3. Helen Davidson, "China Could Invade Taiwan in Next Six Years, Top US Admiral Warns," *The Guardian,* 9 March 2021, www.theguardian.com/world/2021/mar/10/china-could-invade-taiwan-in-next-six-years-top-us-admiral-warns.
4. John Culver, "The Unfinished Chinese Civil War," *The Interpreter,* 30 September 2020, www.lowyinstitute.org/the-interpreter/unfinished-chinese-civil-war/.
5. United Nations Conference on Trade and Development, *Review of Maritime Transport 2020* (New York: United Nations, 2020), p. 41, table 2.3, available at unctad.org/system/files/official-document/rmt2020_en.pdf.
6. The circumstances under which officials on the mainland historically have warned that it would use force have evolved over time. These circumstances have included (1) formal declaration of Taiwan independence, (2) undefined moves toward Taiwan independence, (3) internal unrest on Taiwan, (4) Taiwan's acquisition of nuclear weapons, (5) indefinite delays in the resumption of cross-strait dialogue on unification, (6) foreign intervention in Taiwan's internal affairs, and (6) foreign forces stationed on Taiwan. Article 8 of China's March 2005 Anti-Secession Law states that China may use "non-peaceful means" if "secessionist forces . . . cause the fact of Taiwan's secession from China," if "major incidents entailing Taiwan's secession" occur, or if "possibilities for peaceful reunification" are exhausted. U.S. Defense Dept., *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018* (Washington, DC: Office of the Secretary of Defense, August 2018) [hereafter *Annual Report to Congress 2018*], pp. 93–94, available at media.defense.gov/2018/Aug/16/2001955282/-1/-1/1/2018-CHINA-MILITARY-POWER-REPORT.PDF.
7. Robert D. Blackwill and Philip Zelikow, *The United States, China, and Taiwan: A Strategy to Prevent War* (New York: Council on Foreign Relations, February 2021), available at www.cfr.org/report/united-states-china-and-taiwan-strategy-prevent-war; Ian Easton, *The Chinese Invasion Threat: Taiwan's Defense and American Strategy in Asia* (Arlington, VA: Project 2049 Institute, 2017).
8. Peter Wood, "Snapshot: China's Eastern Theater Command," Jamestown Foundation *China Brief* 17, no. 4 (14 March 2017), available at jamestown.org/program/snapshot-chinas-eastern-theater-command/.

9. "With few overt military preparations beyond routine training, China could launch an invasion of small Taiwan-held islands in the South China Sea such as Pratas or Itu Aba. A PLA invasion of a medium-sized, better-defended island such as Matsu or Jinmen is within China's capabilities. Such an invasion would demonstrate military capability and political resolve while achieving tangible territorial gain and simultaneously showing some measure of restraint." *Annual Report to Congress 2018,* p. 95.
10. Easton, *The Chinese Invasion Threat,* p. 114.
11. Ibid., pp. 115–16.
12. David H. Berger [Gen., USMC], "Preparing for the Future: Marine Corps Support to Joint Operations in Contested Littorals," *Military Review,* April 2021, www.armyupress.army.mil/Journals/Military-Review/Online-Exclusive/2021-OLE/Berger-Future/.
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Andrew S. Erickson and Gabriel B. Collins

19. Deterring (or Defeating) a PLA Invasion

Recommendations for Taipei

China has achieved the most dramatic military buildup since World War II through concerted efforts over the past quarter-century. Previously limited in its ability to execute its Joint Firepower Strike, Joint Blockade, and Joint Island Landing Campaigns against Taiwan, the People's Liberation Army (PLA) is making rapid progress toward acquiring achievability as it prepares to meet the requirements of General Secretary Xi Jinping's Centennial Military Building Goal of 2027. In keeping with the purpose of this volume, this chapter will focus on countering a People's Republic of China (PRC) Joint Island Landing Campaign (which could itself be combined with some combination of the other aforementioned campaign plans against Taiwan).

The stakes scarcely could be higher and the clock is ticking for Taiwan to combat this threat, raising an urgent question: What can Taiwan do (including, in part, with American encouragement and support) to convince Xi and his successors that a military attack very likely would fail—and to reliably defeat PRC military aggression by denying it success, should that wisdom be ignored? For the United States to relentlessly prioritize safeguarding Taiwan, Taiwan must relentlessly prioritize its own defense where it matters most.

This chapter therefore underscores the key dynamics that should inform Taiwan's defense and highlights six areas to prioritize above all else, including legacy systems: (1) air defense, (2) mines, (3) antiship missiles and munitions, (4) coastal artillery, (5) information warfare, and (6) critical infrastructure resilience. In some cases, Taipei and Washington have made initial, gradual efforts but must do much more—and faster—to keep PRC forces at bay. This includes clearing the extensive backlog of systems that Taiwan has purchased but that the United States has not yet delivered.

Russian president Vladimir V. Putin's invasion of Ukraine highlights the urgency of advance preparation, amplified by the fact that Taiwan cannot easily be resupplied during combat the way Ukraine has been for more than two years. The systems "on island" when the first PLA missile lands are very likely what Taiwan's military will have to fight with for at least the first thirty days afterward.[1] Deterrence and denial are the best approaches for a vulnerable society facing a quantitatively greater invading force. Successful denial of lodgment to PRC amphibious and air assault forces would buy time for intervention by the U.S. and its allies—the island's most viable path to remaining autonomous in the event that Beijing pursues forcible unification.[2]

"Gentlemen, we have run out of money. Now we have to think." The words often attributed to Winston Churchill capture a central challenge confronting Taiwan's defense today. Fueled by tremendous economic development, China has developed and deployed a panoply of systems designed to shift the strategic environment from one in which the United States and Taiwan enjoyed overwhelming advantages and could operate with impunity to one in which many of their military operations can only be conducted at great risk.

These new PRC advances primarily are weapons systems that place the United States on the costly end of a series of competitions. It is far cheaper and more effective to attack with a missile, for instance, than to defend against it. China has exploited this dynamic by developing the world's largest, most diverse conventional missile force that includes unprecedented systems such as the DF-17, DF-21D, and DF-26 antiship ballistic missiles. Other areas of potentially disproportionate cost- and operational effectiveness that China has developed include conventionally-powered submarines and naval mines. By playing to the advantages of its physical environment, China is adopting a strategy that strives to negate Taiwan's and America's military strengths by directly targeting their military bases, ships, and aircraft—the very things necessary to defend Taiwan.

China's meteoric military ramp-up, which continues relentlessly, targets Taiwan first and foremost. While increasing spending on defense

should be an urgent priority, in all conceivable scenarios Taipei nevertheless must decide how to face this threat while operating with suboptimal limitations in resources, arms suppliers, and military forces. Particularly given a costly history of defense budget constraints combined with a focus on legacy platforms, what should be avoided above all is the expenditure of resources and effort in ways that fail to effectively address China's mounting military threat. Yet, Taiwan need not be thus condemned—provided that it doubles down on efforts to follow the smartest available strategy, with strong American support.

Porcupine Defense: Best Overall Concept

Several leading assessments rightly have called for Taiwan to pursue a "porcupine strategy" that prioritizes "a large number of small things" for the island's defense.[3] "Porcupine defense" emphasizes numbers, size, affordability, mobility, simplicity, and hiding shooters in clutter. Naval War College Professor William Murray's definition of the concept is "many, small, mobile, and lethal." Small assets are easier to conceal, while many and mobile assets are more survivable. Lethal capability is self-explanatory.[4] The goal is to deploy and train with affordable weapons systems that place China on the disadvantageous end of an arms competition.

One of the most important principles to illustrate what Taiwan should most strive to do, and most strive to avoid, might be described as "bullet versus body." Surface ships and fixed air bases increasingly represent "bodies" vulnerable to "bullets" in the form of missiles. One can expend "bullets" freely, but a hit to a "body" can be terminal. Not only should Taiwan avoid offering up "bodies" for easy destruction, but the island should also specialize in shooting its own "bullets" at PRC "bodies" that must necessarily be used in a given cross-strait military operation (e.g., airborne and seaborne troop transports in the case of an attempted invasion). By contrast, Taiwan cannot readily protect its air bases ("bodies") from the "bullets" of China's PLA Rocket Force. This argues for reducing reliance on such vulnerable assets. One particularly potent way to trade "bullets" for "bodies" is to fire from clutter, which brings us to the next important dynamic.

The concept of "target versus background" is also crucial; it is relatively straightforward to discern a target against the air or ocean surface and missiles can devastate any ship or aircraft so detected. Significant advantages will accrue to the side whose systems' signal-to-noise ratio enables

them to disappear below the "noise floor," thereby blending into the background or into clutter. Examples include the disproportionately effective actions of U.S. adversaries in the 1991 Gulf War "Scud hunt" and the 1999 Kosovo war.[5]

Among the other key dynamics, whatever Taiwan acquires or develops should be highly mobile; a given weapons system's survivability depends on how mobile it is in practice. Systems should thus be truly mobile, not just "relocatable." Where feasible, weapons should be mounted on relatively cheap trucks that can hide in the radar clutter generated by complex terrain or on small high-speed vessels; pursuing both approaches would present the PLA with markedly different and difficult problems to solve. Vessels on the ocean are unlikely to ever blend into surface clutter the way that transporter erector launchers (TELs) and other vehicles blend into land clutter, thereby offering Taiwan's on-island forces potential physics-based advantages over PRC forces crossing the Taiwan Strait.

All told, those tasked with conceiving and executing Taiwan's defense should strive to reclaim what we term the "right end of physics": adopting a minimum energy approach in accordance with military cost-exchange ratios. The goal either is to prevent a successful PRC military attack on Taiwan or to make one prohibitively costly to the attackers. Taiwan's planners should concentrate on being able to establish between Taiwan's maritime approaches and its shores a tremendous no-man's-land (or hellscape) in which PRC forces cannot operate.[6] They should deter by demonstrating the ability to prevent China from achieving its military objectives—deterrence by denial. Finally, time is running out; Taiwan's heretofore tight fiscal environment and now unforgiving threat timeline (the decade of maximum danger) places a premium on deploying and maintaining many affordable, small, mobile, and lethal weapons that can destroy invading forces as rapidly and effectively as possible.

Each day that Xi is persuaded that "today is not the day" to attack Taiwan buys another day of peace as policymakers work through this critical and decisive decade. To help ensure the means to maintain cross-strait peace, Taiwan's government should urgently redouble its investment and effort in six concrete areas: (1) air defense, (2) mines, (3) antiship missiles and munitions, (4) coastal "kill zone" artillery, (5) information warfare (particularly electronic warfare: including jammers, decoys, and deception), and (6) the resilience of critical infrastructure.[7] We now survey each in turn.

Air Defense

Taiwan must prevent the PLA from achieving and maintaining air superiority in the airspace over and around Taiwan. Ukraine's experience demonstrates the importance of mobile ground-based air defenses that, even if imperfect, can deny an attacker air control over key terrain. As Harry Halem and Eyck Freymann explain, "Without air control . . . China would be incapable of executing almost any military plan against Taiwan."[8] Furthermore, in their chapter for this volume, Yung and Haver show that PLA strategists regard air control as a key precondition for a Joint Island Landing Campaign.

Mobile, medium-range missiles offer a potent means of denying Taiwan's skies to PLA aircraft. The Norwegian Advanced Surface-to-Air Missile System (NASAMS) platform stands out as an asset that is mobile, survivable, and combat-proven, and that can fire a range of readily available missiles including the AIM-120 advanced medium-range air-to-air missile (AMRAAM), AIM-9X, IRIS-T, and AMRAAM—Extended Range.[9] Each NASAMS battery firing AIM-120 missiles could deny a column of airspace roughly twenty miles across and fifty-thousand feet high.[10] The system is also comparatively affordable. For the same cost as Taiwan's 2019 deal to acquire sixty-six F-16V fighters, the island's military could purchase more than 150 Norwegian Advanced Surface-to-Air Missile System batteries.[11] Finally, its ability to fire multiple missile types allows for future adaptation. The AMRAAM–Extended Range could expand the existing AIM-120's engagement range by 50 percent and altitude by 70 percent.[12] Truck-mounted NASAMS sensors and launchers dispersed throughout Taiwan that can fire and move would present a formidable challenge to the PLA Air Force. Truly mobile systems can serve as formidable "bullets;" systems that are merely "relocatable" represent "bodies" likely doomed to destruction in actual combat conditions.

For their part, short-range air defense (SHORAD) systems can offer critical protection against lower-flying aircraft, helicopters, and unmanned aerial vehicles (UAVs). In this area, Taiwan needs large stocks of man-portable air-defense systems (MANPADS), which already have shown their utility in Ukraine against aircraft with performance characteristics similar to many of those in China's air force. MANPADS could make an airborne assault prohibitively risky or costly. As of 9 May 2023, the United States alone had delivered 1,600 Stinger MANPADS to Ukraine.[13] The quantity transferred to Ukraine illustrates the sheer munitions mass likely to be required to contest airspace against a capable, determined invader.

Mines

Within the concept of "bullets versus bodies," mines are a type of particularly advantageous "bullet." Taiwan's planners understand the importance of sea mines for countering a PLA amphibious campaign, but they should accelerate their efforts.[14] Taiwan should urgently build or acquire substantial numbers of shallow-water mines akin to the Russian PDM series, which could be deployed rapidly in the tidal zone at likely landing points.[15] Using cheap, rapidly deployable passive obstacles such as steel Czech hedgehogs along Taiwan's west coast, beaches could complement elevated highways and other preexisting impediments to canalize (channel) incoming landing forces, thereby amplifying the lethality of mines and artillery against an invasion force as it tried to land.[16]

Ukraine's use of mines in concert with shore-based antiship missiles (the next section's topic) likely helped deter a Russian amphibious assault on Odessa—a lesson worth considering for Taiwan. As Tom Shugart shows in his chapter, Taiwan also must be prepared for the possibility that the PLA Navy (PLAN) could use offensive mining to isolate the island and hamper the operations of allied militaries. Here the best defense is not efforts to improve mine-countermeasures, but rather to turn the issue around on the PLA and deny it the ability to move an invasion force overwater onto Taiwan.

Antiship Missiles and Munitions

Rapidly maximizing the quantity and survivability of Taiwan's long-range antiship missiles could challenge seriously PLA operations near the island, and thereby have a deterrent effect.[17] Any ships struck by modern antiship cruise missiles would suffer greatly, and even more so if the missiles cause fires that subsequently spread. The United States already has approved the sale of one hundred land-based Harpoon coastal-defense cruise-missile launchers, four hundred missiles, and twenty-five associated radars to Taiwan.[18]

Invading amphibious forces are most vulnerable while they are still aboard their ships. Taiwan therefore should emphasize targeting ships at sea. Escalation risks aside, it is more militarily efficient to sink an invasion force at sea after it has left PRC ports and when it is concentrated in relatively few large (and flammable) amphibious transports and "civilian" roll-on/roll-off vessels than to bombard it after it is ashore and dispersed, hiding amidst port and urban clutter, and probably has a host of camouflage, concealment, and deception (CC&D) assets

nearby. The closer to Taiwan that PRC amphibious ships are, so long as the armored fighting vehicles have not yet debarked, the simpler Taiwan's targeting problem becomes. Targeting will become easier as an invasion force nears Taiwan if shore-based sensors and cheaper, prolific shorter-range UAVs are able to detect the force and help shooters onshore more accurately target their weapons.

While antiship cruise missiles certainly can be lethal, the PLA would also need to consider the damage smaller, loitering munitions can cause. Even a relatively small warhead can inflict a mission kill (rendering an enemy platform incapable of accomplishing its objective without necessarily destroying it completely) by damaging radars and other sensitive, exposed equipment on ships. In doing so, loitering munitions can augment antiship cruise missiles. Taiwan should thus produce or import long-range loitering munitions such as the Switchblade 600 and ALTIUS-600/700 series—each of which has sufficient range to cover the entire breadth of the Strait and can be fired from various mobile launchers.

Taiwan already is developing indigenous loitering munitions. The National Chung-Shan Institute of Science and Technology's *Chien Hsiang* antiradiation loitering munition, for example, can be launched from a trailer mounting twelve box launchers or from naval vessels.[19] But volume matters and an accelerated combination of imports and domestic production will likely be required to build sufficiently large stocks to threaten a PLA amphibious assault force credibly through the decade of maximum danger; Taiwan's production of the *Chien Hsiang* alone is not enough. Loitering munitions can augment antiship cruise missiles (ASCMs) by damaging radars. The United States can export potent loitering munitions and already has agreed to send Taiwan 720 Switchblade-300 (SB300) All Up Rounds and up to 291 Altius 600M-V systems.[20] The combination of fast ASCMs and many slow UAVs will overwhelm PLAN defenses and destroy invading ships.

Coastal "Kill Zone" Artillery

Precision fires can turn Taiwan's near-shore waters, beaches, and airborne landing areas into kill zones for invading forces and help deny lodgment or facilitate destruction or eviction of any that managed to get ashore. The Ukrainian military's use of artillery to destroy a lightly armored (and poorly dispersed) Russian assault force at the Hostomel Airport near Kyiv in February 2022 is illustrative, while other examples from Ukraine highlight the potency of submunitions and area-effect warheads.[21]

Taiwan's forces thus need multiple-launch rocket artillery (for example, High Mobility Artillery Rocket Systems, a.k.a. HIMARS) with submunitions and area-effect warheads to target any landing force close to or on the beach (or in a drop zone).[22] As demonstrated in the Ukraine War and previous conflicts, HIMARS—especially with area munitions (cluster munitions, designed to disperse multiple smaller submunitions over a wide area)—are devastating to unprotected infantry. Additionally, HIMARS could employ Saab's Ground-Launched Small Diameter Bomb (GLSDB), which now has a laser-homing mode to engage moving targets.[23] The GLSDB's 150 km range and high precision would allow rocket systems dispersed throughout Taiwan to target a PRC amphibious landing force.[24]

Taiwan already has recognized HIMARS's effectiveness for its needs; eleven HIMARS units are scheduled to be delivered from the United States by 2027.[25] This demonstrates that leaders already are thinking about the value of mobility, small size, and lethality. However, delivering substantially more of these systems would be even better and could contribute to deterring a PRC invasion by ensuring sufficient mass of fire against a potential invasion force, which would likely be massive, despite combat attrition.

Mobile tube artillery systems also are important, particularly when coupled with Excalibur-type precision shells or submunitions such as dual-purpose improved conventional munitions (DPICMs). The highly accurate 155 mm M982 Excalibur precision-guided artillery projectile is the U.S. Army and Marine Corps's next-generation cannon artillery precision munition.[26] It can be fired from the 155 mm M109A6 medium self-propelled howitzer system, of which the United States has agreed to sell forty to Taiwan, together with associated systems.[27] DPICMs are area or cluster munitions designed to target enemy personnel and light-armored vehicles. Both are optimized for use against invading forces.

The United States has area- and cluster-type shells stockpiled in substantial numbers and can (at least in theory) deliver them rapidly, where they would immediately be compatible with existing Taiwanese 155 mm artillery systems. Taiwan already operates the M109 155 mm self-propelled howitzer and could assimilate more of these platforms into its force. The U.S. Army has roughly five hundred M109A6 systems in storage.[28] An arrangement similar to the World War II–era Lend-Lease Act that helped supply U.S. allies and partners could provide, for example, 100–150 additional artillery systems for Taiwan and would substantially bolster the Taiwanese army's ability to destroy PRC forces that made it onto the beach or into a drop zone.

Taiwan also should stockpile relatively high-volume, lower-cost, precision-guided munitions to saturate invading troop concentrations. Effective antitank guided missiles (ATGMs) on trucks or High Mobility Multipurpose Wheeled Vehicles ("Humvees") are lethal, mobile, and relatively cheap; Taiwan needs more of them. AGM-114 Ground-Launched Hellfire-Light missiles deployed from a modified Humvee chassis, for example, offer a formidable option for destroying incoming armor, amphibious assault vehicles, and landing craft while they are still afloat.[29] Another potentially useful system is the Javelin Advanced Anti-Tank Weapon System–Medium, with rounds pre-positioned in hardened locations near likely landing areas.[30] Ukraine's fight thus far suggests that repelling an intense multivector invasion requires thousands of antiarmor munitions.[31]

Information/Electronic Warfare: Jamming, Decoys, Deception

Recent history suggests that decoys remain effective and induce an adversary to shoot costly guided weapons wastefully. While aircraft are extremely expensive, and Taiwan's might well be stuck on the ground and otherwise unusable in the event of conflict, decoys and deception in employing them are a potential means of reducing the PRC air force's effectiveness. NATO's 1999 bombing of Yugoslavia was rendered measurably more difficult and less effective by Serbian deception, particularly in the form of decoys.[32]

Ukraine has employed a wide range of decoys effectively against Russian forces.[33] For Taiwan today, inflatable decoys of beach, surface-to-air missile, and coastal-battery vehicles and radars should be deployed and moved frequently to confuse the PLA's situational awareness. Decoys and actual vehicles should employ camouflage to compound the PRC's targeting challenge of discerning the real from the decoy. Ideally, decoys and actual vehicles should be indistinguishable to China's military. Posting distant photos of camouflaged decoys on social media can add an air of authenticity and make the targets more attractive for striking. Taiwan also could disguise actual armored vehicles and missile-launch systems as civilian trucks or heavy equipment to complicate PRC targeting efforts.[34]

Lastly, decoys can distract operators and radars on warships to enable other strikes. Ukrainian officials assert that Bayraktar TB2 drones used in this way enabled Neptune antiship missiles to sink Russia's *Moskva*.[35] This suggests Taiwan could use aerial and aquatic "active decoy" drones to facilitate attacks against a blockading or invading ships.

Life-Essential Infrastructure

Resilience is one of the key factors that will enable Taiwan to hold up and hold out. The island should prepare for the possibility of PLA siege warfare, particularly in the context of a PRC blockade or quarantine operation. Taiwan's Petroleum Administration Act currently requires that the government hold petroleum stocks equivalent to thirty days of consumption levels during the prior year (meaning approximately one million barrels per day).[36] It would be better to store sixty days of liquid fuel, in hardened, buried, and dispersed locations.[37]

Taiwan should prepare some emergency stockpiles at higher elevations and run buried pipelines to generators and fuel offtake risers downhill so that in the event of total power loss fuel can be moved by gravity. Fuel suppliers also should practice "over the shore" fuel deliveries of the type used to resupply facilities in austere locations in the event that PRC strikes deny or destroy ports normally used for fuel deliveries.[38] Holding a much higher inventory level in a more dispersed fashion entails a significant investment (roughly $3.5 billion at today's prices), but doing so would reduce vulnerability to precision-guided-munition strikes and increase Taiwan's ability to withstand a blockade.[39]

Likewise, the experiences of Mariupol' and other Ukrainian cities show that invaders may target food and water supplies.[40] Accordingly, 120 days of basic food stocks should be dispersed to ensure resilience against possible maritime blockade or quarantine attempts by Beijing. During the early phase of the COVID-19 pandemic, Taiwan's Ministry of Economic Affairs estimated realistically that local food and key goods stocks were sufficient for one to three months—an amount likely insufficient to weather a prolonged blockade.[41] Access to potable water is also essential. Every Taiwanese community of five thousand or more people should drill groundwater wells and connect them to high-resiliency backup power to maintain potable water supplies in case PRC forces strike reservoirs, main aqueduct systems, and the electricity grid that normally powers pumping operations. Taiwan also needs redundant communications if PRC attacks disrupt undersea cables.[42] As the 2022 Tonga volcanic eruption underscores, Starlink-type satellite internet receivers can enable this continuity, and as Ukraine demonstrates, can even provide connectivity to support military operations.

To ensure basic electricity availability critical to water supply and communications, multifuel turbine electrical-power generators—which can use diesel fuel with its low fire risk as well as gasoline, liquid propane gas, natural gas, bio gas, and other sources—should be distributed and installed

near fuel-storage locations.[43] Fuel supplies for the generators should be dispersed and, to the extent possible, tanks should be placed underground, in caves or in subsurface structures resistant to air and missile attack. There is much more that Taiwan can do to ensure adequate supplies of water, fuel, and food, particularly during a prolonged blockade; increasing resiliency in these areas merits immediate additional research and dedicated effort.

The PLA is studying Russia's experiences in Ukraine and working with Russia to enhance its capabilities and operations. Taiwan must learn and implement its own lessons, including through collaboration with the United States, to avoid succumbing to the PRC's mounting military threat.[44] Against that backdrop, the six urgent focus areas this chapter recommends arise from unforgiving realities. China seeks to win without fighting, or with minimal fighting, but for Taiwan the best path is to try to avoid the fight in the first place by demonstrating the ability to prevent China from consolidating meaningful gains before American and allied firepower arrives. The bottom line is simple: a war deterred is by far the ideal outcome for all concerned. To that end, with urgent assistance, munitions, and training, the United States can help Taiwan become a truly unpalatable and indigestible porcupine before it is too late.

Notes

This chapter builds on and updates Andrew S. Erickson and Gabriel B. Collins, "Eight New Points on the Porcupine: More Ukrainian Lessons for Taiwan," *War on the Rocks,* 18 April 2022, warontherocks.com/2022/04/eight-new-points-on-the-porcupine-more-ukrainian-lessons-for-taiwan/.

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APPENDIX

Crossing the Strait? PLA Amphibious Vessels Relevant to Taiwan Scenarios

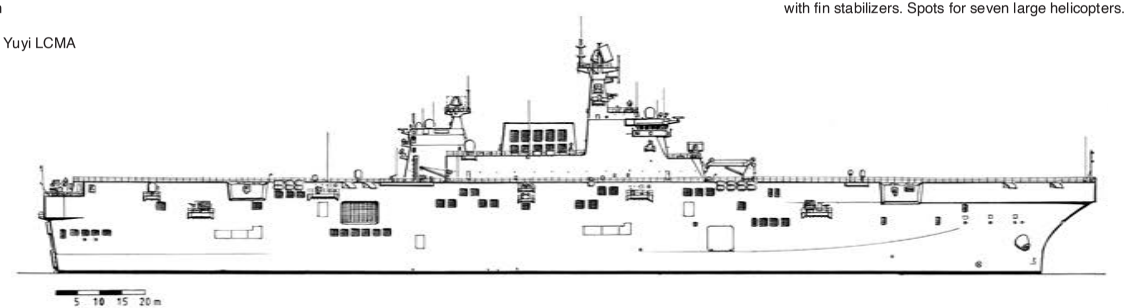
PLA Navy Vessels

Type 075 [Yushen] LHD

Displacement: 35000 std **In Class:** 3
In Service: 2021 **Crew:** ≈1200
Propulsion: 4 DM Hudong 16PC2-6B @ 48000 kW = 23 kts
Dimensions: 237 × 43.5 × 8.5 m
Weapons:
(R)2 PJ-11 30mm
(24)2 HQ-10
2 Type 726/726A Yuyi LCMA
2 elevators

Sensors:
LJQ-382, AESA X-band low altitude search, Type 760, Type 754 radars
TJN-906, JSTIDS data links

Air Group:
28–30 helicopters, including Z-8, Z-9, Z-10, Z-18, and Z-20
Military Lift:
50–60 AAV, Lt tanks, 122mm SP howitzers, and 1200 troops
Remarks:
Hainan/31 in STCN. *Guangxi*/32, *Anhui*/33 in ETCN. Likely fitted with fin stabilizers. Spots for seven large helicopters.

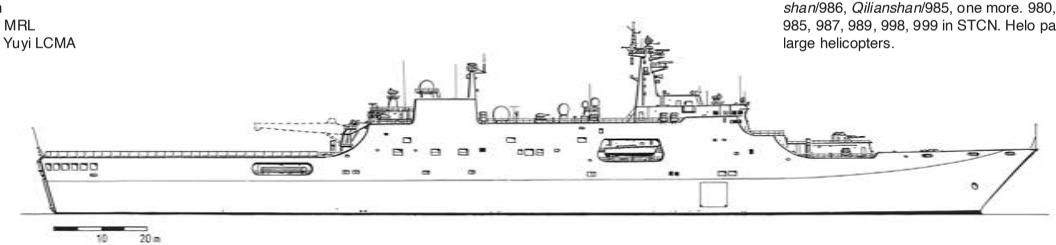


Type 071 [Yuzhao] LPD

Displacement: 18500 std **In Class:** 8 + 1 + 1
In Service: 2007 **Crew:** 175
Propulsion: 4 DM Hudong 16PC2-6V400 @ 35197 kW = 25 kts
Dimensions: 210 × 28 × 7.5 m
Weapons:
(1)1 PJ-26 76mm
(R)4 PJ-13 30mm
(50)4 120mm MS MRL
4 Type 726/726A Yuyi LCMA
2 LCVP

Sensors:
LJQ-360, LJQ-364, Type 760, Type 754 radars
TJN-906 data links

Air Group:
4 helicopters, including Z-8, Z-9, Z-10, Z-18
Military Lift:
20–25 AAV, Lt tanks, 122mm SP howitzers, and 800 troops
Remarks:
Kunlunshan/998, *Jinggangshan*/999, *Changbaishan*/989, *Yimengshan*/988, *Wuzhishan*/987, *Longhushan*/980, *Simingshan*/986, *Qilianshan*/985, one more. 980, 986, 988 in ETCN. 985, 987, 989, 998, 999 in STCN. Helo pad aft with spots for two large helicopters.

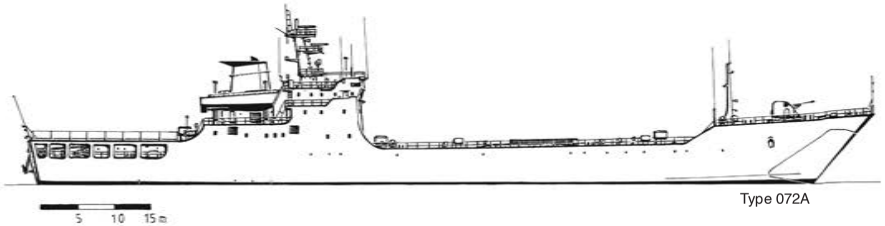


Abbreviations:
AAV: Amphibious Armored Vehicles
IFV: Infantry Fighting Vehicles
MBT: Main Battle Tank
SP: Self-propelled

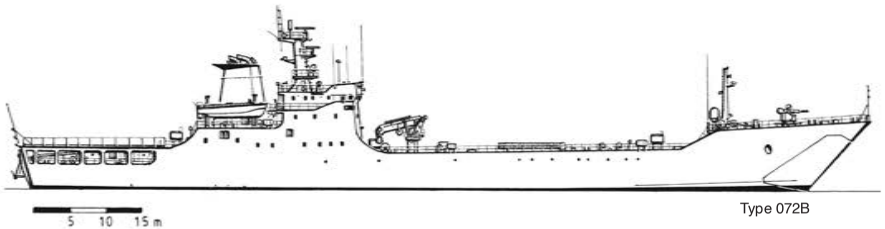
ETCN: Eastern Theater Command Navy
NTCN: Northern Theater Command Navy
STCN: Southern Theater Command Navy
MS MRL: Multiple Rocket Launcher

Type 072A, B [Yuting II] LST

Displacement: 3700 std **In Class:** 9, 6 + 1
In Service: 2003 **Crew:** 104
Propulsion: 2 DM 12PA6V-280MPC @ 14150 kW = 21 kts
Dimensions: 119.7 × 16.4 × 2.8 m
Weapons:
(2)1 PJ-76F 37mm (Type 072A)
(1)1 PJ-17 30 mm (Type 072B)
Sensors:
Type 760, Type 753C radar
TJN-905 data link
Military Lift:
10–15 AAV or 18 122mm towed howitzer + vehicle or 250 troops or 500 tons cargo
Remarks:
Type 072A: *Tianzhushan*/921, *Daqingshan*/922, *Baxianshan*/973, *Huadingshan*/992, *Luo Xiaoshan*/993, *Daiyunshan*/994, *Wanyangshan*/995, *Laotieshan*/996, *Yunwushan*/997.
• Type 072B: *Dabieshan*/981, *Taihangshan*/982, *Wuyishan*/974, *Culaishan*/975, *Tianmushan*/976, *Wutaishan*/977.
• 921 and 922 in NTCN. 973, 974, 975, 976, 977, 981, 982 in ETCN. 992–997 in STCN. Helo pad aft, not fitted with refueling or maintenance facilities. Aft ramp for either two Type 724 LCPA or amphibious vehicles.



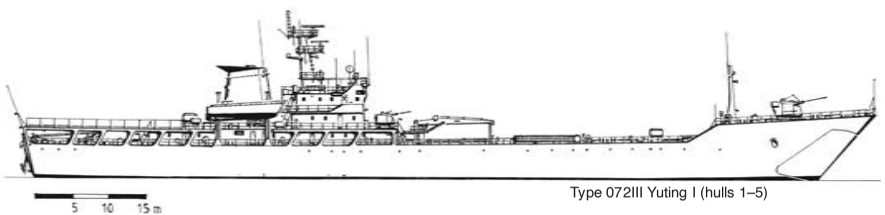
Type 072A



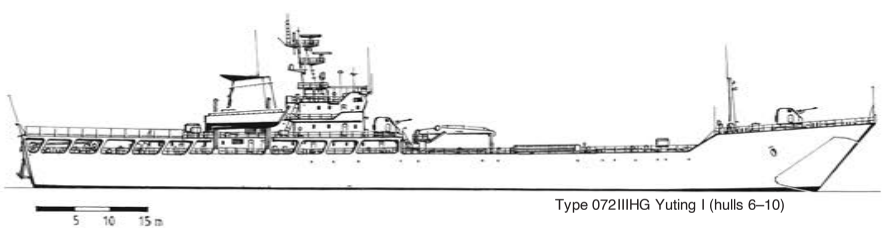
Type 072B

Type 072III, Type 072IIIHG [Yuting I] LST

Displacement: 3430 std **In Class:** 5, 5
In Service: 1992, 1997 **Crew:** 110
Propulsion: 2 DM 12PA6V-280MPC @ 14150 kW = 21 kts
Dimensions: 119.7 × 16.4 × 2.8 m
Weapons:
(2)3 PJ-76F 37mm (072IIIHG)
(2)3 Type 66 57mm/70 (072III)
Sensors:
Type 760, Type 753C radars
TJN-901 data link
Military Lift:
10–15 AAV or 18 122mm towed howitzer + vehicle or 250 troops or 500 tons cargo
Remarks:
Helo pad aft, not fitted with refueling or maintenance facilities. Aft ramp for either two Type 724 LCPA or amphibious vehicles.
• Type 072III: *Emeishan*/991, *Danxiashan*/934, *Xuefengshan*/935, *Haiyangshan*/936, *Qingchengshan*/937. All STCN.
• Type 072IIIHG: *Yandangshan*/968, *Jiuhuashan*/969, *Huanggangshan*/970, *Putuoshan*/939, *Tiantaishan*/940. All ETCN.
• Feb 18: *Haiyangshan*/936 fitted with experimental railgun for trials, replacing Type 66 57mm. Bow ramp welded shut.



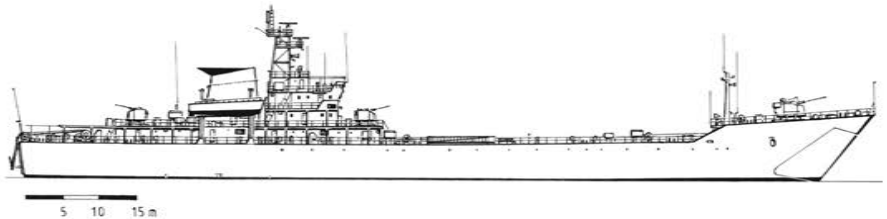
Type 072III Yuting I (hulls 1–5)



Type 072IIIHG Yuting I (hulls 6–10)

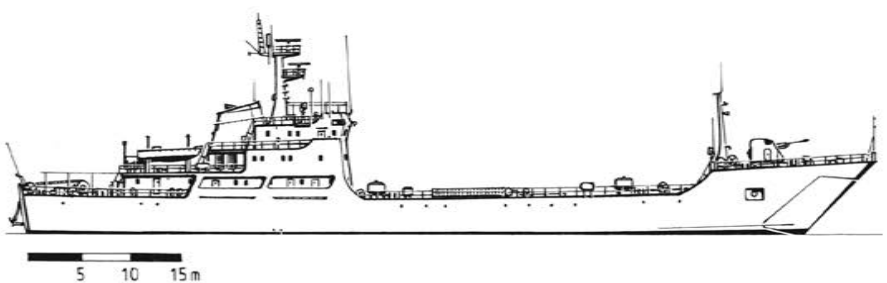
Type 072II [Yukan] LST

Displacement: 3100 std **In Class:** 3
In Service: 1978–2020 **Crew:** 133
Propulsion: DM 12PA6V-280MPC @ 14150 kW = 18 kts
Dimensions: 119.5 × 16.4 × 2.8 m
Weapons:
(2)4 Type 66 57mm/70
(2)4 Type 61 25mm
2 LCVP
Sensors:
2 Type 760 radars
YJN-901 data link
Military Lift:
10–15 AAV or 18 122mm towed howitzer + vehicle or 250 troops or 500 tons cargo
Remarks:
Dongtingshan/931, *Helanshan*/932, *Liupanshan*/933. All ETCN.



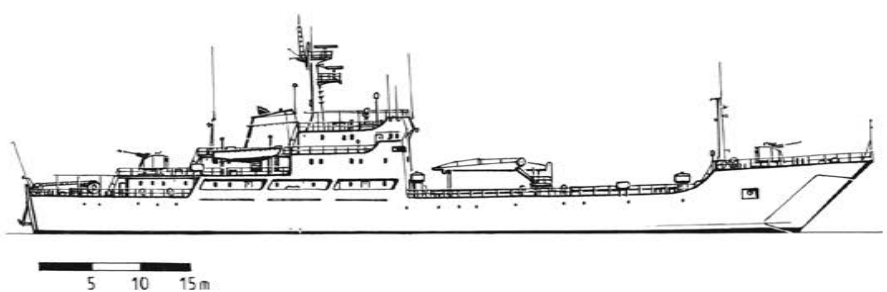
Type 073A [Yunshu] LSM

Displacement: 1550 std **In Class:** 10
In Service: 2003 **Crew:** 74
Propulsion: 2 DM6PA6I-280 @ 7080 kW = 17 kts
Dimensions: 87 × 12.6 × 2.5 m
Weapons:
(2)1 PJ-76F 37mm
Sensors:
Type 760, Type 753C radars
Military Lift:
6 AAV or 180 troops or 250 tons cargo
Remarks:
Shengzhoushan/941, *Lúshan*/942, *Yushan*/943, *Mengshan*/944 in ETCN. *Huashan*/945, *Songshan*/946, *Lushan*/947, *Xueshan*/948, *Hengshan*/949, *Taishan*/950 in STCN.



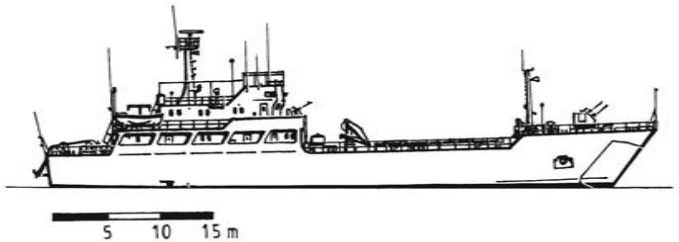
Type 073III [Yudeng] LSM

Displacement: 1460 std **In Class:** 1
In Service: 1994 **Crew:** 74
Propulsion: 2 DM6PA6I-2800 @ 7080 kW = 17 kts
Dimensions: 87 × 12.6 × 2.3 m
Weapons:
(2)1 PJ-76F 37mm
Sensors:
Type 760, Type 753C radars
Military Lift:
6 AAV or 180 troops or 250 tons cargo
Remarks:
Wudangshan/990 in STCN.
• 2010: Decommed, later converted with two deck hatches and a crane and reactivated as island resupply ship in South China Sea. Renamed *Jinchengshan*.



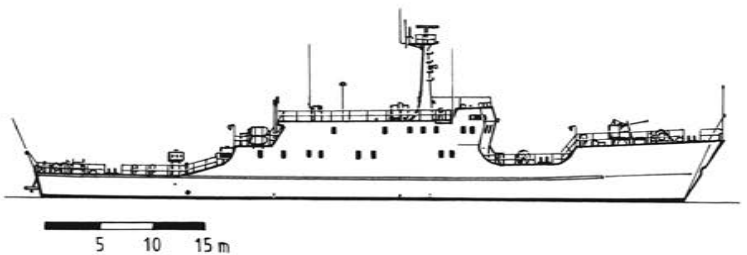
Type 074 [Yuhai] LSM

Displacement: 656 std **In Class:** 15–16
In Service: 1995 **Crew:** 56
Propulsion: 2 DM 8L20/27 @ 1678 kW = 17 kts
Dimensions: 58.4 × 10.4 × 2.34 m
Weapons:
(2)1 Type 61 25mm
(2)2 Type 69 14.5mm
Sensors:
Type 760 radar
Military Lift:
2 AAV or 200 troops or 150 tons cargo
Remarks:
3111–3113, 3115–3117 in NTCN. 3229, 3231, 3244, 3357–3359 in ETCN.



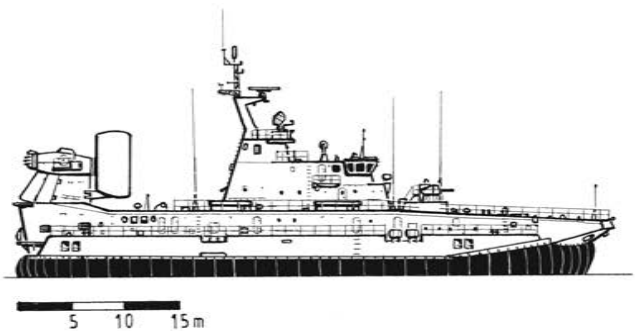
Type 074A [Yubei] LCU

Displacement: 650 std **In Class:** 10
Size Class: D/Small **In Service:** 2004
Propulsion: Diesel **Crew:** 27
Propulsion: 2 DM @ 3600 kW = 18 kts
Dimensions: 58.4 × 11 × 2.7 m
Weapons:
(2)2 Type 69 14.5mm
Sensors:
Type 756 radar
Military Lift:
6 AAV or 150 troops or 150 tons cargo
Remarks:
3128, 3129 in NTCN. 3232, 3233, 3234, 3235 in ETCN. 3315, 3316, 3317, 3318 in STCN.



Ex-Russian Project 1232.2 Zubr [Pomornik]/Type 958 LCUA

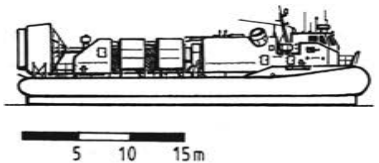
Displacement: 480 std **In Class:** 6
In Service: 2014 **Crew:** 31
Propulsion: 5 GTu NK-12 @ 43520 kW = 63 kts
Dimensions: 57.3 × 25.6 × 1.6 m
Weapons:
(R)2 AK-630 30mm//EO GFC (Pr. 1232.2)
(R)2 PJ-13 30mm//EO GFC (Type 958)
Sensors:
LJQ-362 Mod, Type 760 radars
TJN-906 data links
Military Lift:
3 MBT or 8 AAV or 10 6×6 trucks or 360 troops or 150 tons cargo
Remarks:
3325–3328, two more



Type 726, Type 726A [Yuyi] LCMA

Displacement: 150 std **In Class:** 3, 13 + 6 + 8
In Service: 2011, 2017 **Crew:** 6
Propulsion: 2 GTu QC-70 @ 10295 kW = 52 kts
Dimensions: 33 × 16.8 × 5 m
Weapons: **Cbt Sys:** None
(1)1 QJZ-89 12.7mm

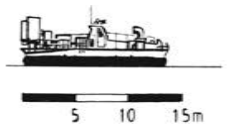
Sensors:
Raytheon Pathfinder radar
Military Lift:
1 amphibious tank and 2 amphibious IFV and 20 troops or 4 amphibious IFV and 40 troops or 60 tons cargo
Remarks:
3226–3239, 3320–3322, 3325–3327, 3330–3334, 3337. Bow and stern ramps. 3320–3322 are Type 726 with Ukrainian gas turbines in STCN.
• 2017: Deliveries of Type 726A begin, with Chinese gas turbines replacing Ukrainian engines.



Type 724 [Payi] LCPA

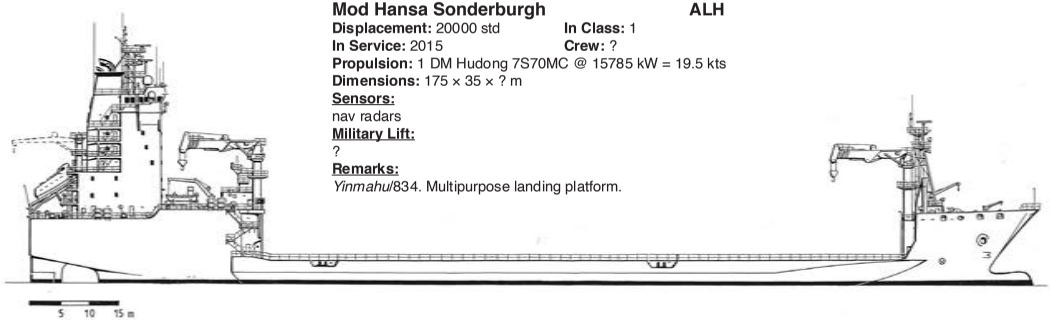
Displacement: 6.4 std **In Class:** 20
In Service: 1994 **Crew:** 3
Propulsion: 2 DM @ 559 kW = 40 kts
Dimensions: 12.4 × 7 × 2 m

Sensors:
nav radar
Military Lift:
10 troops
Remarks:
Air cushion vehicle
• 2020: 3310–3312, 8530–8538 reported in service.



Mod Hansa Sonderburgh ALH

Displacement: 20000 std **In Class:** 1
In Service: 2015 **Crew:** ?
Propulsion: 1 DM Hudong 7S70MC @ 15785 kW = 19.5 kts
Dimensions: 175 × 35 × ? m
Sensors:
nav radars
Military Lift:
?
Remarks:
Yinmahu/834. Multipurpose landing platform.

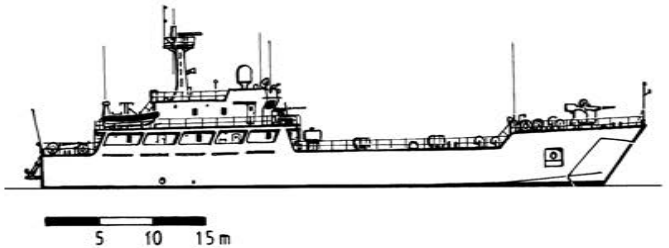


PLA Ground Forces Vessels

Type 074HKG [Yuhai]

WLSM

Displacement: 656 std **In Class:** 3
In Service: 2017 **Crew:** 56
Propulsion: 2 DM 8L20/27 @ 1678 kW = 17 kts
Dimensions: 58.4 × 10.4 × 2.34 m
Weapons:
(1)1 PJ-17 30mm
(1)2 QJZ-89 12.7mm
Sensors:
Type 760 radar
Military Lift:
2 AAV or 200 troops or 150 tons cargo
Remarks:
3357–3359, Hong Kong Garrison ships. Bow ramp.



Type 68 [Yunnan II]

WLCM

Displacement: 85 std **In Class:** 35
In Service: 1980s **Crew:** 10
Propulsion: 2 DM 12V150C @ 882 kW = 11.5 kts
Dimensions: 24.8 × 5.2 × 1.3 m
Weapons:
(2)2 Type 69 14.5mm

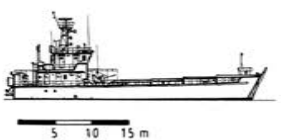
Sensors:
Type 726 radar
Military Lift:
2 AAV or 4 trucks or 150 troops or 36 tons cargo
Remarks:
These small landing craft are no longer used by the landing forces. They are used for general transport and support duties in the bases, and therefore are quasi-auxiliary vessels.

Type 69 [Yupen]

WLCU

Displacement: 156 std **In Class:** c70
In Service: 1997 **Crew:** ?
Propulsion: 2 DM @ 474 kW = 12.5 kts
Dimensions: 33.6 × 5.80 × 1.75 m
Weapons:
(2)2 Type 69 14.5mm

Sensors:
nav radar
Military Lift:
2 AAV or 4 trucks or 150 troops
Remarks:
Some are converted as transports, tankers, or training vessels.



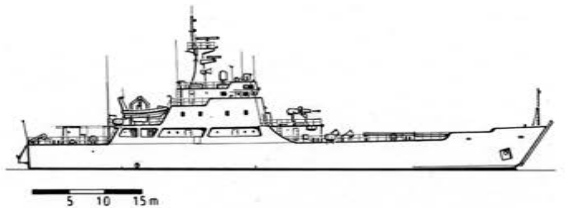
Yujiu

WLCT

Displacement: ? std
In Service: 2021
Propulsion: ?
Dimensions: 73 × 12 × ? m
Weapons:
(1)1 PJ-17 30mm

In Class: 2+
Crew: ?

Sensors:
nav radars
Military Lift:
?
Remarks:
More expected to be built.



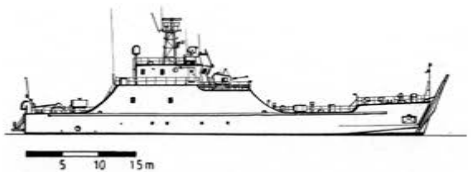
Yutu

WLCU

Displacement: ? std
In Service: 2021
Propulsion: ?
Dimensions: 56 × ? × ? m
Weapons:
(1)2 Type 87 25mm

In Class: about 20
Crew: ?

Sensors:
nav radars
Military Lift:
?



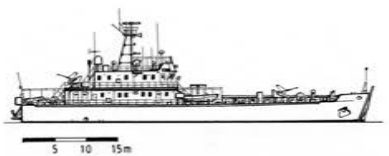
Type 271IID [Yuwei]

WLCU

Displacement: 507 std
In Service: 1987
Propulsion: 2 DM 6300CZ @ 833kW = 13 kts
Dimensions: 56 × 9.2 × 1.7 m
Weapons:
(2)4 Type 69 25mm

In Class: about 100
Crew: 36

Sensors:
nav radars
Military Lift:
3 med. tanks or 7 6×6 trucks or 8 towed guns/howitzers or 300 troops or 150 tons cargo



Yubu

WLCM

Displacement: 600 std
In Service: 2021
Propulsion: ?
Dimensions: 36 × 6.8 × ? m
Sensors:
nav radar

In Class: 7
Crew: ?

Military Lift:
?
Remarks:
Carried in dock space of LHD and LPD.

PLA Navy Amphibious Ship Assignments

	Total In Svc	Eastern Theater Command	Northern Theater Command	Southern Theater Command	Remarks
Type 075 Yushen LHD	3	32, 33		31	
Type 071 Yuzhao LPD	8	980, 986, 988		985, 987, 989, 998, 999	
Type 072A Yuting II LST	9	973	921, 922	992, 993, 994, 995, 996, 997	
Type 072B Yuting II LST	6	974, 975, 976, 977, 981, 982			
Type 072III Yuting I LST	5			934, 935, 936, 937, 991	
Type 072IIIHG Yuting I LST	5	939, 940, 968, 969, 970			
Type 072II Yukan LST	3	931, 932, 933			
Type 073A Yunshu LSM	10	941, 942, 943, 944		945, 946, 947, 948, 949, 950	
Type 073III Yudeng LSM	1			990	
Type 074 Yuhai LSM	15	3229, 3231, 3244, 3357, 3358, 3359	3111, 3112, 3113, 3115, 3116, 3117		
Type 074A Yubei LCU	10	3232, 3233, 3234, 3235	3128, 3129	3315, 3316, 3317, 3318	
Project 12332/ Type 728 Zubr LCUA	6			3325, 3326, 3327	3328, two more unassigned
Type 726/726A Yuyi LCMA	3/13	4 (726A)		3 (726), 9 (726A)	
Type 724 Payi LCPA	20	?	?	?	Unknown assignment

About the Contributors

DENNIS J. BLASKO is a retired lieutenant colonel, U.S. Army, with twenty-three years of service as a military intelligence officer and foreign area officer specializing in China. He was an Army attaché in Beijing and Hong Kong from 1992 to 1996. He served in infantry units in Germany, Italy, and Korea and in Washington at the Defense Intelligence Agency; Headquarters, Department of the Army (Office of Special Operations); and the National Defense University's War Gaming and Simulation Center. Blasko is a graduate of the U.S. Military Academy and the Naval Postgraduate School. He has written numerous articles and chapters on the Chinese military, along with the book *The Chinese Army Today: Tradition and Transformation for the 21st Century,* second edition (Routledge, 2012).

JOHN CHEN is Chief of Data Solutions and a lead analyst at Exovera's Center for Intelligence Research and Analysis, where he works on foreign-policy, national-security, and science-and-technology issues using Chinese-language sources. Chen is also a nonresident fellow at the Atlantic Council's Global China Hub. His current research interests include Chinese cyber and information operations. Chen holds degrees from Dartmouth College and Georgetown University.

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JOHN K. CULVER is a nonresident senior fellow with the Atlantic Council's Global China Hub and a former Central Intelligence Agency (CIA) senior intelligence officer with thirty-five years of experience as a leading analyst of East Asian affairs, including security, economic, and foreign-policy dimensions. Previously as National Intelligence Officer for East Asia from 2015 to 2018, Culver drove the Intelligence Community's support to top policy makers on East Asian issues and managed extensive relationships inside and outside government. He produced a large body of sophisticated, leading-edge analysis and mentored widely on analytic tradecraft. He also routinely represented the Intelligence Community to senior U.S. policy, military, academic, private-sector, and foreign-government audiences. Culver is a recipient of the 2013 William L. Langer Award for extraordinary achievement in the CIA's analytic mission. He was a member of the Senior Intelligence Service and CIA's Senior Analytic Service. He also was awarded the Distinguished Career Intelligence Medal.

J. MICHAEL DAHM is a principal intelligence analyst at the MITRE Corporation in McLean, Virginia. MITRE is a not-for-profit, federally funded research-and-development (R&D) corporation; his analysis informs policy and strategy development for MITRE's government sponsors. His expertise and focus areas include Indo-Pacific security affairs and challenges presented by China across the spectrum of competition. Prior to joining MITRE, Dahm was a senior national-security researcher concentrating on foreign threats and technology development at Johns Hopkins University's Applied Physics Laboratory (APL). He also served as the lab's liaison to the U.S. Intelligence Community, delivering intelligence assessments, mission data, and threat models for APL's advanced R&D programs. Dahm served as a U.S. Navy intelligence officer for over twenty-five years, performing in several diverse operational and staff assignments conducting missions ranging from noncombatant evacuation operations in Europe and Africa to combat operations in the Balkans and Iraq. He has focused on Asia-Pacific security matters since 2006, when he was assigned to the U.S. Pacific Command, serving as Chief of Intelligence Plans and later establishing the Commander's China Strategic Focus Group. From 2012 to 2015, he was the assistant naval attaché at the U.S. embassy in Beijing, China. In his final tour, he served as the Senior Naval Intelligence Officer for China at the Office of Naval Intelligence. On the basis of his extensive experience, he was designated an Asia-Pacific Hands Master by the Navy before retiring from active

duty in 2017. Dahm has a BA in international relations from the University of Southern California and an MS in strategic intelligence from the National Intelligence University. He is now an adjunct professor at the latter, teaching a graduate-level course on Chinese military capabilities and strategy.

IAN EASTON serves as a research fellow at the Project 2049 Institute, where he conducts research on defense and security issues involving the United States, China, Japan, and Taiwan. During the summer of 2013, he also was a visiting fellow at the Japan Institute for International Affairs in Tokyo. Previously Easton worked as a China analyst at the Center for Naval Analyses in Alexandria, Virginia, for two years. Prior to that, he lived in Taiwan and China for five years. During his time in Taiwan, he worked as a translator for Island Technologies Inc. and the Foundation for Asia-Pacific Peace Studies. While in Taipei, he also conducted research with the Asia bureau chief of *Defense News.* Easton holds an MA in China studies from National Chengchi University, in Taiwan, and a BA in international studies from the University of Illinois Urbana-Champaign. He also holds a certification in advanced Mandarin Chinese, having formally studied the language at Fudan University, in Shanghai, and National Taiwan Normal University in Taipei. His research has been featured in major media outlets in the United States and Asia. He has lectured at the Naval War College and Japan's National Defense Academy.

MAJ. TOM FOX is an aviation officer in the U.S. Army. He currently serves in the 2nd Combat Aviation Brigade at Camp Humphreys, Republic of Korea. He is rated in the OH-58D Kiowa Warrior scout helicopter and AH-64E Apache attack helicopter. In 2011, he deployed to Kandahar, Afghanistan, in support of Operation ENDURING FREEDOM. From 2018 to 2021, he served as an assistant professor of international affairs and taught Chinese politics in the Department of Social Sciences at the U.S. Military Academy at West Point. He holds a BSFS from Georgetown University and an MPP from the Harvard Kennedy School.

CDR. WILLIAM FOX, USN, currently serves as senior intelligence analyst and branch chief for the Foreign Influence China Branch in the Directorate for Intelligence of U.S. Africa Command. He recently served as a founding member of the Red Team for the Office of the Secretary of Defense, as Senior Intelligence Officer for East Asia in the Chief of Naval Operations' Directorate for Information Warfare (OPNAV N2N6), and as special assistant to the Joint Chiefs of Staff Director for Intelligence (Joint Staff J2). Fox previously served as an assistant naval attaché at the U.S. embassy in Beijing,

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CRISTINA L. GARAFOLA is an associate policy researcher at the RAND Corporation. Her research focuses on the ramifications of China's rise for its global status, particularly with respect to defense issues, China's influence on regional actors, and implications for the United States. From 2017 to 2019, Garafola served in the Office of the Secretary of Defense, where she focused on national defense strategy and Indo-Pacific strategy implementation. She also has worked at the Department of the Treasury, the Center for Strategic and International Studies, and the Department of State. She is the coauthor of the book *70 Years of the PLA Air Force* (2021), published by the China Aerospace Studies Institute. Her work has been published by RAND and in *Asian Security, Journal of Strategic Studies, War on the Rocks,* and the Jamestown Foundation's *China Brief.* Garafola holds an MA in China studies from the Johns Hopkins School of Advanced International Studies, a graduate certificate from the Hopkins-Nanjing Center for Chinese and American Studies, and a BA in international relations and Chinese from Hamilton College. She speaks Chinese.

ZOE HAVER is a China analyst at Recorded Future. She specializes in the South China Sea disputes, maritime security, and the People's Liberation Army. She has worked on these topics for Radio Free Asia, the Center for Advanced China Research, SOSi's Center for Intelligence Research and Analysis, the Naval War College's China Maritime Studies Institute, C4ADS, and other organizations. She received her BA from George Washington University and is proficient in Mandarin Chinese.

LONNIE HENLEY retired from federal service in 2019 after more than forty years as an intelligence officer and East Asia expert. He served twenty-two years as a U.S. Army China foreign area officer and military intelligence

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LT. GEN. CHARLES W. HOOPER, USA (RET.), is one of America's most distinguished soldier-diplomats and known as a conceptual and analytical thinker, a consummate negotiator, a trusted adviser who effectively navigates complex, sensitive issues and challenges, and a catalyst for collaboration and cooperation. He is well-known and widely respected within the Departments of State and Defense and the Intelligence Community and among national-security scholars. Lieutenant General Hooper has over forty years of experience in security policy formulation and execution, strategic intelligence, security cooperation, sensitive negotiations, foreign military sales, education, and transformational leadership. A fluent Chinese linguist with almost seven years living and working in China, he is one of the nation's foremost experts on the Chinese military and defense industries. In addition to operational assignments with the 25th Infantry and 82nd Airborne Divisions and teaching Chinese foreign policy at the Naval Postgraduate School, Lieutenant General Hooper had three high-profile diplomatic assignments, including serving as the U.S. defense attaché—the senior U.S. military officer—in both China and Egypt. Lieutenant General Hooper also served as the senior Department of Defense (DoD) strategist and planner (J5) for U.S. Africa Command, as deputy strategy and plans director for U.S. Indo-Pacific Command (Deputy J5), and as the senior China and Taiwan policy official in the Office of the Secretary of Defense. In his final military assignment (2017–20), he was director of the Defense Security Cooperation Agency, responsible for the overseas sale of all weapons, military equipment, support services, and

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KEVIN MCCAULEY has served as senior intelligence officer on the Soviet Union, Russia, China, and Taiwan during thirty-one years in the federal government, as well as an adjunct at the RAND Corporation. He has served on numerous advisory boards and working groups supporting the Intelligence Community, National Intelligence Council, and U.S. Indo-Pacific Command. McCauley has traveled extensively throughout the Asia-Pacific region for the government. His publications include *PLA System of Systems Operations: Enabling Joint Operations;* "Cultivating Joint Operations Talent" in a 2021 Army War College publication, *The People of the PLA 2.0; People's Liberation Army: Army Campaign Doctrine in Transition* for the U.S. Army Training and Doctrine Command (TRADOC); and *Russian Influence Campaigns against the West: From the Cold War to Putin.* McCauley has provided testimony to the U.S.-China Economic and Security Review Commission on the joint logistic support force and logistics support to expeditionary operations. McCauley currently writes on People's Liberation Army and Taiwan military affairs. He also contributes to the U.S. Army TRADOC's Foreign Military Studies Office's *OE Watch* journal.

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DR. CHRISTOPHER YUNG currently serves as the dean of academic affairs of the Marine Corps War College, Quantico, Virginia. In this capacity he oversees the curriculum design, development, revision, and execution of the academic calendar for the Marine Corps's top-level school. As such, he is responsible for the education of the future senior national-security leadership from all the military services (lieutenant colonels and colonels), the interagency (GS-14s and -15s), and international military students from across the globe. He has oversight of the college's civilian and military professors/instructors. He is part of the civilian academic leadership (Council of Deans) responsible for coordination of all academic issues across Marine Corps University (MCU). He is a member of the Joint Staff's Military Education Coordination Council. Previously, Yung was the Donald Bren Chair of Non-Western Strategic Thought and the Director of East Asian Studies at MCU. In that capacity he lectured and led seminars at the Marine Corps War College, the School of Advanced Warfighting, the Command and Staff College, the Expeditionary Warfare School, and all the other schools and education organizations under the MCU umbrella. He received the 2019 Elihu Rose Award for Civilian Faculty Teaching at MCU. Yung specializes in Asian security issues, particularly strategic issues related to China and the Chinese military. He researches, writes, and publishes widely on the People's Liberation Army, has testified before Congress on Chinese military capabilities, and has made American and international media appearances,

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