TARGET TAIWAN: PROSPECTS FOR A CHINESE INVASION

Lyle Goldstein
Director, Asia Program

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KEY POINTS

1. In a scenario where China attempts an amphibious invasion of Taiwan and the United States does not fight, the invasion will likely succeed assuming Beijing is willing to bear heavy casualties.
2. Taiwan's vulnerability to China is due to its proximity, since it is located well within range of Chinese missiles, airpower, rocket artillery, helicopters, and paratroopers. All this will reduce Taiwan's ability to prevent an amphibious landing.
3. Due to its air superiority and the geography of Taiwan, which is mostly urban and mountainous, China can plan for an infantry fight, at least initially, not one dominated by heavy armor. Hence, civilian vessels, including small craft of all types, can help ferry most troops ashore.
4. While an operation to seize Taiwan would be a highly risky endeavor that could result in heavy Chinese losses, Beijing would likely be motivated to bear such costs, since it views national unification as a core interest.
5. A Chinese invasion of Taiwan thus cannot be discounted and Taiwan should prepare by boosting its defense spending, emphasizing its own self-reliance, and engaging in diplomacy.

A CHINESE INVASION OF TAIWAN: POINTS AND ASSUMPTIONS

The United States and China are the two most powerful nations in the world and the greatest potential flashpoint between them is the island of Taiwan. A Chinese invasion of Taiwan, which could escalate into a war between nuclear-armed superpowers, remains a distinct possibility. To grapple with this danger, American strategists need objective analyses of the military balance and various possible scenarios involving Chinese use of force against Taiwan. There are many ways China could coerce Taiwan, including a blockade or a limited attack, but this paper considers the feasibility of an all-out invasion. It seeks to present the most severe possible test of Taiwan's defenses, which it finds wanting.

The paper assesses that the combined forces of China's ballistic and cruise missiles, supplemented by rocket artillery and drones, would substantially weaken Taiwan's air defenses. These strikes would enable China to attack with airpower—initially perhaps several thousand precision strike missions per day—which would create substantial chaos and gaps in Taiwan's defenses. Into these gaps could fly hundreds of transport helicopters and aircraft to land thousands of soldiers on Taiwan during the first day of an invasion.

If it is very casualty acceptant, China could employ airborne landings to inhibit the mobilization of Taiwan's reserve forces and seize key landing areas, such as beaches, small ports, and remote landing strips. Airborne and heliborne forces would enable PLA troops to come ashore in an amphibious attack resembling the Normandy invasion in scale. However, this amphibious attack could rely heavily on dispersion using small boats, civilian transport craft, and improvised artificial docks to ensure the ingress of forces. These small boats could be widely used, assuming the attacking forces would not initially require massive sealift for large quantities of heavy armor. This is plausible: China could rely on infantry with some heavy equipment for urban operations but mostly supported by covering fire from the air, primarily from missiles and drones as well as manned aircraft and helicopters.

This paper's focus is on the initial attack and the establishment of initial lodgments. The fight to fully establish control over the island once the troops land, where more heavy armor would be needed, is given less attention. That is because of space constraints and because a full Chinese capture of Taiwan, while it could take a long time and involve hard fighting and heavy losses on both sides, would almost certainly follow if an invasion force can establish itself on the island. This paper is not intended as a stand-alone analysis. It is the first in a series by Defense Priorities that will explore in-depth the dimensions of a hypothetical U.S. military intervention in a Taiwan scenario. This paper examines primarily Chinese and Taiwanese capabilities as context for what any U.S. intervention would face, with possible U.S. and allied roles analyzed in subsequent papers.

The analyses here turn on three foundational points about how the Chinese would fight. First, this paper argues that China can achieve some surprise. The Chinese will not catch the Taiwanese entirely unawares, but they could move fast enough with their initial air, missile, and drone attacks, followed immediately by an amphibious invasion, that Taiwan will struggle to initiate and fully mobilize its defenses, including by mining harbors and calling up reserves. Without surprise, the Chinese might still win, but the fight would be tougher.

Second, this paper argues the Chinese believe they can establish beachheads without heavy armor in the initial invasion wave. This would allow them to heavily employ civilian craft that cannot carry heavy vehicles ashore. If the Chinese thought they needed more tanks and armored personnel carriers to gain and hold a beachhead, they couldn't employ so many or so varied a grouping of ships for the landing, giving Taiwan a better chance of sinking a significant portion of the invading armada.

Third, this paper argues that China will be highly casualty-tolerant and thus able to employ varied capabilities aggressively, using small boats that are easily sunk if hit and heliborne and airborne forces vulnerable to ground fires. If China cannot stomach very heavy losses, it would either not invade or perhaps do so in a more conventional way, relying on its military's big amphibious ships and ground assaults using tanks and other heavy vehicles—a scenario not examined here. The assumption rests on the calculation that a China motivated enough to embark on such a risky endeavor as a Taiwan invasion—one that could put the Communist Party's rule at risk—would be willing to lose lots of troops. Western strategists should also assume that any Beijing leader willing to take such a momentous step is likely to have the support of the Chinese nation and armed forces, and thus be willing to take heavy losses. For China, after all, the resolution of the Taiwan issue is one of its "fundamental conditions of national rejuvenation."[1]

In addition to these three key insights, three assumptions underlie the analysis of this paper.

First, it is assumed that the United States will not fight in the war. This assumption services the analytic purpose of determining how the Taiwanese military might fare on its own, but it's also very plausible. Since Taiwan is not a treaty ally of the United States, just as Ukraine wasn't a treaty ally in early 2022, and since China is a nuclear power, just as Russia is a nuclear power, it seems likely enough that any U.S. response would be constrained similarly to the U.S. response in the Ukraine war.

A second assumption is that Beijing opts for an all-out invasion rather than a strategy of coercion, limited attack, or maritime blockade.[2] All these options, and combinations of them, are possible and could theoretically serve China's aim of national unification. However, an all-out invasion might preclude foreign intervention and allow China to dictate the terms of unification. Unquestionably, this approach would require a high level of violence, and so would constitute an inherently risky proposition. While not necessarily the most likely Chinese approach, it should be fully understood and considered by U.S. analysts, strategists, and decision-makers.

A third assumption is that Taiwan's armed forces will not suffer a total collapse at the beginning of a Chinese invasion, even though such a collapse cannot be ruled out. There are certainly valid questions about how the Taiwanese military would react to the reality of an invasion given their lack of experience and long-time assumption of reliance on U.S. support. But for the purposes of this analysis, it's assumed they will remain organized and motivated to fight. The total collapse of Taiwan's defense effort does not constitute an analytically useful premise, because without resistance there is no doubt China could conquer Taiwan.

The scenario of a Taiwan invasion is examined here in four steps. First the paper looks at the initial attacks by air, missile, and drone forces. A second section will examine the likelihood of an airborne and heliborne assault. A third stage will outline how significant numbers of Chinese forces would undertake an amphibious invasion of Taiwan. Fourth, somewhat less attention is given to a prospective final ground combat in the campaign, as it is assumed that once PLA forces come ashore and establish lodgments, the final conquest of the island is only a matter of time. Each of these sections compares Chinese and Taiwanese forces and examines their possible interactions on the battlefield.

CHINA EMPLOYS THE ELEMENT OF SURPRISE

Surprise is in keeping with patterns of China's use of force since 1949.[3] As stated in a 2023 Department of Defense report on Chinese military power, China's official strategy is one where "Active defense encompasses offensive and preemptive aspects."[4] It also comports with the PLA's understandings of modern amphibious warfare, as well as the Chinese military's doctrinal affinity for close civil-military coordination.[5] The sudden onset of the August 2022 Chinese military exercises around Taiwan offers some limited evidence that Beijing can act swiftly, without a major buildup and with little warning, as with its prior actions to build reef bases in the South China Sea in 2014 and 2015. China's advanced road, rail, and vast port infrastructure, as well as the recent, higher than normal frequency of Chinese military exercises proximate to Taiwan, suggest large numbers of military men and material can move quickly and, even if detected, can be easily mistaken for exercises.[6]

Some analysts are skeptical that China can achieve surprise in a Taiwan scenario, noting that preparations for such a large war would entail visible mobilizations that might offer a year or more of warning.[7] Others contend two to four weeks of warning is more realistic because China would "take measures to minimize warning time."[8] Yet even that estimate is likely too optimistic. China understands well that, as Sun Tzu wrote, "All warfare is deception."[9] Therefore, the PLA will go to extraordinary lengths to hide its attack preparations, knowing full well this is one of the key determinants of success for the campaign. China might use regular military exercises to limit alarm as it masses an invasion force, although at present it has not conducted exercises at anything like the needed scale.[10]

Many China watchers would concede that surprise as a strategy could be effective, but assess China's current military sealift capabilities and determine that China is not yet prepared for an invasion. This view fails to take into consideration the vast non-military resources at China's disposal, particularly the civilian maritime fleet, which can be pressed into service to transport troops.

There are many additional reasons to believe Beijing might succeed in cloaking its intentions and thus reduce any warning time prior to missile strikes to hours rather than days. As described below, major initial blows would come through missiles, drones, and airstrikes, followed by heliborne and airborne landings. All the forces involved in these operations would be mobile or even highly mobile (e.g. helicopters), allowing them to go into action over Taiwan very suddenly, even from bases deep in China's interior. True, the efforts involved in putting men and heavy equipment aboard ships would be visible to satellites (although some

might be surreptitiously pre-loaded), but a "rolling start" to the campaign would enable that mobilization to occur during the initial air, missile, and drone strikes, accompanied by airborne and heliborne landings.[11]

Finally, China is not just an enormous country with plentiful and massive warehouses, but an extremely tightly controlled society where secrets are quite well maintained. Concealing preparations for an invasion might be difficult but if any nation is equipped to do it, it's China.

CHINA'S MISSILE AND AIR CAMPAIGN CLEARS THE WAY FOR GROUND FORCES

The missile and air attack on Taiwan would aim to enable the amphibious and airborne/heliborne attacks. It would accomplish this by degrading Taiwan's command and control, as well as its defenses across the board, sequencing the attack and using each strike capability to maximum advantage.[12] Taiwan is a small island, its area only slightly larger than that of Maryland. The military targets are even more concentrated, clustered largely on the western third of the island. The firepower campaign China employs will thus be similarly concentrated.

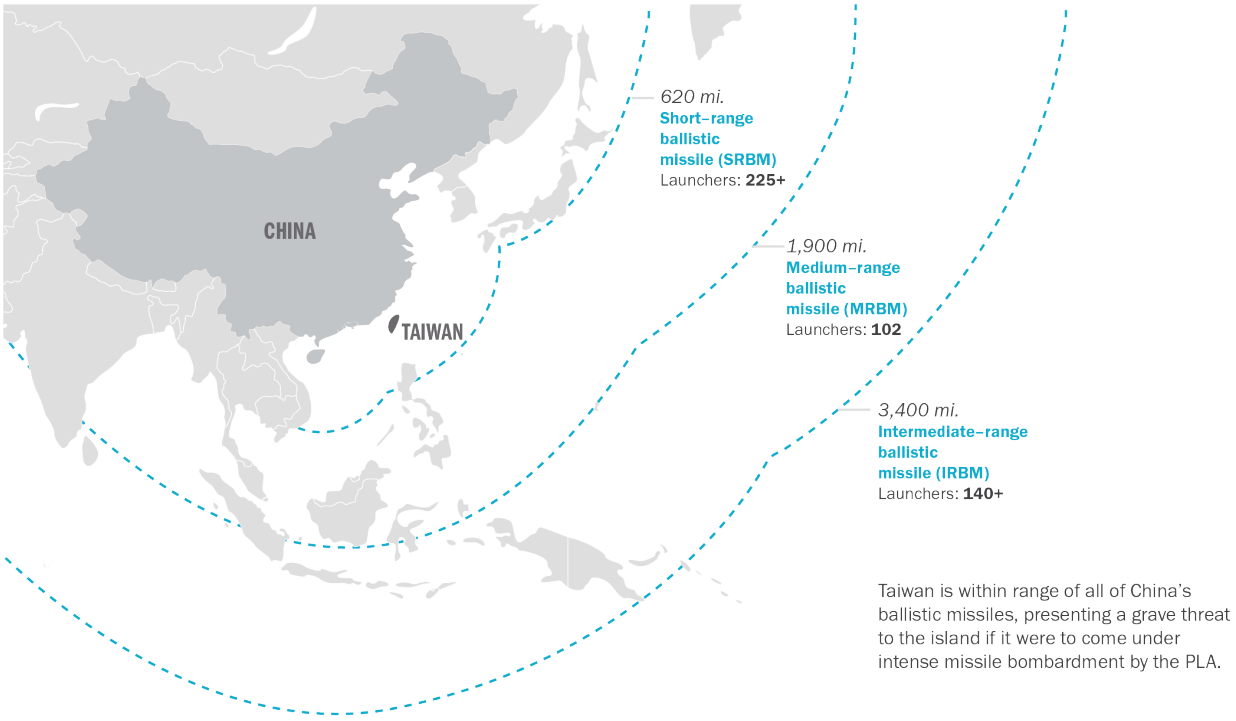
China's intensive aerial attack would begin with a "shock and awe" barrage, but it would continue over a period of months. Objectives would include: attacking Taiwan's civilian and military headquarters; destroying the island's communications infrastructure, radars, and power stations; suppressing Taiwan's early warning radars, missile and air defenses, and airbases; targeting Taiwan's naval and ground forces facilities, including fortified positions (concrete bunkers and tunnels), as well as ships at piers in Taiwan's various naval anchorages; sinking certain vessels, such as mine-layers, which would be prioritized in initial strikes; and destroying logistics infrastructure such as fuel and storage tanks, ammunition bunkers/depots, and transportation infrastructure (roads and bridges).

DEPLOYING CHINA'S EXPANDED AND UPGRADED MISSILE AND AIR CAPABILITIES

The Department of Defense's 2024 report "Military and Security Developments Involving the People's Republic of China" analyzes China's Rocket Force, which contains ballistic and cruise missiles.[13] The assessment of the author is that Beijing has made significant upgrades to both its missile and air fleets and that the total number of missiles is significantly higher than the DoD report maintains. China has also developed drones in recent years that are not documented in detail by the DoD, as well as extensive rocket artillery.

In a Taiwan scenario, even if China reserved some ordnance for other contingencies, it would significantly damage the island's defenses. It is not known exactly how many ballistic missiles, cruise missiles, drones, rocket artillery, manned aircraft, and other strike missions could be brought against the island, but it could number in the thousands per day—at least initially. And China has significant industrial capacity to continue building up its arsenal of missiles and drones, and replenish stocks during protracted conflict. The 2024 Defense Department report states that "many of the PRC's missile programs are comparable to other international top-tier producers."[14]

CHINESE BALLISTIC MISSILE RANGES



Note: Ranges are approximate.
Source: *The Military Balance 2024,* International Institute for Strategic Studies; Missile Defense Project, "Missiles of China," Center for Strategic and International Studies, April 12, 2021.

The People's Liberation Army (PLA) could bombard Taiwan's most important targets with a combination of ballistic missiles, rocket artillery, drones, and cruise missiles. Rapidly attaining air superiority, the vast striking power of the PLA Air Force (PLAAF) might then be employed against Taiwan. While Taiwan's robust air defenses would take a toll on the Chinese aerial attackers, the small areas to be attacked combined with China's heavy firepower could enable Beijing to foment chaos in Taiwan's command and control and unhinge its defenses in preparation for heliborne and parachute assaults.

China's theater ballistic missiles would likely see extensive operational use in a conflict with Taiwan. Beijing has invested heavily in its ballistic missile arsenal in recent years, which is operated by the People's Liberation Army Rocket Force (PLARF), and boasts a diverse stockpile optimized for a variety of missions, from maritime area denial to deep penetration strikes against ground targets.[15]

The ability to penetrate well within an adversary's defensive depth is considered crucial by China's military planners. China's 2020 Science of Military Strategy characterizes this as a "long-range large-scale conventional precision strike capability," noting that it offers "important support for winning informatized [i.e. regional] wars."[16] Of note here is China's fusion of modern precision warfare with a traditional saturation doctrine that dominated how military science thought about ballistic missiles in the aftermath of the Persian Gulf War.[17] In other words, a Chinese assault on Taiwan would seek to overwhelm Taiwanese air defenses while having confidence in its ability to neutralize inland targets with minimal collateral damage.

Given this doctrine, the growth of China's ballistic missile arsenal—in number and sophistication—is important. Short-range ballistic missiles (SRBM) with ranges of up to 620 miles will be the mainstay of any

Chinese ballistic missile attack on Taiwan. PLARF fields an estimated 300 SRBM launchers and an inventory of some 900 individual missiles for these launchers.[18] This presents a significant threat to Taiwan's ballistic missile defense architecture, composed principally of Tien Kung and Patriot batteries. Reliable numbers for these systems in Taiwanese service are not known but there has long been frustration in Washington about the unpreparedness of Taiwan's air defense capabilities relative to the threat the island faces.[19]

While longer-range ballistic missile systems would be able to fill a crucial area denial mission in ensuring outside aid is unable to reach Taiwan, China's SRBMs would be tasked with saturating Taiwan's limited air defenses and neutralizing key targets like airbases, command and control nodes, and logistics hubs.[20] According to a 2023 wargame by the Center for Strategic and International Studies (CSIS), these targets would be eminently vulnerable, as all are well within the range and strike capability of China's SRBMs.[21] PLARF is well postured to carry out the mission, with fully a third of all conventional ballistic missile brigades equipped with SRBMs—and most of these deployed in China's Eastern Theater Command area of responsibility, well within range of Taiwanese targets.[22]

DRONES

Another dimension of China's preparatory campaign will be the widespread use of drones for surveillance, battle damage assessment, and direct attack. One lesson Chinese strategists took from the 2020 Nagorno-Karabakh war in the South Caucasus was that "Before the operation began, Azerbaijan first used the drone group to destroy the air defense system of the other side, creating conditions for other aircraft to carry out operations."[23] China had already developed an array of drones well before 2020, and its conclusion from the South Caucasus conflict suggests it would deploy them early.[24] Taiwanese forces would shoot down many of China's drones, but those drones are cheap, plentiful, and expendable.

In a conflict with Taiwan, China would seek to employ its drones as part of a saturation effort with the objective being to destroy Taiwanese targets and air defenses in particular. Specifics regarding China's drone employment doctrine are limited but glimpses can be seen in unlikely places. China's Military Museum in Beijing, for instance, recently featured an exhibit alluding to a "Future Swarm Combat System"—suggesting a reliance on the massing of unmanned aerial capabilities for saturation operations.[25]

China's drone infrastructure is well positioned to fill the PLA's needs. China accounts for a significant portion of the global drone market, and controls 70 to 80 percent of the U.S. market.[26] It's reported to have 2,300 civilian companies involved in drone production.[27] The Chinese military fields a diverse array of systems suitable for a saturation doctrine, including a variant of the retired Shenyang J-6 fighter, designated J-6W, which has been converted to unmanned use. J-6Ws are said to be postured in Fujian, proximate to targets in Taiwan.[28] As these capabilities grow, so too will China's confidence in their employment on the battlefield.

However, China's drone doctrine is not so crude as to only constitute saturation. Relying on the public comments of drone manufacturers and Chinese strategists, Major Emilie B. Stewart, writing for the China Aerospace Studies Institute, has identified a wide variety of other missions China's planners have in store for their drone swarms, including target acquisition, reconnaissance, electronic warfare, and counterterror operations, the last potentially relevant to any postwar occupation of the island.[29] Expect China to prioritize the use of drones to stalk Taiwan's mobile forces and to scout fortified zones on the island, though how many drones China has available for this purpose is unknown.[30]

CRUISE MISSILES

Chinese cruise missiles are likely to play an essential role in any invasion of Taiwan. Targets for these missiles would include Taiwan's military bases, and especially its armories, ammunition bunkers, fuel storage, and communications network.[31] Cruise missiles are relatively slow and thus more likely than ballistic missiles to be intercepted by air defenses. This is why cruise missiles make more sense as part of the second wave of attacks—after the air defense and missile warning radars are disabled by the first wave of ballistic missile strikes.

These missiles are accurate within five to 10 meters and carry powerful warheads. China likely has massive stores of them, and they could be fired from land, air, and sea assets (including submarines). More than 170 Chinese H-6 heavy bombers could unleash payloads of cruise missiles in the first hours of an attack against Taiwan's radars, airbases, and naval assets.[32] But that would only be part of the cruise missile attack, since most Chinese naval and air assets can wield land-attack cruise missiles, and these weapon stores could number in the tens of thousands.[33]

MANNED AIRCRAFT ATTACK KEY TARGETS

The attacks outlined above would pave the way for more traditional strikes by China's large fleet of manned aircraft. The PLAAF began regular "around the island patrols" in December 2017 with an aerial fleet that included bombers, fighters, refueling, and battle management/early warning aircraft.[34] DoD reports China's inventory of aircraft includes 1,900 fighters (3,100 including fighter trainers), 500 bombers and attack aircraft, 500 transport aircraft, and 250 special mission aircraft. China may not employ its entire air force, but it is reasonable to estimate it would bring more than 2,000 aircraft into the fight over Taiwan, including the heralded J-16 that is optimized for both ground attack and electronic warfare (suggesting it will play a premier role in a Taiwan scenario).[35] The H-6 heavy bombers mentioned above could fly in from airbases deep within China to enhance surprise and deliver specialized payloads, including a "large size thermobaric weapon" designed to blast through eight meters of reinforced structure.[36]

Beijing's force of fighters, attack aircraft, and bombers available for a Taiwan scenario could operate from about 40 airbases within 500 miles (800 kilometers) of Taiwan, according to a study published in 2015.[37] However, the PLA has been busy building new runways, so that in 2025 it was reported that China now has 134 airbases within 1,000 nautical miles of Taiwan and roughly 650 hardened aircraft shelters on these bases.[38] That would enable China to deploy aircraft over the island, attacking Taiwan's communications and transport infrastructure, while also targeting its military bases, including especially fuel and munitions storage facilities. This large force of combat aircraft would also take as a primary mission shooting down any Taiwanese aircraft that got into the air despite the missile, air, and drone attacks against their airbases. Given Taiwan's robust air defenses, losses are sure to be heavy for China's manned aircraft.

Other priority targets for China's bombers and attack aircraft would be the Taiwanese navy, both ships at the pier as well as those that managed to make it out to sea. In addition, Chinese aircraft would focus on the island's mobile anti-ship missile platforms. Another high-priority target would be certain key infrastructure nodes (e.g. bridges) in an attempt to block the concentration of Taiwanese forces against early Chinese lodgments. In perhaps a portent of what's to come, a leading Chinese military newspaper emphasized in early 2024 the importance of Allied air operations in support of the Normandy invasion during World War II to prevent the "German army's powerful strategic and operational reserves… [from] concentrating to organize large-scale anti-landing operations."[39]

It is worth emphasizing that China has never before exercised air operations on this scale, making it hard to assess their performance in ideal circumstances, let alone under fire.

Taiwan's airbases could be suppressed in the initial missile, rocket artillery, and drone attack phase to the point that they are not able to launch significant numbers of fighter-interceptors to contest Chinese air superiority. The same is true of Taiwan's battle management aircraft.

CHINA VS. TAIWAN AIR FORCES

	PRC	PRC	Taiwan
	Total	Eastern and Southern Theater	Total
Fighters	1,900 (3,100*)	800 (950*)	350 (400*)
Bombers/Attack	500	300	0
Transport	500	40	50
Special Mission Aircraft	250	150	20

Note: Only equipment, aircraft, and ships considered operational are included, although they may not yet be assigned to a specific theater. The total column refers to all equipment, aircraft, and ships, assigned and unassigned. The "Taiwan Strait Area" includes the PLA's Eastern and Southern Theaters. This chart displays estimated totals of military aircraft from PLAAF and PLAN Aviation. However, the PLAAF may supplement its military transports with civilian aircraft in a combat scenario.

* The totals in parentheses include fighter trainers.

Source: "Military and Security Developments Involving the People's Republic of China," Washington, D.C.: U.S. Department of Defense, 2024, 165.

In general, mobility confers major advantages on a defending army and vastly complicates the tasks of an attacking air force, as the U.S. learned during the famous "Scud Hunt" during the Persian Gulf War. But mobile systems are not a cure-all for air defense, especially in the age of drone surveillance and precision attacks. If one excludes both highly urbanized parts of Taiwan and the portions of the island with rugged mountain terrain, the physical areas favorable to hosting air defenses are quite small, allowing fewer cover opportunities for air defense systems. Taiwan could substantially improve its air defenses by layering road mobile and manportable systems. This would increase Chinese losses but would be unlikely to prevent their air power from achieving its objectives in an invasion.

A point of comparison is the Russian invasion of Ukraine, where limited Russian firepower has been widely dispersed over Ukraine's vast territory.[40] While Taiwan enjoys the geographic advantage of being an island, which would make an invasion harder, it is about 6 percent the size of Ukraine by area—and even less if the mountainous eastern part of the island is excluded since it is quite unsuitable for most military operations. Meanwhile, China's military budget was nearly three times larger than Russia's in 2023 (and prior to Russia's increased spending due to their attack on Ukraine, China's military budget was more than four times larger).[41] All this suggests a significantly greater weight of firepower will be brought to bear on a much smaller space.

Taiwan has extensive air defenses, including an estimated 228 or more surface-to-air missile (SAM) systems spread between its army and air force.[42] Taiwan has at least 20 fixed early warning sites and an additional 10 mobile early warning radars.[43] The island's defense will also rely on nine or more *Patriot* batteries with roughly 300 interceptors at the ready.[44] Current doctrine for the employment of *Patriot* systems recommends that two interceptors are fired at each target to increase the chance of a successful intercept.[45] Taiwan's indigenous *Skybow* air/missile defense systems could also be quite effective, but some of them may face the limitation of being deployed into fixed sites, making them easier to target.[46]

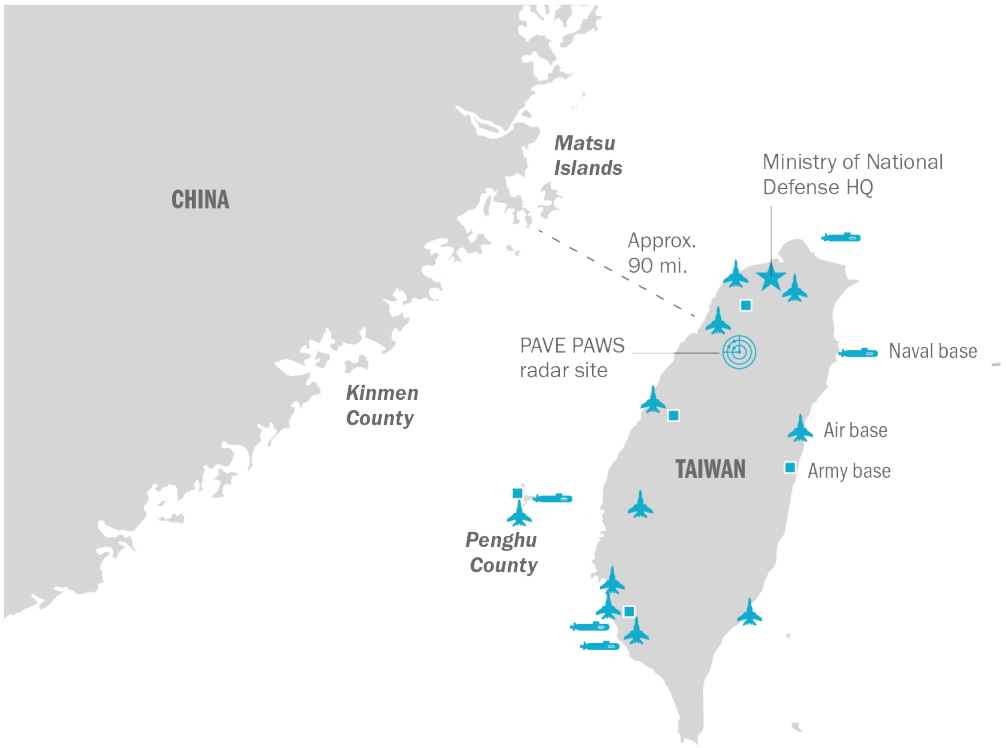
In general, mobility confers major advantages on a defending army, insofar as it complicates targeting for an attacking air force. Taiwan reportedly has 72 long-range anti-aircraft launchers, and 80 percent of them are mobile. Taiwan also possesses short-range systems, such as the RIM-7M Sparrow and likely many anti-aircraft guns.[47] Yet there may still be matters of timing: a 2019 order by Taiwan for 250 *Stinger* systems, a shoulder-fired man-portable missile system effective against adversary aircraft, which will give them 500 in total, has only been partially completed.[48] An additional order of nearly 2,000 more Stingers, possibly with some production done in Taiwan, is supposed to be completed by 2031, but experience suggests that may be optimistic. In addition, the Taiwan Air Force has about 400 combat capable aircraft (if you include fighter trainers), including a force of 140 F-16s.[49] Another critical part of Taiwan's air defense would be its five E-2 *Hawkeye* battle management and early warning aircraft.[50] Taiwan's fleet of aircraft could theoretically fly from 57 assorted airbases and civilian airports, but could also operate from highways during wartime if necessary.[51]

TAIWAN HAS LITTLE TIME TO RESPOND

A Chinese air and missile campaign would necessarily be launched in a way that provides Taiwan with little to no warning. Unlike moving large military platforms, missiles could be fueled, loaded, and fired within a few hours and masked as exercises. In that sense, China's version of shock and awe might look quite different than either the U.S. air campaign in the Persian Gulf War or Russia's equivalent in Ukraine in early 2022. Other elements of the Chinese invasion would not attain complete surprise (e.g. the gathering of ships for the amphibious invasion that could occur during the few days after the bombardment begins). PLA missile ranges and high readiness rates would permit Beijing to execute a true bolt from the blue, since their missile systems need not move to strike Taiwan.[52] Since the island is a mere 90 miles off the Chinese coast, airstrikes could likewise come with little to no warning—a matter of hours or even minutes. In addition, aircraft and missiles based deep within China's interior could be employed, allowing Beijing to mask an attack much more effectively.[53]

Many of the early warning radar sites on Taiwan are fixed and well known—for example, the giant PAVE PAWS radar facility at Leshan Mountain.[54] These radars, many of which can look deeply into Chinese airspace, would be critical to give Taiwan warning of incoming missiles, aircraft, and drones, as well as plotting intercepts for missile defense systems.

MAJOR TAIWANESE BASES AND FACILITIES AS LIKELY TARGETS



Sources: AFP News Agency, "Sizing up Taiwan," X, August 1, 2022, https://twitter.com/AFP/status/1554294550960963584; Allen Thomson, "A Dossier on the Pave Paws Radar Installation on Leshan, Taiwan," Military Analysis Network, Federation of American Scientists, March 8, 2013.

Taiwan's military bases, Ministry of National Defense headquarters, and PAVE PAWS radar site are likely to come under direct attack by Chinese missile strikes in an attempt to prevent an effective military response.

Undoubtedly, such radars would be among the very first targets, potentially unhinging the entire system. The island's defense would also rely heavily on just nine *Patriot* batteries, but that likely wouldn't be enough.[55] Even if every Taiwan *Patriot* missile were to make a successful intercept, that would still leave more than 80 percent of Chinese SRBMs that would not be intercepted.[56] The *Patriot* radars do not have 360-degree coverage and have a relatively long reload time of 30 to 60 minutes.[57]

The *Patriots* will constitute high priority targets for the PLA.[58] Chinese missiles likely have countermeasures against intercept by Taiwan's *Patriot* batteries, including possibly decoys. The constricted flight time of China's ballistic missiles, as little as 10 seconds, and the fact that China's most modern SRBMs can carry multiple warheads, will make intercept exceedingly challenging for Taiwan's missile defenses.[59]

Yet Taiwan's missile defenses and radars may face an even greater threat from cruise missiles and drones. Cruise missiles may have slightly lower penetration capability, but their higher precision and much lower cost suggests these weapons could overwhelm Taiwan's defenses.[60] Likewise, drones and drone swarms could prove effective at targeting Taiwan's early warning radars.[61]

Chinese rockets could target Taiwan's early warning radars and air defenses.[62] The employment of rocket artillery demands particular attention from strategists studying the Taiwan balance, not only due to the fact that this is a novel cross-strait bombardment capability, but also because these systems are relatively

cheap, rapidly replenished, and quite easy to conceal.[63] There are reported to be 60 or more such rocket artillery systems that can range all of Taiwan.[64] This opens the prospect of massive and widespread indirect fire, allowing the more expensive ballistic missiles to be used against only the most high-value targets in Taiwan. Moreover, only minutes after the first volleys, rocket artillery launchers could be reloaded and used to restrike targets (e.g., Taiwanese airfields that have not been totally put out of action by the initial salvoes).[65] The PLA has been practicing long-range strikes with rocket artillery in support of a cross-strait operation since 2016 and such operations are likely to be extremely effective when supported by long-loitering drones.[66]

Another primary target for Chinese missile strikes would be Taiwan's airbases. Such missiles might be sufficient to cause "the airfields to lose the ability to support take-offs or landings," as one Chinese analyst put it.[67] Submunitions could shutter these bases for at least a day (and potentially much longer), opening the window for an all-out invasion. In mid-2020, the PLA revealed a new missile specially designed to deliver submunitions or explosive bomblets.[68] Chinese war planners are aware of U.S. efforts to upgrade Taiwan's ability to rapidly repair airfields, so the PLA is likely to plan on restriking these airbases on a regular basis to prevent them from becoming operational, increasing the demand for Chinese missiles.[69] For this reason, it might be that few of Taiwan's fighters make it off the ground, and those that do would face long odds. The 2023 CSIS Taiwan wargame report concludes: "The Taiwanese air force squadrons that survived China's joint fires strike were eventually destroyed in air-to-air combat."[70]

If an average of 10 Chinese short-range ballistic missiles (SRBM) were targeted at each of Taiwan's 57 airfields (more for airbases and less for civilian and secondary airstrips), that would require about 63 percent (570) of the estimated Chinese SRBM force (900) to disable (at least temporarily) Taiwan's air force and leave 330 SRBMs for other targets.[71] Of course, if China has to hit the airfields repeatedly, they could deplete the bulk of their known SRBM stock.[72] Nevertheless, a mix of munitions, including especially kamikaze drones, would likely enable Beijing to put these airfields out of action for an extended period of time.

China would attempt, and quite possibility succeed at, sinking Taiwan's navy. Missiles, drones, and aircraft could quite easily target the Taiwanese navy at its relatively few naval bases in Kaoshiung, Su'ao, Keelung, and in the Penghu Islands. Some vessels and Taiwan's four diesel-electric attack submarines might get out of port to join forces already at sea, but China's robust satellite surveillance data could provide real-time targeting of these ships and would likely destroy them with missiles at their piers.[73] Among priority naval targets would no doubt be Taiwan's new but small fleet of rapid mine-laying craft.[74] Chinese military press reporting in early 2024 suggests these particular vessels and their cargoes are being tracked with great interest by mainland strategists.[75]

A related important target would be depots storing sea mines. The main Taiwanese naval base at Tsoying in southern Taiwan presents many obvious targets according to commercially available satellite photographs, but Taiwan's fleet could be most easily and efficiently defeated by simply blocking the narrow harbor entrance (just 1,000 feet) with either sea mines or a scuttled vessel. Indeed, Taiwan's few naval bases are so vulnerable to attack that the island's leaders are once again considering extreme solutions, such as basing submarines in artificially constructed coastal caves like the Swedish do (though this is cost-prohibitive and unlikely to be relevant in the near and medium terms).[76]

HELICOPTERS AND PARATROOPERS ENABLE THE AMPHIBIOUS LANDING

A unique characteristic of a Chinese invasion would likely be a significant effort to land soldiers via helicopters and parachute landings preceding the amphibious landings. This would not only help deliver more soldiers to the island, but make it more difficult for Taiwan to repel amphibious ships since these forces operating in the Taiwan rear areas would help interdict Taipei's rapid response forces.

Following developments in worldwide amphibious doctrine and the U.S. Marine Corps doctrine of vertical insertion, China has moved to pursue three-dimensional amphibious warfare.[77] This means flying over the beach rather than planning beach landings, which might be described as two-dimensional. Airborne assaults proved critical to the success of the Normandy invasion, and likewise vertical insertion could form another enabler for a Chinese invasion of Taiwan. While China's airborne and heliborne attackers are almost certain to suffer very heavy losses, they might still succeed. The main objectives would be as follows:

1. To sever key transport nodes (i.e., bridges) so that beach landing areas cannot be quickly reinforced by Taiwan reserve forces;
2. To secure small, isolated fishing ports and remote airfields that can be used for the ingress of additional Chinese forces;
3. To sow confusion and panic in the Taiwan rear so the main thrust of the Chinese attack remains initially disguised;
4. To capture key infrastructure, pin down headquarters units, and secure high ground to serve as forward observers for guiding strikes.

Even if China cannot achieve all these objectives, inserting thousands of troops in Taiwan's rear could create havoc, tie up Taiwan's forces, and handicap their ability to engage Chinese landing forces in the first few days of a conflict.

TAIWAN'S AIR DEFENSES MIGHT NOT BE ENOUGH

The above section reviewed Taiwan's air defenses in some detail. These defenses would also be crucial in trying to stop a PLA heliborne or parachute assault on the island. While the island's air force and longer-range air defenses could play a role, they would be damaged, perhaps fatally, in China's initial missile barrage. Thus, shorter-range and man-portable systems could be optimal for defending against the Chinese airborne assault. The Russo-Ukrainian War suggests that short-range air defenses can inhibit and even successfully counter adversary airborne assaults.[78]

Yet it is not clear that the *Chaparral* system, based on 1960s technology, that's presently at the heart of Taiwan's short-range air defenses will be up to the task. It may have significant technical deficiencies, including its short-range and narrow attack angle.[79] *Stinger* man-portable air-defense systems (MANPADS) could be ideal for coping with the risk of Chinese heliborne and parachute attack, but there are concerns that Taipei's order of 250 *Stingers* in 2019 could suffer delays due to supplies being diverted to support

Ukraine.[80] A significant shipment of *Stinger* missiles did arrive in Taiwan in late 2023.[81] More traditional anti-aircraft guns, concentrated in areas most vulnerable to airborne assault, might be Taiwan's best hope for the short term, but existing systems like the M42 anti-aircraft light tank date from the 1950s.

Taiwan's ground forces could also be important for countering Chinese airborne and heliborne attacks. In that respect, it will be useful for Taiwan to create echelon defenses proximate to rrts and airstrips, figuring that these will be high-priority targets for airborne attacks. At close range, even small arms can be effective against helicopters or parachuting troops. As a model, the island's defenders could study Ukraine's stand against Russian invaders at the Hostomel airport outside Kyiv. That battle seems to have been critical to slowing and even unhinging the Russian assault.[82] Taiwan's special forces could prove most important for blunting the PLA's airborne insertions.[83] Armor and attack helicopters would also be crucial given their high mobility and firepower capabilities. Reserve forces could be useful but are not likely to muster in time, assuming a largely unforeseen attack. These capabilities are discussed in more detail in the next section.

HELICOPTERS AND AIRCRAFT HELP SOLVE CHINA'S SEALIFT CHALLENGES

A Chinese invasion could include a significant effort to land soldiers via helicopters before attempting an amphibious landing. This would not only get more soldiers onto the island to fight, but also make it more difficult for Taiwan to repel invading ships since these forces would help interdict Taipei's rapid response forces. As one textbook on amphibious warfare explains, the current concept for Western navies is to "conduct ship-to-objective maneuvers… instead of old-style ship-to-shore movement."[84] In other words, navies are working toward sending forces over beaches with aircraft rather than across via traditional landing craft.

However, for China in a Taiwan scenario, the vertical insertion concept would be relatively simple, since Taiwan is well within range of the PLA's growing armada of helicopters flying from bases on China's southeastern coast. It is certainly the case, given the lethality of shoulder-fired air-defense systems, as demonstrated in Ukraine, that the PLA high command may consider such operations too risky, since hundreds of airframes and tens of thousands of soldiers could be lost in such a campaign. On the other hand, PLA sources appear to recognize and accept that high casualties among airborne forces may be necessary in high-intensity warfare.[85]

One possible way to limit Chinese casualties would be to disperse their landing forces across a greater number of landing zones, farther away from their ultimate targets. This would make it harder for Taiwanese defenders to react due to the plethora of locations they would need to send forces to, and perhaps necessitate that they pull forces from key locations. On the other hand, if Chinese forces were dispersed—even if they planned to recombine before attacking their main targets—it would increase the difficulties they would face on the ground, such as longer travel times, the limitations of operating in smaller groups, the need to reconnect with other forces to achieve mass, and more challenging resupply. China will thus face tradeoffs between survivability and concentrated landings, even as they have the advantage of a much larger military from which they can continue to replenish their forces. However, there is still the additional question of how a high casualty rate—assumed to be acceptable to a Chinese leadership determined to reconquer Taiwan—will impact morale and the will to fight among the Chinese military and broader public.

HELICOPTER FLEET EXPANSION AND ADVANCEMENTS

The PLA helicopter inventory includes both attack and scout helicopters, as well as transport and increasingly heavy-lift helicopters. Attack helicopters have been a particular focus with two new variants: the Z-10 as well as the Z-19, of which China has 208 and more than 120 respectively.[86] These helicopters, which seem to derive from the U.S. *Apache* and *Cobra* designs, have been operating more commonly in the maritime domain, including landing and taking off from ships. This is notable since ground forces helicopters are not often used over water, and the PLA has even undertaken exercises that involved deploying them off of merchant vessels.[87] There is no direct precedent for employing attack helicopters in the mission of amphibious fire support on this scale, but this capability could be a force multiplier in providing flexible but highly concentrated fire support to forces coming ashore.[88]

Over the last few years, the PLA surpassed 1,200 military helicopters in its force, and it is now working to train a sufficient number of helicopter pilots.[89] This number excludes helicopters that are definitely assigned to non-transport tasks like anti-submarine warfare, but does include multi-use helicopters that could supplement the transport fleet. New transport helicopters include both the Z-20—similar to the American S-70, the helicopter from which the U.S. military's UH-60 *Black Hawk* is derived, which China imported from the United States in the 1980s—and the Z-8L wide-body upgraded assault transport helicopter, which is capable of carrying dozens of soldiers, light vehicles, and artillery.[90] These new forces would fly together with Russian-made Mi-171 heavy transport helicopters.[91] China also has a growing inventory of civilian helicopters that could be used in a Taiwan scenario.[92] Expedited rope delivery of combat troops has become a standard training practice in the PLA, including not just for ground forces, but also the navy, air force, and even the People's Armed Police, a force of at least 500,000 that has its own mobile forces.[93]

Working in tandem with China's airborne forces, and relying on what the Department of Defense estimates is China's 500 fixed-wing transports, including the new force of Y-20 large transports, vertical insertion could deliver the first PLA soldiers onto the ground in Taiwan.[94] It is noteworthy, moreover, that the 2023 Department of Defense report on Chinese military power observes that "the PLAAF may supplement its military transports with civilian aircraft in a combat scenario."[95] China has the second largest civil transport fleet in the world.[96] Casualties among airborne troops will be heavy, testing the resolve of airborne forces and pilots necessarily lacking in combat experience.[97] It may be that airborne operations have become rare in combat due to the increasing lethality of modern weaponry and the fact that paratroopers are inherently vulnerable as they descend to the ground. Still, there is little evidence to suggest the PLA believes airborne operations are obsolete. Rather, the intensifying training regime for airborne operations throughout the Chinese military suggests the opposite. Beijing's heliborne and airborne forces would be resupplied not only by pallets coming by parachute, but also perhaps by heavy drones.[98]

Vertical insertion could place thousands of PLA soldiers into dozens of lodgments around the island on day one of an attack, including in the mountainous interior, in order to secure key nodes like airports and also create mayhem by shutting down roads and executing direct attacks on Taiwan's headquarters.[99] Evidence suggests Beijing is committed to building up special forces troops.[100] China likely has over 20,000 troops that are designated as PLA Army special forces, and this figure does not include units in the air and naval forces, or in the PAP.[101] In addition to training for parachute and heliborne assault, they are being trained for mountain and urban warfare, as well as stealth insertion, hard target reduction, and sniper tactics. They will constitute the leading edge of any assault on Taiwan that might well come through vertical insertion.

China has nearly 900 helicopters that could carry an average of 15 soldiers each to the island in an attack. Assuming 750 of those helicopters are used, the author estimates 9,000 troops or so could plausibly

transfer to the island with each craft making one trip. If three roundtrips per day were made, China could airlift more than 20,000 soldiers to Taiwan on the first day.[102] Similar calculations concerning parachute insertion with multiple sorties and high attrition could more than double the soldiers airlifted to Taiwan.[103] The PLA could plausibly bring tens of thousands of soldiers to the ground on Taiwan in the first 24 hours without having made any beach landings.

TAIWAN'S DEFENSIVE EFFORTS WILL NOT STOP CHINA'S INVASION

The scenario outlined above would amount to one of the largest airborne operations ever undertaken, but that is itself not a reason to assume it will not occur, especially given Chinese logistics capabilities, extensive preparation, and likely commitment. Given that China would be launching what it sees as a war of national reunification, it is reasonable to expect Chinese casualty tolerance in Taiwan would be great, even if it's difficult to say how Chinese units will hold up under heavy fire. It should be underlined that a high rate of attrition would be expected, with more than 500 aircraft assumed to be shot down in the above models. It is not clear whether the PLA has practiced large-scale helicopter operations involving hundreds of airframes, but Chinese military news reporting has hinted that such brigade-sized maneuvers have been undertaken.[104]

Helicopter operations have inherent vulnerabilities, as demonstrated in Vietnam and Afghanistan, as well as the "Black Hawk Down" episode in Somalia. Moreover, U.S. experience in wielding attack helicopters on the modern battlefield, for example at Karbala during the Iraq War, shows they won't necessarily be highly successful against defending ground forces.[105] Russia's recent experience in Ukraine provides another cautionary tale. A rather detailed study of the Russian heliborne attack against Hostomel Airfield near Kyiv in the opening phase of that conflict presents a mixed picture.[106] Although Russia did succeed in landing the planned force and did secure the airport perimeter, they were not able to control the surrounding area, and so Ukrainian forces successfully stymied the larger attempt to ingress forces through the airport. Of the 34 helicopters involved in the Russian operation, six or seven were reportedly shot down.[107]

It is likely that dispersed Taiwanese ground forces, using a variety of MANPADS and small-caliber weapons, will shoot down a high percentage of Chinese helicopters, killing or wounding even tens of thousands of PLA heliborne assault troops. If Taiwan can muster and disperse their reserves in time, which is unlikely, these casualty numbers will rise even higher. Such carnage will sorely test Chinese resolve, but might still fail to stop a committed Chinese air assault.

CHINESE AIRCRAFT PROVIDE SUPPRESSING FIRE AND DISPERSED ATTACKS

While Chinese strategists have not elaborated on how they would endeavor to defeat Taiwan's MANPADS, the PLA would likely employ two main strategies: suppressing fire and avoidance (meaning directing helicopter assaults against areas that are likely to be sparsely defended). Thus, remote rural and mountainous areas (e.g., Taiwan's numerous national parks) or thickly settled urban areas could make ideal landing zones, especially given that Taiwan bans the private ownership of firearms and there's no known plan to distribute arms even in densely populated cities. Taiwan is famously fond of golf, and its many fairways could make ideal landing zones for Chinese heliborne troops and paratroops.[108] It seems that many

or even most PLA helicopters could range the entire island, especially if using drop tanks—a common practice in the PLA.[109]

Moreover, Taiwan's ban on the private ownership of firearms suggests that dispersed airborne attacks against isolated villages could work for the PLA, allowing for successful insertions even if they're somewhat distant from major objectives.[110] In previous Chinese military campaigns, such as the Sino-Indian War of 1962, the PLA had great success with wide-ranging flanking maneuvers across very difficult terrain. This points to landing zones that are quite distant from actual military objectives, increasing the chances of safe heliborne or airborne ingress. In addition, reporting on a late 2023 shipment of *Stingers* from the United States noted the arms were going to "capital defense units," meaning in the Taipei area, suggesting much of the island is less well defended. According to a leading Taiwan defense analyst, Taiwan's MANPADS are not highly dispersed and regular troops rarely drill with them.[111]

Airborne soldiers often lack heavy weaponry, so Taiwan might employ armor to attack Chinese lodgments, but China has been working on this problem and has revealed new weaponry, such as light mobile missile systems for airborne troops.[112] The fact that every Chinese armed service, including the People's Armed Police, is actively practicing for heliborne/airborne assault points to a potentially massive scale of operations.[113]

The PLA is aiming to decrease their helicopters' vulnerabilities by lowering their acoustic and infrared signatures and practicing with various countermeasures.[114] Chinese strategists are watching carefully how Russian forces have adopted measures to make their helicopters more effective in the war in Ukraine, including with the extensive and apparently somewhat successful use of electronic warfare to jam adversary missile systems.[115] Nevertheless, a heliborne assault would require an expectation of heavy losses, and it is possible China might decide on a less bloody option. For example, there is a clear pattern of increased PLA exercises with tactical drones.[116] Moreover, Chinese defense analysts cite close integration between drones and the Chinese helicopter force as a developing aspect of PLA close air support doctrine for high-intensity warfare.[117] It is likely that swarms of drones would precede airborne attacks and be used to distract and exhaust Taiwan's air defenses. Hamas demonstrated in October 2023 how targeted and comparatively simple airborne attacks can have outsize strategic effects and defeat even the most sophisticated defenses.

LARGE-SCALE AMPHIBIOUS LANDINGS: CHINESE CIVILIAN SHIPS AUGMENT THE ARMADA

If China is successful in its aerial and missile bombardment of Taiwan, coupled with the airborne and heliborne insertion of troops as outlined above, it will make an amphibious assault over the beach less challenging. The PLA is practicing intensively for an amphibious assault with regular reports of such exercises in the Chinese military press.[118] According to the 2022 Department of Defense report on Chinese military power, this involves "extensive joint amphibious training."[119] Along with ground forces, the PLA Marine Corps has also been expanded from two to 11 brigades and could reach 55,000 marines in the near future.[120] These forces, along with more than 50,000 special forces soldiers, would form the shock troops of the invasion, though the total Chinese ground forces would number roughly a million with an additional 510,000 in the reserves.[121]

To be sure, amphibious forces can be vulnerable, crossing wide open spaces in easily detected ships and facing prepared defenses. Moreover, China's soldiers and marines will require ammunition, gasoline, food, water, and engineering and medical support. Yet for all the difficulties associated with amphibious warfare, many assaults from the sea over the last century proved successful, especially when the attacker has air superiority.[122]

Taiwan's island geography does offer some natural obstacles to attackers, including rocky narrow beaches, extensive mudflats that limit where boats can land, frequently rough seas, and urban terrain that aids defenders. Yet in some respects, this geography is still rather amenable to amphibious invasion due to the island's small, linear shape comprising mostly urban terrain, along with a dense spine of mountains that faces outward toward the wider Pacific Ocean. Cities tend to favor defenders in warfare, but the Taiwanese might not want to turn their cities into battle zones, especially given the likelihood that doing so will slow but not stop the Chinese advance.[123] As discussed in more detail below, the PLA is training intensively for urban warfare, including by studying recent examples from the Russo-Ukrainian War. And there are some indications that China may see cities as playing to their strength in numbers: instead of tanks, China will rely on mass infantry able to call in targeted airstrikes to prevail in the urban environment.

The determinate geographical factor in this scenario is Taiwan's proximity to China, which will allow Beijing to deploy a massive armada of ships and men against the island from a variety of vectors with little warning. Proximity, coupled with China's assumed will to accept enormous losses to achieve unification, will make China's success quite likely. Objectives for the initial beach landings will be to seize a number of beachheads that will enable China to bring in enough men and materiel to overwhelm Taiwan's defenders within one to two months. Key means to this end include:

1. The assembly of an armada of military and mostly civilian ships to ferry in Chinese forces for an assault against Taiwan. China could build a large number of amphibious attack vessels if it wished—it is the world's largest ship builder.[124] It is plausible that China's paucity of specialized amphibious attack ships reflects a lack of serious preparation in previous decades that might be starting to change. Also possible, however, is that China maintains its reliance on civilian ships as part of a ruse to lull Taiwan into thinking Beijing does not intend to make an amphibious attack.[125]
2. The landings must be preceded by adequate intelligence, supporting fires, and the clearance of obstacles, including especially mines. The aerial landing of forces in the enemy's rear to cut off landing areas from Taiwan reinforcements will also be a key and perhaps vital enabler.
3. China must secure small ports and airfields that will enable the landing of second- and third-echelon forces to secure an advantage of overwhelming numbers.

OBSTACLES TO A SUCCESSFUL AMPHIBIOUS LANDING

Taiwan will use several layers of defenses to prevent landings and attempt to immediately collapse any lodgment the PLA tries to create for follow-on forces—driving Chinese forces back into the sea from any beachheads, that is. According to the 2024 DoD report, Taiwan has 104,000 active-duty personnel in its ground forces, but it also has large reserve forces that total about 1.7 million.[126] Yet the DoD report from two years earlier also observes that "Taiwan faces considerable equipment and readiness challenges," noting that the island has not succeeded in filling all of its active-duty billets while not all reserves participate in regular refresher training (this language was removed from the 2023 report).[127] Beach defenses might entail

mines to destroy landing ships, tanks, and invading personnel, as well as strong points featuring interconnected bunkers with medium-caliber weapons and missile systems of various types.

Taiwan commissioned new mine-laying ships into its fleet in early 2022.[128] China would likely target minelayers in port at the start of its air campaign. Some would likely survive to lay mines, so China would still have to contend with a considerable number of sea mines and land mines on beaches.[129] Taiwan might even sink ships to block certain harbors. These defenses will slow landings and subject landing forces to attacks. But then China has prioritized engineering units with this challenge in mind.[130] The Chinese can overcome these hurdles thanks to their advantages in airpower and mass as well as their ability to use Taiwan's myriad smaller harbors with lighter vessels.

Ideally, beach defenses have numerous layers with larger artillery systems in the rear. Taiwan finished receiving an order of 400 Javelin missiles in 2024.[131] The island additionally is reported to possess 223 indigenous MLRS (rocket artillery) systems.[132] Its tank forces are in the process of being upgraded, with Taiwan receiving its first batch of M-1 *Abrams* in 2024. The island currently has an estimated 850 tanks, according to IISS, or 800 according to the DoD.[133] Assuming Taiwan's road network remains usable, tanks could be crucial to Taiwan's defense, since they can move quickly to reinforce areas under attack. Attack helicopters could be useful for the same reason and Taiwan possesses nearly 100 *Apache* and *Cobra* helicopters.[134] Additionally, the island boasts between 1,100 to 2,100 pieces of artillery, some of which are mobile.[135] Taiwan unveiled in 2019 an indigenous, loitering munition or "suicide drone."[136] It may prove especially important that Taiwan builds many of its own munitions, since, unlike Ukraine, Taiwan will not be able to receive supplies from abroad once the war begins, at least for a prolonged initial phase.[137]

The island has received about 300 truck-mounted *Harpoon* anti-ship cruise missiles from the United States and more than 1,000 additional weapons have been ordered.[138] Taiwan also has an indigenous anti-ship cruise missile called the *Hsiung Feng III*, which reportedly has truck-mounted and sea variants with an air-launched variant currently under development.[139] As of 2022, a supposed 70 launchers had been deployed.[140] These weapons could cause problems for a Chinese landing force, so the PLA will try to counter them with precision strikes enabled by drone surveillance.[141] Other Chinese counters will likely consist of distribution into large numbers of smaller vessels, as well as air and missile defense provided by naval escorts. Additional Taiwanese long-range missiles can be fired at substantial distances against Chinese military bases on the mainland, if they survive the initial onslaught. Finally, Taiwan's navy is reasonably large with 22 frigates, four destroyers, an amphibious assault ship, and 43 coastal patrol craft, though just four submarines.[142]

MILITARY AND COAST GUARD VESSELS JOIN CIVILIAN FERRIES AND FISHING BOATS TO MOVE CHINESE LIGHT INFANTRY

The Chinese Navy has made progress over the last decade in augmenting its high-end amphibious capabilities. Amphibious attack ships, particularly the most recent models, are on par with their Western equivalents and allow for the deployment of air-cushioned craft, as well as 60 amphibious armored vehicles (AAV).[143] The newer Type 075 is a true "helicopter carrier" that can carry up to 30 helicopters. With such unique capabilities, these ships are likely to play a role in the opening phases of an amphibious attack that would put a premium on the speed that air-cushioned craft can provide. China has upgraded its standard amphibious assault vehicle (AAV) from the Type 63A to the Type 05, which appeared in large numbers in

2021.[144] These new vessels provide better armor, survivability, and speed, according to the 2022 DoD report on Chinese military power.[145] Chinese amphibious warfare exercises increased in number in 2021. Exercises have been held at night and in bad weather, and have been "multi-domain" in nature.[146]

Specialized amphibious attack vessels capable of launching AAVs would support the heliborne assault discussed in detail in the previous section. The PLA Navy has other amphibious attack vessels as well.[147] Combined, these vessels could land approximately 20,000 troops on Taiwan in a first wave and more in subsequent waves, though this would still be far below what is needed to ensure the success of a Chinese invasion of Taiwan.[148] Moreover, conventional wisdom holds that Taiwan has few beaches suitable for amphibious invasion. Yet these two issues are likely to be resolved to a large degree by relying on merchant vessels, deploying shallow draft small boats to ferry troops ashore, which will allow for greater flexibility regarding landing locations.

The first couple of days of a Chinese invasion of Taiwan would likely see massive Chinese attacks to cripple the Taiwanese Navy. These ships would likely constitute secondary targets during the first 24 hours, following attacks on radars and airbases. Many Taiwanese warships would likely be sunk at piers before they could get out to sea. According to the 2023 CSIS Taiwan wargame report, "the sheer volume of Chinese missiles makes Taiwan's… naval forces almost irrelevant."[149] Later in the same wargame, these analysts acknowledge that "As with every scenario, Taiwan lost its entire navy."[150] China's very significant superiority in submarines and surface combatants might destroy Taiwanese ships that survived initial air and missile attacks.

THE PLA NAVY, CHINA COAST GUARD, AND MARITIME MILITIA

In a Taiwan invasion scenario, the Chinese Navy would be assisted in its amphibious attack mission by ground forces, as well as by the China Coast Guard (CCG) and the maritime militia. According to the 2023 DoD report on Chinese military power, the amphibious attack mission is now a "high priority" for the PLA Army (ground forces).[151] The maritime militia is a large paramilitary organization especially active in the South China Sea area.[152] The CCG is estimated to have around 500 vessels: 150 regional and oceangoing patrol vessels, 50 regional patrol combatants, and 300 coastal patrol craft.[153]

Putting the Chinese Navy aside, the assessment of the author is that Chinese ground forces and the CCG would each be independently capable of landing in excess of 50,000 Chinese soldiers during the initial weeks of combat.[154] However, the maritime militia, or more broadly the widespread incorporation of civilian craft of varying types into China's invasion armada, might enable Beijing to rapidly dispatch more than 500,000 soldiers to conquer Taiwan over the course of a two-month campaign, allowing for continuous replenishment after inevitably heavy casualties.

Mines are a considerable threat to landing forces, and the PLA is approaching this problem with a heavy emphasis on mine-clearing units.[155] These include both specialized mine-clearing warships as well as innovative drone vessels and amphibious craft intended to destroy mines in the surf zone area proximate to landing areas.[156] It's important to recognize that Taiwan generally cannot deploy extensive minefields during peacetime, because of the related dangers especially to civilians, and because, as a major global shipping power, Taiwan cannot risk a mining accident damaging its extensive maritime trade.

In this way, Taiwan's contemporary situation forms quite a contrast, for example, to the German defenses along the French coast in the period before the Normandy invasion. The Germans could set up all manner of

beach defenses and fortifications without taking into account the dangers they would pose to civilians in the areas concerned.

CHINA VS. TAIWAN NAVAL FORCES

	PRC	PRC	Taiwan
	Total	Eastern and Southern Theater Command Navies	Total
Aircraft Carriers	3	1	0
Amphibious Assault Ships	3	3	1
Cruisers	8	4	0
Destroyers	42	30	4
Frigates	49	36	22
Corvettes	50	40	0
Medium Landing Ships/Tank Landing Ships/Amphibious Transport Dock	58	51	51
Attack Submarines	47	31	4
Nuclear-Powered Attack Submarines	6	2	0
Nuclear-Powered Ballistic Missile Submarines	6	6	0
Coastal Patrol (Missile)	60	60	43
Coast Guard Ships	141	N/A	170

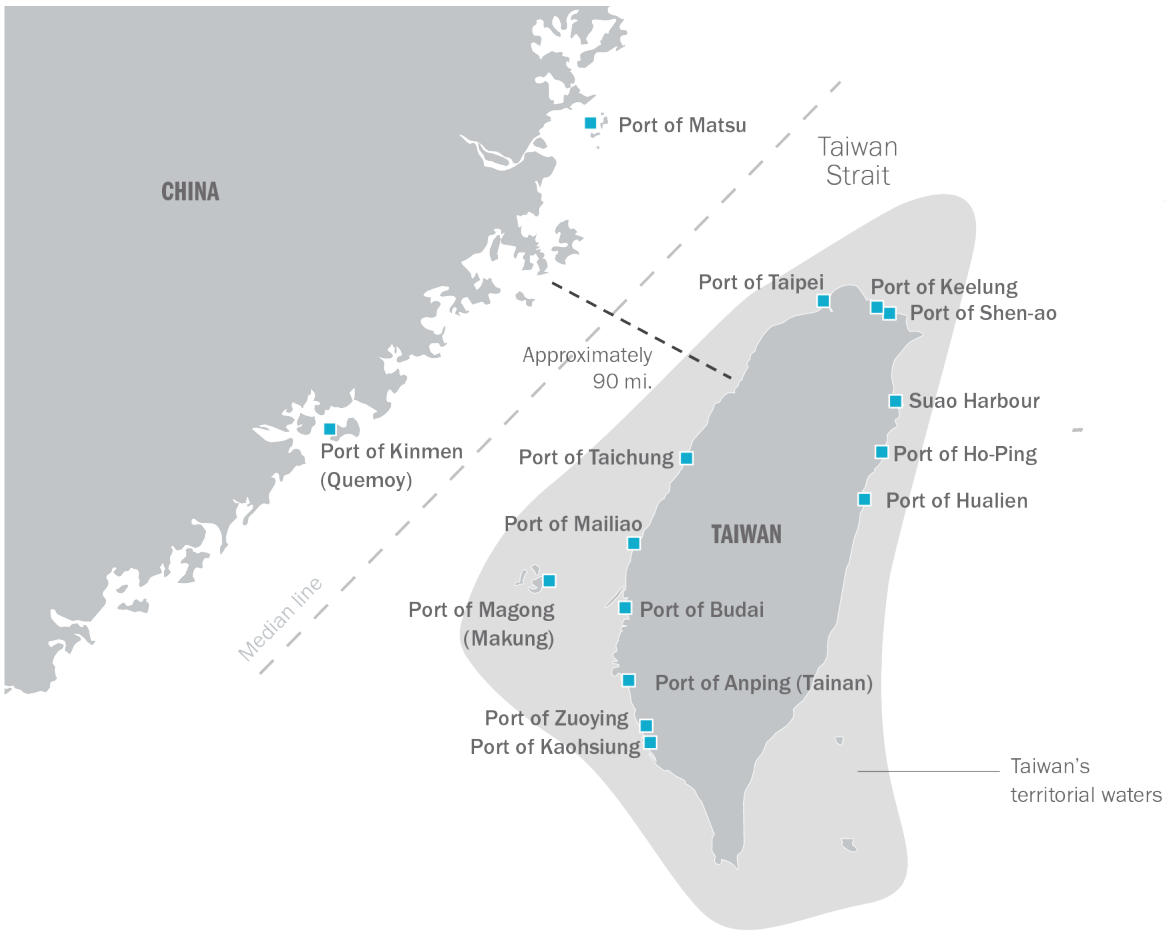
Note: Only equipment, aircraft, and ships considered operational are included, although they may not yet be assigned to a specific theater. The total column refers to all equipment, aircraft, and ships, assigned and unassigned. The "Taiwan Strait Area" includes the PLA's Eastern and Southern Theaters. The PLAN has the largest force of principal combatants, submarines, and amphibious warfare ships in Asia. In the event of a major Taiwan conflict, the Eastern and Southern Theater Navies would participate in direct action against the Taiwan Navy. The Northern Theater Navy (not shown) would be responsible primarily for protecting the sea approaches to the PRC but could provide mission-critical assets to support other fleets. In conflict, the PRC may employ CCG and CMM ships to support military operations.

Source: "Military and Security Developments Involving the People's Republic of China," Washington, D.C.: U.S. Department of Defense, 2024, 165.

The creation of large-scale defensive minefields would therefore depend on extended warning and rapid mining capabilities, which would be difficult to achieve but not impossible.[157] Taiwan has four fast mine-laying boats known as the *Min Jiang* class.[158] This is another instance where China's ability to achieve

surprise is paramount. If successful, the Taiwanese Navy would not have sufficient time to lay extensive minefields.

TAIWAN'S MAJOR PORTS



Source: "Ports in Taiwan," Ports.com; Ian Easton, "Hostile Harbors: Taiwan's Ports and PLA Invasion Plans," Project 2049 Institute, July 22, 2021.

Taiwan has 12 major ports on its main island that could be used as landing zones for a Chinese invasion. Chinese small boats could also attempt to land at the hundreds of smaller ports and harbors on the island.

As noted above, Chinese military planners are likely to prioritize interdicting such efforts by directly targeting and then attacking mine-laying platforms and also related mine storage depots. The Chinese Navy has a long history with mine clearance operations going back to the assistance it rendered to North Vietnam clearing its ports of U.S. air-dropped mines.[159] Over the course of 2022–23, there appeared to be numerous indications of intensifying PLA Navy training for mine countermeasures.[160] Moreover, PLA specialists continue to look for lessons from the Normandy experience. As one September 2023 Chinese military assessment explains: "For the Normandy landing, the USN developed… unmanned boats such as 'Porcupine' and 'Sledge' loaded with… explosives, and blew up a large number of… sea mines [and obstacles] placed by the German army in the shoals."[161]

China has immense civilian maritime resources that are likely to be committed in the event of an all-out invasion of Taiwan, including seven out of 10 of the world's largest container ports, more than 5,000 merchant ships, and more than 400,000 fishing vessels.[162] Ningbo, a gigantic port proximate to myriad Chinese military bases and located just 12 hours' sail from Taiwan, has 309 large berths with appropriate cranes for rapid loading.[163] Even China's most distant northern ports of Tianjin and Dalian are fewer than two days' sail from Taiwan (though using such ports could aid Taiwan's warning and preparation). China could rely on hundreds of large and medium ports along its huge coastline to disguise and then support this assault based largely on civilian assets.

A major theme of the 2022 Department of Defense report on Chinese military power is the importance of China's Military-Civilian Fusion (MCF) strategy. Three aspects of this strategy are highly relevant to a Chinese invasion of Taiwan: 1) "building military requirements into civilian infrastructure"; 2) "leveraging civilian service and logistics capabilities for military purposes"; and 3) "expanding and deepening China's national defense mobilization system."[164] The MCF measures, along with increased military readiness, will "enable the PRC to quickly transition to a wartime footing."[165]

For the roughly comparable landing of approximately 150,000 soldiers at Normandy on June 6, 1944, the Allies began embarkation on May 31, allowing five days to put the troops and equipment aboard ships.[166] China's loading process could be much faster given modern technologies and the decades China has had to plan the attack.

RO-ROS AND OTHER CIVILIAN SHIPS

Among the various merchant vessels that China could bring to bear in a Taiwan scenario, civilian RO-RO (roll on, roll off) ferries have recently garnered attention, as it's believed they could serve as "auxiliary amphibious landing ships." According to one detailed 2021 analysis, "The PLA has been using civilian transportation capabilities for military mobility for many years, moving military forces and equipment up and down the Chinese coast. RO-RO ferries provide significant capacity to move armor and other rolling stock. Recent PLA innovations are enabling greater roles for civilian ferries to move forces ashore."[167]

China already operates dozens of these large vessels and is now producing more.[168] According to one estimate, these ferries could bring China's sea transport capabilities to more than one million tons. As one article puts it, "These civilian roll-on/roll-off fleets, essentially all of which could be put at the service of the People's Liberation Army, are also greater in tonnage than the sum of all of the U.S. Navy's amphibious assault ships."[169]

Another military assessment explains, "If mainland China takes military action against Taiwan, a roll-on roll-off ship can unload an armored brigade to a port controlled by the People's Liberation Army within a few hours."[170] As with the campaign that followed the Normandy invasion, the PLA would most certainly be seeking to secure ports in Taiwan for rapid unloading and supply of forces ashore.[171] Taiwan's defending forces might undertake a "scorched earth" strategy and sink ships in their harbors to render them temporarily unusable as German forces retreating from Cherbourg did in 1944. Yet even if China is not able to secure port access to Taiwan, Beijing's military planners have developed and exercised with artificial piers or "offshore mobile debarkation platforms" to enable rapid unloading even along austere coastlines.[172] In addition, it was reported in mid-2021 that one of China's large ferries "has been fitted with a modified ramp able to launch and recover amphibious armored vehicles while offshore."[173] In other words, Chinese ferries could operate more like amphibious assault ships and would not require port facilities to disembark vehicles.

In 2025, multiple sources confirmed that China has been rapidly constructing "special barges" or "mobile piers" designed to facilitate amphibious landings. These large vessels, apparently intended to work in groups, vary in length from 361 to 607 feet. Their chief characteristics are large pylon legs that extend into the seabed to lift and stabilize ships against wave action, along with a telescoping bridging apparatus that can expedite offloading of heavy equipment and vehicles onto higher parts of a beach. These barges have been compared to the Mulberry Harbors of the Normandy campaign in World War II. The new special landing barges are confirmed to have been active in exercises in early 2025, including in concert with ferries and other commercial vessels.[174]

RO-ROs are often mentioned as a supplement to China's military sealift and amphibious capability and their capabilities could be amplified by these special landing barges. Some analysts say they are critical because they might be converted to land heavy artillery and armor. But what most analysts overlook is that with infantry, the demands for sealift become bearable with the use of civilian ships. With helicopters and close air support, China doesn't need to bring a lot of armor over to Taiwan to win this fight.

Somewhat counterintuitively, China's fishing fleet may present an even more ominous threat to Taiwan than Beijing's fleet of RO-RO ferries. The reason is the ferries are large and relatively simple to target with anti-ship cruise missiles. By contrast, tens of thousands of fishing vessels would be too numerous to target with standard anti-ship weapons and could thus likely overwhelm Taiwan defenses—particularly when afforded escort protection by Chinese naval and air forces. "China's global fishing fleet did not grow into a modern behemoth on its own," writes one analyst, adding, "For over a decade, the Chinese government has helped pay to construct bigger, more advanced steel-hulled trawlers."[175] As a detailed 2021 analysis of China's maritime militia relates, these fishing boats are not "ordinary" fishing boats and must "meet very exacting standards."[176]

These fishing boats could not be expected to carry armored vehicles and would be sunk more easily than military vessels equipped with robust damage control systems. Nevertheless, the small vessels are useful for several reasons beyond their large numbers: they are accustomed to working in austere sea conditions, they have appropriately trained crews, and they have the cranes and winches needed to put troops and gear over the side and into small boats quickly. Their cavernous holds, usually filled with their fishing catches, would provide space for soldiers and their equipment and the small boats to carry them ashore.

Perhaps most importantly, however, is the fact that China has always had a large fishing fleet, so its existence does not immediately suggest a threat in the way a massive buildup of classic amphibious landing vessels would. This point seems implicit in the assessment of the 2022 DoD report on Chinese military power, which determines that due to its training and use of civilian roll-on/roll off vessels, the PLAN Marine Corps has enough flexibility to decrease "the requirement to build additional PLAN amphibious ships to successfully assault Taiwan. This operational flexibility also provides operational and logistics units within the PLANMC the training and proficiency to move between military and civilian vessels."[177] Later in the same report, the Pentagon notes that the U.S. has not seen clear evidence China has built large numbers of tank landing ships (LSTs) or medium-sized landing craft because "it is possible the PLA assesses it has sufficient amphibious capacity and has mitigated shortfalls through investment in… civilian lift vessels and rotary-wing assets…."[178]

The 2023 CSIS Taiwan wargame fails to account for the vast majority of civilian vessels that would comprise a Chinese invasion, a significant oversight that leads CSIS to model the hypothetical Chinese amphibious landing fleet as just 96 vessels in total, which does not reflect the use of every Chinese warship.[179] Yet even with that questionable assumption, the CSIS modeling still assesses that Taiwanese forces on their own

could only succeed in sinking just 16 percent of China's amphibious fleet.[180] The fact that such PLA landings are predicted to succeed under generous assumptions (limited target set) for the Taiwan side suggests that a much larger, more realistic Chinese amphibious fleet size, drawing on China's very ample civilian assets, is likely to succeed. The CSIS wargamers seem to concede that the PLA will succeed in making lodgments: "The Chinese [in all game iterations] were always able to get troops onto Taiwan. The Taiwan Strait is so narrow, the Chinese forces so numerous, and Taiwanese defenses so limited that defeating the invasion at sea was not possible."[181]

True, China does not appear to have exercised these craft on the massive scale that an amphibious invasion of Taiwan would require, and relying on civilians for such an operation is a major risk.[182] But China may have carried out similar exercises on a smaller scale.[183] According to the 2022 DoD report, large sorties of Chinese fishing vessels for strategic purposes have occurred near Whitsun Reef and the Natuna Islands, and these operations may have involved dozens or even hundreds of vessels.[184]

A May 2022 study published by the U.S. Naval War College suggests that civilian shipping and the maritime militia likely constitute the "backbone of a Taiwan invasion." According to this paper, the PLA plans "to rely heavily on mobilized maritime militia forces operating requisitioned civilian shipping… including both [for] the delivery of PLA forces onto Taiwan and logistical sustainment." Furthermore, "The PLA does not regard civilian shipping as a stopgap measure… but as a central feature of its preferred approach." According to this report, "the retrofitting of civilian vessels for military use [was] accelerated in 2003." The report cites Chinese data suggesting that in 2015, the maritime militia "consisted of more than 5,000 ships organized into 89 militia transportation units, 53 waterway engineering units, and 143 units with other specializations." It is not difficult to see the outlines of this ominous structure from alternative Chinese sources.[185]

SMALL BOATS

Chinese foot soldiers are likely to come ashore in small boats. The large number of recent exercises undertaken by the PLA using such craft are an indication of this.[186] An especially revealing exercise employing small craft from a cargo bulker surfaced in mid-2022 and is illustrative of the larger concept of combining small craft with civilian shipping.[187] Some of the virtues of small boats are their speed, stealth, low cost, and perhaps most notably their small size, allowing them to be carried and launched by almost any kind of civilian ship. Such vessels will run the gamut from inflatable rafts with outboard engines to more standard small landing craft to more high-performance vessels.[188]

The downside for China is that small boat captains, despite being in a "maritime militia," are not active military personnel trained for combat and have never rehearsed an operation on this scale, making it a serious risk for the PLA to undertake. And the greater vulnerability of small boats would make for heavy losses if they come under heavy fire from Taiwanese forces that have not been adequately suppressed by air cover and other methods of shore bombardment.

However, there are indications that some higher-quality small boats could also be part of the invading force. In January 2020, a Chinese shipbuilding magazine revealed the details of a "new type of high speed vessel," specifically the Type 928D assault boat for the ground forces.[189] Using such craft, which could be hidden among the vast and cavernous storage areas proximate to China's massive ports, Chinese assault teams could access the entire Taiwan coastline within a mere four or five hours. Such upscale assault boats will likely be reserved for special operations against high-value targets, such as isolated fishing ports, but the campaign may still feature tens of thousands of these boats. This distributed approach to amphibious

assault would complicate the targeting problem for Taiwan's defenders. For example, an expensive anti-ship missile could conceivably be worth expending on a very large landing craft but would hardly be appropriate against a small boat carrying just eight to 10 soldiers.

NAVAL FIREPOWER AND MULTIPLE-LAUNCH ROCKET SYSTEMS BOMBARD LANDING SITES

A pertinent question concerns whether the Chinese Navy has sufficient firepower to adequately bombard various landing sites before amphibious landings. Traditionally, a huge volume of cannon fire, including from battleships, has been required to destroy and traumatize defenders, especially if they are sheltering in deeply reinforced bunkers. It is conceivable that ground forces artillery will be "taken aboard various types of merchant ships in order to create shipborne artillery task groups, since actual PLA Navy warships will be tied down with other tasks, such as escorting the amphibious task forces."[190] Photos seem to confirm that the PLA has experimented with this approach and could allow early and intensive use of thousands of ground forces artillery pieces, including in excess of 1,300 multiple launch rocket systems (MLRS). Additionally, China is known to have 1,000 PHL-81 MRL systems in storage.[191] Moreover, there is evidence the PLA is taking an active interest in "guided artillery shells," including how they can be secured from jamming and used effectively in combination with UAV surveillance.[192]

CHINESE ROCKET FORCES

System	Launchers	Missiles	Estimated Range
ICBM	550	400	>5,500 km
IRBM	250	500	3,000 km—5,500 km
MRBM	300	1,300	1,000 km—3,000 km
SRBM	300	900	300 km—1,000 km
GLCM	150	400	>1,500 km

Source: "Military and Security Developments Involving the People's Republic of China," Washington, D.C.: U.S. Department of Defense, 2024, 66.

Such new artillery technologies could make this approach more feasible. Still, current Chinese doctrine and capabilities appear to have airpower, supplemented heavily by drones and loitering munitions, as the lead force in pulverizing landing zones. Moreover, it is possible that Beijing would possess high quality intelligence for targeting purposes. China has a constellation of satellites for overhead photographic intelligence, and can also access nearly real-time photos of Taiwan's beaches through Google Earth.

An invasion armada comprising thousands of ships of various types assures myriad vectors of attack and the ability to absorb major losses, increasing the certainty that some of these vectors could succeed. Some Chinese sources suggest the PLA is planning for very significant casualties for invading Chinese forces, perhaps between 15 and 35 percent.[193] For an invasion force of perhaps half a million, that could mean casualties of well over 125,000.

The Normandy campaign is often cited to demonstrate how difficult amphibious warfare is, because an overstretched German army still inflicted high casualties on the Allies. Yet the German army had a deep well of combat experience throughout its ranks, as well as a proven record of efficiency in combat—advantages that Taiwan lacks. In fact, casualties for the Allies proved relatively light: 4,413 killed out of 150,000 invaders.[194] Allied planners thought casualties could be as high as 75,000, but went ahead with the operation anyway, knowing it could be incredibly costly. That calculation could very possibly approximate Beijing's calculations with respect to an all-out invasion of Taiwan.

Skeptics of China's ability to launch an amphibious invasion of Taiwan assert that the Falklands War demonstrates the difficulty of amphibious warfare, since 15 percent of the British naval task group that intervened in the Falklands was sunk by the Argentines.[195] Yet this point does not stand up to close scrutiny, given that the overall distance between China and Taiwan is only 90 miles. Britain was undertaking amphibious operations more than 8,000 miles from its home shores—a far riskier endeavor operationally than what China would be undertaking in Taiwan. Wielding a massive armada of military and especially adapted civilian ships—a practice learned in part from the Falklands experience—China would likely view as acceptable an amphibious invasion even if it lost 15 percent of its invasion force ships.[196]

INFANTRY AND FIREPOWER, NOT ARMORED VEHICLES, AS THE INVASION'S FIRST WAVE

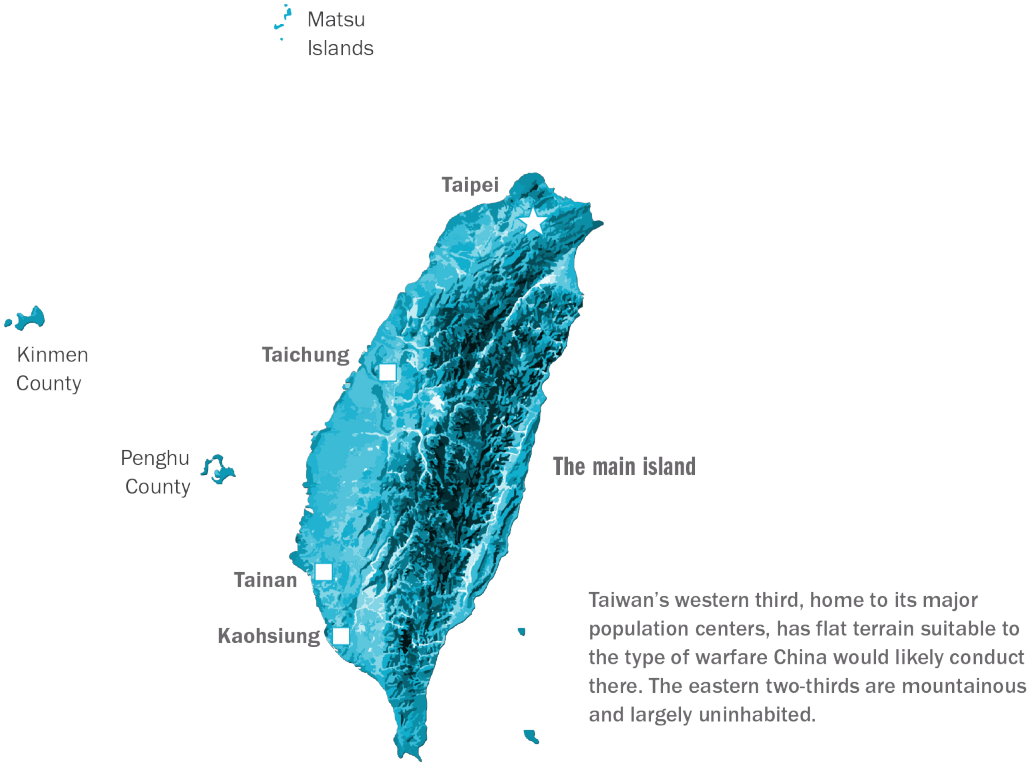
Conventional analyses of a Chinese invasion of Taiwan emphasize landing armored vehicles, which in turn require large amphibious vehicles to carry them. But a lighter force could also invade Taiwan, at least initially, reducing the demand for large amphibious ships. The ability of a civilian armada to successfully land large numbers of infantry in small boats is more feasible.

The Normandy invasion required a massive logistics build-up because Allied tank forces planned to race across the north European plain to Berlin. That 750-mile axis of advance during the early summer of 1944 required vast logistics support and fuel since the relatively flat terrain was highly amenable to armored warfare. This is in contrast to a Taiwan battlefield.[197] To get an idea of the massive added logistics requirements that armored vehicles require, consider that a battalion of 14 U.S. Army M2 Bradley fighting vehicles are estimated to require 2,330 gallons per day in mobile combat operations.[198]

Taiwan's geography is comprised roughly of urban areas on the western one-third of the island and mountainous zones covering the two-thirds on the eastern side.

The western coast, facing mainland China, is where the main ground forces battle for the island would take place, since Taiwan's central and eastern mountains are too high and steep to sustain large ground force operations. Admittedly, the western third of the island does form a plain suitable for armored operations. However, this small area comprises a relatively narrow strip of land that is approximately 140 miles by 30 miles. This strip hardly constitutes a promising opportunity for armored thrusts practicing large-scale maneuver warfare, particularly as it is cleft by numerous large rivers that will present another obstacle to the movement of tanks if bridges are blown, as they likely would be in a conflict. Notably, the CSIS 2023 Taiwan wargame explains that in the initial phases of the landing, the Chinese side will have major incentives to strike Taiwan bridges in order to prevent Taiwan reserves from attacking the initial PLA lodgments.[199]

TAIWAN'S TOPOGRAPHY



Armored vehicles have utility in these circumstances, and Chinese sources confirm this.[200] Some vehicles (e.g., breacher assault vehicles) could be particularly useful in the beach landing phase.[201] These vehicles are equipped with mine clearing abilities and also line charges or high explosives with lofted trajectories for attacking trenchworks. Likewise the Chinese would likely bring in a variety of heavy vehicles in secondary or tertiary amphibious landings to support attacking forces once their beachheads were firmly established. Nevertheless, armored vehicles are overall not the key to this hypothetical campaign, but rather could be a secondary element if the Chinese successfully insert forces vertically to tie up Taiwanese forces in the rear. The PLA would likely use infantry as the primary attack force and have been developing doctrine and training to accord with this priority. Such developments include, but are not limited to, intensive training with flamethrowers, shoulder-fired anti-tank and anti-air weapons, mortars, line charges, camouflage, tactical drones, snipers, bridging, and entrenching.[202] Specialized infantry weapons, moreover, are evident, including grenade launchers and folding rifles that are ideal for urban combat.[203]

Taiwanese forces might also make the most of their city settings to create urban fortresses that slow down Chinese attackers, following the pattern of Ukraine's defenders, for example, at Bakhmut and Avdiivka. This seems to be a major recommendation of the 2023 CSIS Taiwan game report, since it concludes that "defeating Chinese forces before they land is likely impossible." These analysts warn: "Although defense of [Taiwan's] cities would result in severe damage, failing to defend them would make Chinese operations on the island much easier."[204]

The aim of this CSIS recommendation appears to be to slow down the Chinese campaign, allowing time for Taiwan's allies to come to its aid. That could be a plausible approach to Taiwan's defense, but it is outside the scope of this paper, which assumes Taiwan is on its own (though such a scenario will be addressed in subsequent papers of this explainer series). Within the parameters of this particular study, a Ukrainian-type strategy of fighting for every inch of Taiwan's sprawling cities would delay China's conquest of the island but would not alter the outcome, not least because China is much less resource-constrained than Russia. In fact, the CSIS analysts go even further and say Taiwan should not defend its beaches, but should rather develop "prepared fortifications inland" on the pattern of the Japanese defense of Iwo Jima and Okinawa, aiming for "prolonged bloody campaigns ashore."[205]

Soldier motivation and tactics, supplemented by airpower and drones, will largely determine the outcome of the war. The PLA must neither support large tank armies in Taiwan, which require vast amounts of fuel, nor develop forward airbases on the island, which would similarly require a massive logistics effort. The Russo-Ukrainian War has confirmed the experience of other wars that tanks are vulnerable to well-trained, well-armed land forces, not to mention drones.[206] It is true that Taiwan is one of the most densely populated areas of East Asia. While this could offer Taiwanese forces some defensive opportunities, it is most likely they would still be overwhelmed by highly motivated PLA foot soldiers, who have been drilled intensively in tactics for urban warfare.[207]

CONQUEST OF TAIWAN ONCE FORCES LAND: HIGH-INTENSITY COMBAT

As for the conquest of the island, following upon the initial lodgments, this will involve high-intensity ground combat, encompassing both urban and mountain warfare. Chinese airpower and artillery, both in ample supply, will take the lead. Moreover, Chinese troops have trained in the different elements of this campaign, including urban warfare, anti-tank operations, and mountain warfare. Given Taiwan's geography, it is conceivable that Chinese ground forces could conquer Taiwan by moving from many directions simultaneously in order to maximize confusion among the defenders. This might involve arduous maneuvers through the mountainous terrain of the central and eastern island.[208]

A plausible simulation from a Chinese defense magazine posits simultaneous moves from west and east against Taipei, requiring landing forces arriving at remote Jinshan to climb over Mount Yangming to take Taiwan's capital from the rear.[209] That simulation estimates that roughly 200,000 PLA soldiers would be required to conquer the island, along with approximately 1,000 tanks, 2,000 armored vehicles, and 1,000 artillery pieces.[210] Notably, the ground campaign would likely face at least two difficult junctures. First, the initial beach and airborne lodgments secured by the PLA will undoubtedly be hit by heavy Taiwan artillery fire. Consequently, a major challenge for the PLA will be attempting to knock out Taiwanese artillery forces, primarily with airpower, and push them back, so that Chinese ground forces can flow smoothly through secured ports and airfields, and these heavy vehicles can be landed. As stated in previous sections, the Chinese flow of heavier forces into the attack will rely on efficient logistics in its rear and the seizure of a number of small ports around Taiwan. That effort will surely be supplemented by artificial piers.

CHINA VS. TAIWAN GROUND FORCES

	PRC	PRC	Taiwan
	Total	Taiwan Strait Area	Total
Total Ground Force Personnel	1,040,000	427,000	104,000
Group Armies/Army Corps	13	5	3
Combined Arms Brigades	80	30	7
Artillery Brigades	15	5	3
Army Aviation Brigades	13	4	2
Air Assault Brigades	3	1	0
Airborne Brigades	6	6	0
Marine Brigades	11	5	2
Tanks	3,800	1,000	800
Artillery Pieces	7,600	2,300	1,100

Note: Only equipment, aircraft, and ships considered operational are included, although they may not yet be assigned to a specific theater. The total column refers to all equipment, aircraft, and ships, assigned and unassigned. The "Taiwan Strait Area" includes the PLA's Eastern and Southern Theaters.

Source: "Military and Security Developments Involving the People's Republic of China," Washington, D.C.: U.S. Department of Defense, 2024, 164.

Taiwanese ground forces would most likely counterattack after several days, since that would have allowed Taiwan to mobilize and prepare for such a counter blow.[211] It's true that Taiwan would have the advantage of bringing armor against PLA forces that would mostly consist of infantry at this stage and Taiwan has recently prioritized the acquisition of advanced tanks like the M1 Abrams.[212] For precisely that reason, Chinese ground forces have been drilling frequently in anti-tank tactics, including the intensive anti-tank tactics used in the Russo-Ukrainian War.[213] China produces the man-portable HJ-12 anti-tank missile that is often compared to the U.S. Javelin missile. This weapon could be supplied to the invading forces and used to destroy any Taiwanese tanks that are encountered.[214]

Given such tactics, along with PLA air superiority, a hypothetical counterattack by Taiwanese forces might not succeed. The quality of Taiwan's reserve forces remains an open question. As one recent report explains, "On paper, the 2.3 million reservists enable Taiwan to match China's 2 million-strong military. Yet, the reserve system has long been criticized. Many felt the seven days of training for the mostly former soldiers was a waste of time."[215] For the CSIS 2023 war game, Taiwan reserve units were assessed to fight at half the strength of regular units. That same report observes that Taiwan regular ground forces have shrunk in number since 2011 from 200,000 to 94,000 in 2022, and concludes pessimistically: "Taiwan's ground forces may not be as ready and competent, unit-for-unit and type-for-type, as China's."[216]

As noted above, Taiwan's reasonably large armored forces with their substantial mobility could play a role in trying to mitigate and even destroy China's initial lodgments. Taiwan's armored forces are being upgraded at

present. A lesson of the Ukraine war is that even the most modern armor remains vulnerable to infantry weapons, drones, and airpower—all of which the PLA could wield against Taiwan's armored forces. The PLA would also attack roads and bridges to limit the movement of these forces around the island. Still, Taiwan's tanks could have a definite role in frustrating the progress of a Chinese invasion.

No doubt the capture of large cities, including especially Taipei and Kaoshiung, would present major complications and could tie down substantial Chinese resources for long periods. Yet the PLA has ample manpower to employ once it manages to secure landing zones. The Russian siege of Mariupol offers some lessons for China, including the need to surround and corral defenders.[217] Still, it's plausible that many residents of these large Taiwanese cities will prefer capitulation to the "Mariupol model."[218] Major combat would likely end within 10 weeks, even if some cities continued to hold out. Operations in the mountainous areas of Taiwan could last for an additional three to four months.[219]

Available estimates, moreover, support the assessment that Taiwan's ground force capabilities are not especially strong. A 2021 report illustrated that Taiwan's armed forces are generally 20 percent below "authorized end strength," with front-line units a shocking 40 percent below stated requirements.[220] The island's ground forces, as noted, amount to just 104,000 professional soldiers, while the PLA wields over a million.[221] And Taiwan's reserve forces are reportedly not in fighting shape, as one recent account noted that personnel are called up "every two years for a maximum of seven days, and often this is just on paper."[222]

WHAT TAIWAN NEEDS: SELF-RELIANCE AND DIPLOMACY

The above scenario has illustrated that China might have sufficient military power to invade and conquer Taiwan. This is not a foregone conclusion—war is inherently risky and difficult—but it is a possibility.

Here, the research question has been narrowly defined: what are the prospects for Taiwan's defense if it has to confront a Chinese attack on its own? Analysis yields the conclusion that the island is susceptible to Chinese attack due chiefly to proximity, but also growing Chinese might and national will, as well as China's employment of developing defense technology. It has been demonstrated that opening missile and air salvoes could have a devastating impact on Taiwan, quite possibly yielding air and sea control above and around the island.

Rather than swarming over beaches, the initial waves of attackers would come through the air via helicopter and parachute. Drones could be a powerful force multiplier for both of these opening phases of the invasion. While these initial operations might decide the campaign, reinforcements would follow in more traditional amphibious operations, but these would be mostly executed by small craft launched from a massive armada of civilian ships.

While Taiwan could take a page from North Korea or Albania and build extensive bunkers that tunnel deep into the earth, such an outcome does not appear likely. Taiwan has consistently under-invested in its military over the last several decades. While Taipei is now increasing defense expenditures having spent about 2.45 percent of its GDP on defense in 2024, that number was just 1.82 percent as recently as 2016.[223] Facing its own challenging national security environment, Israel's defense spending from 2010 to 2020 has never fallen below 5 percent of GDP.[224]

The scenario envisioned here is one where the Chinese take major risks in their mode of attack: gambling that they achieve some surprise; inserting lightly armed troops via helicopter and parachute who will be vulnerable and hard to resupply; limiting initial reliance on armor; and using small boats, which are highly vulnerable, especially to mines. The Chinese could opt for a more traditional approach, which would limit their liabilities but decrease their overall odds of success. Still, as argued above, a Chinese leadership that undertakes the momentous decision to attack to Taiwan will be risking their own survival as leaders. It seems fair to assume this would be a risky course.

But such a course is still very possible, which is why Taiwan's defense would benefit from major hikes to its defense budget, restructuring its reserves to make them more capable, investing in more light and mobile weaponry (especially mobile anti-ship missiles), and acquiring or building more Javelins, Stingers, or similar weapons that can be used against tanks or helicopters with infantry well-trained to quickly employ them.

Even given such measures, Taiwan is not assured of a successful defense; far from it. Western strategists do the island no favors by minimizing its peril.[225] Future papers in this series will expand on these themes, demonstrating U.S. limitations in the event of a Taiwan attack, why allies would be reluctant to get involved, and why a better plan is for the United States to preserve the One China policy which has worked for decades. The wisest course for Taiwan would be to consider a more realistic approach of self-reliance, and especially the possibility of diplomacy.[226]

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[11] Lyle Goldstein, "The hard school of amphibious warfare: examining the lessons of the 20th century's major amphibious campaigns for contemporary Chinese strategy," *Asian Security*, 19:1, 26–42.
[12] This is not to imply that all of Taiwan's air defenses and headquarters would be destroyed during the first 24 hours. Inevitably, substantial segments of these Taiwanese units will remain operational. The point is that they will be damaged so significantly as to impact the campaign in China's favor. This is not certain but highly likely given the geography and forces arrayed.
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[37] *The Military Balance 2024*, 258–259. Also, see Eric Heginbotham et al, *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power, 1996–2017* (Santa Monica: RAND, 2015), Figure 6.1, 138. Logically, many of these aircraft must be held in reserve to cope with potential foreign intervention. A report emerging from the Zhuhai Air Show in November 2022 suggests that the Chinese advanced attack air fleets are now larger than previously estimated. See Mike Yeo, "Zhuhai Airshow Display Reveals Info on China's J-20, J-16 Inventory," Defense News, November 8, 2022, https://www.defensenews.com/air/2022/11/08/display-at-zhuhai-airshow-reveals-info-on-chinas-j-20-j-16-inventory/.
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[42] *The Military Balance 2024*, 314–317.
[43] Michael Beckley, "The Emerging Military Balance in East Asia: How China's Neighbors Can Check Chinese Naval Expansion," *International Security* 85, vol. 42, no. 2 (Fall 2017), 78–119.
[44] *Military Balance 2024*, 317. Each battery may have eight launchers and each launcher has four missiles ready to fire. See "Patriot," U.S. Army Aviation and Missile Life Cycle Command, https://history.redstone.army.mil/miss-patriot.html#:~:text=A%20PATRIOT%20battery%20(i.e.%2C%20the,ready%2Dto%2Dfire%20missiles.
[45] super militia, "How Patriot Missile Defense System Works," YouTube, April 27, 2017, https://www.youtube.com/watch?v=btYHkxPZFh4&t=240s.
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[49] "Military and Security Developments…" 2024, 165; *The Military Balance 2024*, 317.
[50] *The Military Balance 2024*, 317.
[51] "Taiwan," World Fact Book, CIA, https://www.cia.gov/the-world-factbook/countries/taiwan/#transportation.
[52] On the increasing readiness of Chinese missile forces for a Taiwan scenario, see "2023 Report on Military and Security Developments…" 145–146.
[53] "Military and Security Developments Regarding the People's Republic of China," U.S. Department of Defense, 2022, 60. Another reason the PLA might achieve surprise with its initial missile strikes is that the PLA Rocket Forces have a very intense pattern of exercises that could be used to disguise an attack. According to the 2022 DoD report, "In 2021, the PLARF launched approximately 135 missiles in testing and training. This was more than the rest of the world combined." "Military and Security Developments…" 2022, VII.
[54] "A Dossier on the Pave Paws Radar Installation on Leshan, Taiwan 樂山 24.499 N, 121.072 E," Federation of American Scientists, March 8, 2013, https://man.fas.org/eprint/leshan.pdf.
[55] *The Military Balance 2024*, 317.
[56] The 2023 DoD report on Chinese military power estimates that China has 1,000 SRBMs. "2023 Report on Military and Security…" 67. As noted above, Taiwan would wield about 300 interceptors against that Chinese force of SRBMs. Since two interceptors are fired at each incoming missile per Patriot employment doctrine (see text above), that suggests fewer than 20 percent of China's SRBMs would be destroyed even if the system was working working at an extremely high level of efficiency since only 150 Chinese missiles would be intercepted by Taiwan's Patriot systems.
[57] David Beckstrom, "Safety, Security Requires Readiness First," U.S. Army, April 1, 2016, https://www.army.mil/article/165246/safety_security_requires_readiness_first.
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[59] Wang Xushin [王继新], "Analysis of Taiwan Army's Ballistic Missile Early Warning and Interception Capability" [台军弹道导弹预警拦截能力分析], *Ordnance Knowledge* [兵器知识], January 2018, 23.
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[62] Su Lei et al, "Simulation Deductions in the Battle of Motherland Reunification," 32. On the employment of rocket artillery in the August 2022 crisis, see Liu Xuanzun, "PLA Launches Long-Range Rocket Artillery, Conventional Missiles in Drills around Taiwan," *Global Times*, August 4, 2022, https://www.globaltimes.cn/page/202208/1272190.shtml.
[63] Minnie Chan, "China's New PCL191 Multiple Launch Rocket System Casts Shadow over Taiwan Strait," *South China Morning Post*, https://www.scmp.com/news/china/military/article/3041007/chinas-new-pcl191-multiple-launch-rocket-system-casts-shadow.
[64] *The Military Balance 2024*, 256.
[65] Su Lei et al, "Simulation Deductions in the Battle of Motherland Reunification," 37.
[66] Tian Ying, "Striking Like a Thunderbolt," 13.
[67] Zhang Yilong [张亦隆], "Analysis of the PLA's Combat Capability against Taiwan" [解放军对台作战能力分析], *Naval and Merchant Ships* [舰船知识], July 2020, 23.
[68] An Dong [安东], "Steel Rain: The New Type of Indigenous Air-delivered Submunitions" [钢铁暴雨: 国产新型机载航空布撒器], *Ordnance Science and Technology* [兵工科技], no. 15 (2020), 47–50.
[69] Tian Ying, "Striking Like a Thunderbolt," 12.
[70] Cancian, Cancian, and Heginbotham, "The First Battle of the Next War…" 98.
[71] "Military and Security Developments," 2024, 66.
[72] The DoD estimate of 900 missiles for China's SRBM could be an undercount. True, the PLA may be concentrating on other novel strike capabilities, including cruise missiles, rocket artillery, and drones. However, it also stands to reason that China would prepare more than three missiles per launcher. It's also worth noting that China is watching the Ukraine war very carefully and has no doubt grasped the revolutionary importance of drones to achieve optimal penetration and striking power. For a recent look at Chinese assessments of Russian missile attack capabilities in the Ukraine war, see, for example, Lyle Goldstein and Nathan Waechter, "China Evaluates Russia's Use of Hypersonic 'Daggers' in the Ukraine War," *Diplomat*, January 11, 2024, https://thediplomat.com/2024/01/china-evaluates-russias-use-of-hypersonic-daggers-in-the-ukraine-war/.
[73] "Taiwan Submarine Capabilities," Nuclear Threat Institute, August 27, 2024, https://www.nti.org/analysis/articles/taiwan-submarine-capabilities/.
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[75] See "A Closer Look at Taiwan's Indigenously-built Warships"[近观台湾自制军舰], *Weapon* [兵器], no. 1, 2024, 26–27; scanned images available at Lyle Goldstein (@LyleGoldstein), "Chinese strategists study Taiwan Navy's new minelaying vessels," X, January 5, 2024, https://x.com/lylegoldstein/status/1743402665428590830.
[76] Minnie Chan, "Taiwan's Undersea Base Plan Resurfaces as Cross-strait Tensions Rise," *South China Morning Post*, May 6, 2023, https://www.scmp.com/news/china/military/article/3219554/taiwans-undersea-submarine-base-plan-resurfaces-cross-strait-tensions-rise.
[77] On the "three dimensional" aspect of modern amphibious warfare doctrine, see also Xue Xueling and Xu Miaobo [薛学林, 徐苗波], "Three Dimensional Amphibious Landing: Like a Steel Knife Thrust into the Enemy's Chest" [立体登陆: 就象钢刀插入敌胸膛], People's Navy [人民海军], May 31, 2013, 5.
[78] Ken Dilanian, Courtney Kube, Carol E. Lee, and Dan De Luce, "U.S. Intel Helped Ukraine Protect Air Defenses, Shoot Down Russian Plane Carrying Hundreds of Troops," NBC News, April 26, 2022, https://www.nbcnews.com/politics/national-security/us-intel-helped-ukraine-protect-air-defenses-shoot-russian-plane-carry-rcna26015.
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[80] "Taiwan Flags Risks of Stinger Missile Delays, Says Pressing U.S.," Reuters, May 3, 2022, https://www.reuters.com/world/asia-pacific/taiwan-flags-risk-stinger-missile-delays-says-pressing-us-2022-05-03/.
[81] Lo Tien-pin and Jake Chung, "US Delivered Stinger Missiles: Sources," *Taipei Times*, February 4, 2024, https://www.taipeitimes.com/News/front/archives/2024/02/04/2003813053.
[82] See, for example, Abbie Shull, "Ukrainian and Russian Forces Have Been Fighting for Hours over a Critical Airfield just Outside Kyiv," *Business Insider*, February 24, 2022, https://www.businessinsider.com/ukraine-russia-fight-over-airfield-outside-kyiv-2022-2.
[83] Seth Cropsey and Harry Halem, "Taiwan's Special Operations Forces," Real Clear Defense, October 20, 2021, https://www.realcleardefense.com/articles/2021/10/20/taiwans_special_operations_forces_799768.html.
[84] Ian Speller and Christopher Tuck, *Amphibious Warfare: Strategy & Tactics from Gallipoli to Iraq* (London: Amber Books, 2014), 164.

[85] Yu Xiaopeng, Meng Xianjun, and Wang Ning [俞晓鹏, 孟现军, 王宁], "Characteristics and Lessons from the Airborne Operations Accompanying the Normandy Landing Campaign" [诺曼底登陆战役中空降 作战的特点及其启示], *Military History* [军事历史], no. 4 (2001) 41. According to this Chinese military rendering, Eisenhower faced serious doubts on his staff regarding the operation, which some assessed would result in 50 percent casualties. Eisenhower is quoted as saying, "I agree this is risky, but we must take risks."
[86] *The Military Balance 2024,* 256, 260–261.
[87] Chinese military news shows both a PLA 71st Army Group transport and attack helicopters operating from a merchant vessel. CCTV7 *Military Report* [军事报道], May 14, 2022. Additional recent evidence of Chinese ground forces helicopters training for a cross-strait attack are in the same source: 73rd Army Group on April 14, 2022, 72nd Army Group on April 28, 2022, and 74th Army Group on May 17, 2022.
[88] This is simply explained by the fact that helicopter forces did not exist at the time of the last major amphibious assaults. Undoubtedly, General Dwight Eisenhower would have preferred to employ helicopters over gliders during the Normandy assault.
[89] *The Military Balance 2024*, 256, 259–261, 264. There is ample evidence of an ambitious program to train new Chinese helicopter pilots. For example, there is a report of a extensive use of synchronized simulators to support training for a large-scale heliborne assault. See CCTV7 *Military Report* [军事报道], April 28, 2022. The IISS numbers are confirmed by this additional source: Alexander Chramshykin [Александр Храмчихин], "The Celestial Rotary-wing Empire" [Поднебесная винтокрылая империя], *Independent Military Review* [Независимое Военное Обозрение], December 16, 2021, https://nvo.ng.ru/armament/2021-12-16/6_1170_china.html. The Russian defense industry has a keen interest in the Chinese helicopter market, since it has sold Beijing billions of dollars of helicopters over the last three decades.
[90] *Naval and Merchant Ships* [舰船知识] (April 2019), insert.
[91] China continues to import large numbers of Russian helicopters even as it rapidly builds its own, suggesting great urgency. For example, it is reported that China signed a contract in 2019 for the purchase of 100 Mi-171 large transport helicopters. Alexei Nikolski [Алексей Никольский], "China Bought $2 Billion Worth of Helicopters from Russia" [Китай закупил в России вертолеты на сумму более $2 млрд], *Vedomosti* [Ведомости], October 22, 2020, https://www.vedomosti.ru/politics/articles/2020/10/22/844293-kitai-zakupil?ysclid=l3vnxnr8zw.
[92] In May 2022, AVIC tested its new multi-use heavy lift helicopter AC313A that is capable of carrying 28 passengers. South China Morning Post, "China-made New Heavy-lift Multirole Helicopter AC313A Makes Maiden Flight," YouTube, May 18, 2022, https://www.youtube.com/watch?v=qSNW2hvIE50.
[93] *Military Balance 2024,* 263. See, for example, picture and caption at *PLA Daily* [解放军报], March 10, 2022, 6, http://81.cn/jfjbmap/content/2022-03/10/node_7.htm.
[94] "Military and Security Developments…" 2024, 165.
[95] "2023 Report on Military and Security…" 185.
[96] "China Country Commercial Guide," U.S. International Trade Administration, April 7, 2023, https://www.trade.gov/country-commercial-guides/china-aviation.
[97] Yu Xiaopeng, Meng Xianjun, and Wang Ning [俞晓鹏, 孟现军, 王宁], "Characteristics and Lessons from the Airborne Operations Accompanying the Normandy Landing Campaign" [诺曼底登陆战役中空降作战的特点及其启示], *Military History* [军事历史], no. 4 (2001), 39–43.
[98] See, for example, a heavy drop operation pictured on the cover of *PLA Daily* [解放军报], July 20, 2021, http://81.cn/jfjbmap/content/1/2021-07/20/01/2021072001_pdf.pdf. A cargo drop exercise by the PLAAF Airborne Corp. was reported on in CCTV7, *Military Report* [军事报道], June 2, 2022. On drone support for Chinese airborne troops, see Liu Xuanzu, "Drones Assist PLA Paratroopers with Logistics Supply Tasks in Assault Exercise," *Global Times*, December 13, 2021, https://www.globaltimes.cn/page/202112/1241379.shtml.
[99] The 2023 DoD Report on Chinese Military Power offers that the PLAAF Airborne Corps is comprised of 10 brigades or roughly 40,000 personnel. "2023 Report on Military and Security…" 64. That figure may overestimate the number of PLAAF paratroopers, since one brigade is a training unit and there are additional support personnel. However, all three branches of the armed forces plus the Peoples Armed Police (PAP) wield paratroopers and/or heliborne infantry. Therefore, the number of soldiers trained for either parachute or heliborne assault could well exceed 100,000. On the PAP's relatively new heliborne infantry capability, see China Military Web [中国军网], January 13, 2022; for a Chinese Air Force parachute exercise, see China Military Web [中国军网], October 26, 2021; for a Chinese Navy parachute exercise, see Lu Hongbo, Zhang Zhi, and Jin Tian [卢红波, 张智, 金天], "Parachutes Bloom between the Sea and Sky" [伞花绽放海天间], *PLA Daily* [解放军报], December 13, 2021, 9, http://81.cn/jfjbmap/content/2021-11/16/content_303226.htm; and an example of Chinese ground forces heliborne infantry exercise is photo, PLA Daily [解放军报], November 10, 2021.

[100] Alice Su, "A Dispatch from the Counterterrorism Olympics," *Atlantic*, May 13, 2014, https://www.theatlantic.com/international/archive/2014/05/a-dispatch-from-the-counterterrorism-olympics/370781/. While not all military competitions offer credible results, this report of an event occurring in Jordan, a U.S. ally, and under the supervision of Western security companies should be taken seriously.

[101] This number likely strongly underestimates the true number of special forces troops in China, since it assumes just eight PLA Army special forces brigades (estimated at 2,500 soldiers each) and leaves aside special forces based in both Hong Kong and Macau, and other units. "PLA Army Special Operations Forces," Boot Camp & Military Fitness Institute, https://bootcampmilitaryfitnessinstitute.com/elite-special-forces/chinese-elite-special-forces/pla-army-special-operations-forces/.

[102] I assume a high degree of attrition (20 percent casualties, equivalent to Normandy) and multiple sorties (three). This simple helicopter transport model has 750 aircraft flying in sortie no. 1, of which 20 percent are shot down, allowing for 600 helicopters to deliver 9,000 troops. For sortie no. 2, another 20 percent are lost, so that 480 helicopters deliver 7,200 troops. For sortie no. 3, another 20 percent are lost, so that 384 helicopters reach their landing zones and deliver 5,760 troops. Thus, a plausible number of helicopter-delivered soldiers equals 21,960 troops. It's worth noting that the PLA might choose not to employ its entire helicopter force, since holding back a substantial reserve force of helicopters for sustainment would constitute sound strategy.

[103] I assume that 400 transports could each carry 50 paratroopers each, that there could be three sorties and would be high attrition (20 percent, equivalent to Normandy losses). This simple airborne transport (parachute) model has 400 aircraft flying sortie no. 1, of which 20 percent are shot down, allowing 320 transport aircraft to deliver 16,000 paratroopers. For sortie no. 2, another 20 percent are lost, so that 256 aircraft deliver 12,800 troops. For sortie no. 3, another 20 percent are lost, so that 10,250 troops are landed. Thus, a plausible number of transport (parachute) delivered soldiers equals 39,050. It's worth noting that the PLA might well choose not to employ its entire transport force, since holding back a substantial reserve force of air transports for sustainment would constitute sound strategy.

[104] See, for example, CCTV7 *Military Report* [军事报道], July 5, 2022, still image at Lyle Goldstein (@LyleGoldstein), "China 79th Army Group aviation ex. CCTV7, Junshi Baodao, 5July," X, July 7, 2022, https://x.com/lylegoldstein/status/1545090118721146880?s=20; and CCTV7 *Military Report* [军事报道], March 13, 2023, still image at Lyle Goldstein (@LyleGoldstein), "Some chest thumbing on Chinese mil news. CCTV7, Junshi Baodao, 13Mar," X, March 13, 2023, https://x.com/lylegoldstein/status/1635450419399868416?s=20.

[105] "A Flotilla of Army Helicopters Joins Attack on Karbala," *Washington Post*, March 28, 2003, https://www.washingtonpost.com/archive/politics/2003/03/29/a-flotilla-of-army-helicopters-joins-attack-on-karbala/3b318b62-7251-406f-b762-2cf0e8822df1/.

[106] Liam Collins, Michael Kofman, and John Spencer, "The Battle of Hostomel Airport: A Key Moment in Russia's Defeat in Kyiv," War on the Rocks, August 10, 2023, https://warontherocks.com/2023/08/the-battle-of-hostomel-airport-a-key-moment-in-russias-defeat-in-kyiv/.

[107] Collins, Kofman, and Spencer, "The Battle of Hostomel Airport."

[108] See, for example, "Taiwan," Top 100 Golf Courses, https://www.top100golfcourses.com/golf-courses/asia/taiwan.

[109] The CSIS 2023 Taiwan wargame report suggests that PLA heliborne assault is only a concern for the "extreme west of Taiwan." Cancian, Cancian, and Heginbotham, "The First Battle of the Next War…" 48. That assumption could be far too optimistic in Taiwan's favor given that recent sources explain China's helicopter fleet has been purpose-built with the range for the "sea crossing" [跨海作战] mission in mind. See Yin He [银河], "Development Prospect of China's Heavy Armed Helicopter" [中国发展重型武装直升机的前景探讨], *Shipborne Weapons* [舰载武器], October 2022, 21. In that article, the range for the Z-10 attack helicopter, for example, is given as in excess of 800 kilometers, and the Taiwan Strait is just 160–250 kilometers wide. Not only are Chinese helicopters regularly training in the coastal zone, but they are practicing with expendable fuel tanks. See report from military news CCTV7, *Military Report* [军事报道], July 5, 2022.

[110] See, for example, David Codrea, "Taiwan 'Gun Control' Means Firearms Training Too Little Too Late," Firearmsnews.com, June 8, 2023, https://www.firearmsnews.com/editorial/taiwan-gun-control/474681#:~:text=%E2%80%9CIn%20Taiwan%2C%20civilians%20are%20not,the%20University%20of%20Sydney%20corroborates.

[111] Interview with Paul Huang, Harvard Fairbank Center Visiting Fellow, February 12, 2024. Huang additionally stated that most of Taiwan's MANPADS are currently truck-mounted, suggesting that they could be more easily targeted by attacking Chinese forces.

[112] See, for example, picture, *PLA Daily* [解放军报], August 2, 2022, 2, http://81.cn/jfjbmap/content/2022-08/12/node_3.htm.

[113] Chinese helicopter assault and parachute operations are regularly reported in Chinese military news on CCTV7 Military Report [[军事报道]]. Chinese Air Force parachute operations were reported out on November 15, 2021, January 8, 2022, and May 3, 2022. Chinese Navy training for heliborne assault was reported on December 8, 2021, February 16, 2022, March 22, 2022, and April 22, 2022. Chinese ground forces parachute and heliborne assault training was reported with greatest frequency on October 24,

November 8, November 29, December 4, December 7, December 10, and December 16, 2021, as well as on January 21, February 19, February 23, March 24, April 5, April 7, April 15, April 20, April 21, and May 28, 2022.

[114] See, for example, Wang Hongwei and Gao Kai [王宏伟, 高凯], "Black Hawk Down in Mogadishu" [黑鹰坠落摩加迪沙], *China National Defense Report* [中国国防报], March 25, 2021, http://www.81.cn/gfbmap/content/2021-03/25/content_285613.htm. The increasing importance of stealth characteristics for helicopters are discussed in detail in "Envisioning America's Next Generation Armed Reconnaissance Helicopter" [展望美国下一代武装侦察直升机], *China National Defense Report* [中国国防报], April 26, 2022, 4.

[115] Xuan Feng [选锋], "From Repeated Losses to 'NATO Tank Killer': How the Ka-52 Realized Its Battlefield Reversal" [从迭遭损失到'北约坦克杀手': 卡-52如何实现战场逆袭], *Ordnance Knowledge* [兵器知识], November 2023, 44–46. On the increasing effectiveness of Russian electronic warfare in the Ukraine war, see "Russia Is Starting to Make Its Superiority in Electronic Warfare Count," *Economist*, November 23, 2023, https://www.economist.com/europe/2023/11/23/russia-is-starting-to-make-its-superiority-in-electronic-warfare-count. That article notes that such Russian EW techniques are "likely to be passed onto the Chinese."

[116] See, for example, CCTV7, *Military Report* [军事报道], May 19 and May 23, 2022, and June 2 and June 25, 2022.

[117] Lyle Goldstein and Nathan Waechter, "With China in Mind, China Observes Attack Helicopter Operations in Ukraine," *Diplomat*, May 15 2023, https://thediplomat.com/2023/05/with-taiwan-in-mind-china-observes-attack-helicopter-operations-in-ukraine/.

[118] An incomplete listing of Chinese military press reporting on amphibious exercises in 2022 would include: CCTV7, *Military Report* [军事报道], January 2, February 27, and May 7; *China Military Net* [中国军网], January 31, March 1, March 17, April 27, and May 26; and *PLA Daily* [解放军报], January 27, 4; February 17, 1; February 21, 4; March 14, 5; April 7, 1; April 13, 2; April 16, 1; April 19, 1; April 20, 2; April 24, 1; April 28, 2; May 8, 1; May 13, 1; May 18, 1; May 20, 1; May 25, 3; and June 7, 4.

[119] "Report on Military and Security Developments…" 2022, https://navyleaguehonolulu.org/maritime-security/ewExternalFiles/2022-military-and-security-developments-involving-the-peoples-republic-of-china.pdf.

[120] "Military and Security Developments…" 2024, 57.

[121] The Chinese PLA wields roughly 15 brigades of special forces soldiers. John Chen and Joel Wuthnow, "Chinese Special Operations in a Large-Scale Island Landing," Chinese Maritime Report no. 18 (Newport, RI: U.S. Naval War College, 2022) 6, https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1017&context=cmsi-maritime-reports. In this report, these forces are compared to the U.S. Army Rangers. Assuming they have similar-style brigades (regiments), then each of these brigades may have roughly 3,500 soldiers. Aside from the Chinese military, Beijing can also draw upon extensive special forces groups in its half-million strong People's Armed Police. See, for example, Lyle Goldstein, "Chinese People's Armed Police (PAP) commando unit trains for counter-terrorism CCTV7, Junshi Baodao, 16June," X, June 17, 2022, https://x.com/lylegoldstein/status/1537964800189247488.

[122] Notably, Chinese strategists have taken lessons from the Gallipoli and Dieppe failures. See Zhang Chao [张超], "A Review and Lessons from the Gallipoli Campaign" [加里波利战役回顾与启示], *Military History* [军事历史], no. 3 (2016), 27–30; and also Qian Feng and Deng Yunsheng [钱 锋, 邓云生], "Victory Made with Blood: From Dieppe to Normandy" [鲜血铸就的胜利—从迪耶普到诺曼底], *Military Digest* [军事文摘], no. 9 (2019), 57–61.

[123] In addition, urban warfare is a very common theme in Chinese military exercises. See, for example, reporting in CCTV7, Military Report [军事报道], January 14, June 16, July 12, October 13, and December 4, 2022.

[124] "China Wins Number-One Rank in Annual Shipbuilding Orders for 2021," *Maritime Executive*, January 3, 2022, https://maritime-executive.com/article/china-wins-number-one-rank-in-annual-shipbuilding-orders-for-2021.

[125] If China made very overt preparations for an all-out amphibious attack, that would likely cause Taiwan to undertake major preparations, such as radically increasing its defense budget, and this would make the attack harder from the PLA point of view. Indeed, Chinese strategists are well aware that deception was a key part of the Allies' success in the Normandy invasion. Peng Xunhou [彭训厚], "An Unprecedented Large-scale Landing Campaign: Comment on the Landing in Normandy" [史无前例的大规模登陆战役—诺曼底登陆战役述评], *Military History* [军事历史], no. 1 (2008), 31–33. That point is further discussed in Lyle Goldstein, "The Hard School of Amphibious Warfare: Examining the Lessons of the 20th Century's Amphibious Campaigns for Contemporary Chinese Strategy," *Asian Security*, December 1, 2022, 5, 8, 10, https://www.tandfonline.com/doi/full/10.1080/14799855.2022.2148525.

[126] "Military and Security Developments…" 2024, 131, 164.

[127] "Report on Military and Security Developments…" 2022, 131. This phrasing was removed from the DOD's 2023 report, where the focus shifted to recent improvements.

[128] "Taiwan Adds Minelaying Ships to Defenses against China," Defense News, January 14, 2022, https://www.defensenews.com/naval/2022/01/14/taiwan-adds-minelaying-to-defenses-against-china/.

[129] On the issue of possible land mine use in a Taiwan scenario, see Lyle Goldstein and Nathan Waechter, "Landmines in Ukraine: Lessons for China and Taiwan," *Diplomat*, September 26, 2023, https://thediplomat.com/2023/09/landmines-in-ukraine-lessons-for-china-and-taiwan/.
[130] See, for example, Lyle Goldstein, "Chinese "82nd Army organized an engineering unit to conduct mine-laying and obstacle-clearing training..." X, October 11, 2024, https://x.com/lylegoldstein/status/1844812277293203719.
[131] Eric Gomez and Benjamin Giltner, "Taiwan Arms Backlog, June 2024: First Arms Sales to the Lai Ching-te Administration and New Information about Delays," Cato Institute, July 9, 2024, https://www.cato.org/blog/taiwan-arms-backlog-june-2024-first-arms-sales-lai-ching-te-administration-new-information.
[132] *The Military Balance 2024*, 315.
[133] *The Military Balance 2024*, 315; and "Military and Security Developments..." 2024, 164.
[134] *The Military Balance 2024*, 315.
[135] *The Military Balance 2024*, 315; "Military and Security Developments..." 2024, 164.
[136] Lawrence Chung, "Taiwan Unveils 'Suicide' Drone at Arms Expo as Taipei Expands Military Spending," *South China Morning Post*, August 15, 2019, https://www.scmp.com/news/china/military/article/3022935/taiwan-unveils-suicide-drone-arms-expo-taipei-expands-military.
[137] Cancian, Cancian, and Heginbotham, "The First Battle..." 3, 122.
[138] For details about the number of Harpoon missiles delivered to Taiwan, see Shirley A. Kan, *Taiwan: Major U.S. Arms Sales Since 1990*, CRS Report No. RL30957 (Washington, DC: Congressional Research Service, 2014), 56–59, https://sgp.fas.org/crs/weapons/RL30957.pdf; "Trade Registers," Stockholm International Peace Research Institute, https://armstrade.sipri.org/armstrade/page/trade_register.php. For details about the number of Harpoon missiles approved for sale though not delivered to Taiwan, see "Taipei Economic and Cultural Representative Office in the United States (Tecro) – Rgm-84l-4 Harpoon Surface Launched Block II Missiles," Defense Security Cooperation Agency, October 26, 2020, https://www.dsca.mil/press-media/major-arms-sales/taipei-economic-and-cultural-representative-office-united-states-17; "Contracts For March 2, 2022," U.S. Department of Defense, March 2, 2022, https://www.defense.gov/News/Contracts/Contract/Article/2952403/; "Taipei Economic and Cultural Representative Office in the United States – Agm-84l-1 Harpoon Block II Missiles," Defense Security Cooperation Agency, September 2, 2022, https://www.dsca.mil/press-media/major-arms-sales/taipei-economic-and-cultural-representative-office-united-states-agm; Keoni Everington, "Taiwan-US seal deal for 160 Sidewinder, Harpoon, and long-range missiles worth US $1.4 billion," Taiwan News, January 2023, https://www.taiwannews.com.tw/en/news/4777553; Shivani Tanna, "Taiwan to buy 400 US anti-ship missiles to face China threat," Reuters, April 17, 2023, https://www.reuters.com/world/asia-pacific/taiwan-buy-400-us-anti-ship-missiles-face-china-threat-bloombergnews-2023-04-17/; Ronald Watkins, "Boeing Wins $1.17B US Navy Contract for Harpoon Block 2 Missiles," *Defense Post*, April 11, 2023, https://www.thedefensepost.com/2023/04/11/boeing-harpoon-missile-award.
[139] Akhil Kadidal & Rahul Udoshi, "Taiwan progresses air-launched version of HF-III anti-ship missile," *Janes*, March 3, 2025, https://www.janes.com/osint-insights/defence-news/defence/taiwan-progresses-air-launched-version-of-hf-iii-anti-ship-missile; "Taiwan Navy unveils Hsiung Feng III missile road-mobile launcher carrier," Naval-Technology.com, August 15, 2013, https://www.naval-technology.com/news/newstaiwan-navy-hsiung-fengiii-missile/.
[140] Brent Eastwood, "Taiwan Has Big Plans for Its Missiles Should China Invade," Sandboxx, August 4, 2022, https://www.sandboxx.us/blog/taiwan-has-big-plans-for-its-missiles-if-china-were-to-invade/ (originally published on 1945.com).
[141] Reporting in fall 2024 reveals that Chinese strategists are, in fact, closely tracking the movement of Taiwan's truck-mounted anti-ship missiles. See Paul Huang, "Taiwanese Missile Positions Are Giving Away Their Positions to China," Foreign Policy, October 21, 2024, https://foreignpolicy.com/2024/10/21/taiwan-missiles-osint-china-war/. Moreover, Chinese strategists are studying Ukraine's use of anti-ship missiles against the Russian Black Sea Fleet. See, for example, Zhang Xuanguang [张绚光], "Lost Glory: The Sinking of Russia's Black Sea Flagship *Moskva"* [失落的光荣: 详析俄罗斯黑海舰队旗舰 '莫斯科'号的沉没], *Shipborne Weapons* [舰载武器], June 2022, 10–22.
[142] "Military and Security Developments..." 2024, 165.
[143] *Military Balance 2024*, 258.
[144] "2022 Report on Military and Security..." 129.
[145] "2022 Report on Military and Security..." 129.
[146] "2023 Report on Military and Security..." 136.
[147] *The Military Balance 2024*, 258.
[148] See, for example, Christopher A. Lawrence, "The Load on PLA Amphibious Assault Ships," Depuy Institute, December 3, 2024, https://dupuyinstitute.org/2024/12/03/the-load-on-pla-navy-amphibious-assault-ships/.
[149] Cancian, Cancian, and Heginbotham, "The First Battle..." 65.
[150] Cancian, Cancian, and Heginbotham, "The First Battle..." 98.
[151] "2023 Report on Military and Security..." 144.

[152] On the maritime militia, see, for example, Gregory Poling, Tabitha Grace Mallory, and Harrison Pretat, "Pulling Back the Curtain on China's Maritime Militia," Center for Strategic and International Studies, November 2021, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/211118_Poling_Maritime_Militia.pdf?Y5iaJ4NT8eITSlAKTr.TWxtDHuLIq7wR.
[153] "Military and Security Developments..." 2024, 76–77.
[154] These calculations are based on conservative assumptions that are as follows: the CCG has well over 500 vessels. If just 300 of these ships each carry an average of 100 combat personnel, making one transit per day and losing 20 percent due to combat losses during each transit, that would yield more than 70,000 troops in four days. *The Military Balance 2024*, 263. Likewise, the Chinese PLA Ground Forces have their own fleet of coastal patrol vessels and landing craft that number over 250. *The Military Balance 2024*, 256. If just 200 of these boats each carry an average of 80 combat personnel, making one transit per day and losing 20 percent due to combat losses during each transit, that would yield more than 50,000 troops in one week.
[155] For example, the PLAN conducted exercises with mine-countermeasures (MCM) ships in December 2022. CCTV7, *Military Report* [军事报道], December 6, 2022.
[156] On the unmanned mine clearance boat, see "Obstacle Clearance Unmanned Vessel of the Chinese Ground Forces" [中国陆军无人破障艇], *Naval and Merchant Ships* [舰船知识], January 2021, folded insert. A heavy mine-clearing robot for use against land mines was profiled in CCTV7, Military Report [军事报道], August 19, 2022.
[157] Jonathan Dorsey, Kelly A. Grieco, and Jennifer Kavanagh, "Delay, Disrupt, Degrade: Mine Warfare in Taiwan's Porcupine Defense," War on the Rocks, March 21, 2024, https://warontherocks.com/2024/03/delay-disrupt-degrade-mine-warfare-in-taiwans-porcupine-defense/. This article makes a good case that sea mines should be a priority for Taiwan's defense. However, the authors admit that Taiwan is very far from being able to execute this strategy at present and they also illustrate that putting thousands of sea mines into the water could take at least a week. They may also neglect the impact of China's preemptive targeting of Taiwan's mine-laying platform and storage areas, the scale and geography of China's amphibious assault, as well as new possibilities for robots to take up the mine-clearance mission. In the end, Western metrics, including with respect to mine clearance, may underestimate the PLA's willingness to take high losses in a Taiwan invasion.
[158] "Navy shows new ships' capabilities," *Taipei Times*, January 8, 2022, https://www.taipeitimes.com/News/taiwan/archives/2022/01/08/2003770971.
[159] Evidence of these early Chinese mine-countermeasure operations in Vietnam against U.S. sea mines are conspicuously displayed in the newly renovated Chinese Navy Museum in Qingdao, China, visited by the author on April 8, 2023. Meanwhile, Chinese peacekeepers are extremely active in international mine clearance operations, spearheading efforts, for example, in Lebanon for the UN. Hua Xia, "Chinese Peacekeepers in Lebanon Awarded Medal," Xinhua, June 17, 2020, http://www.xinhuanet.com/english/2020-06/17/c_139144410.htm.
[160] Chinese Navy mine clearance exercises were reported on in *PLA Daily* [解放军报] on February 16, 2022 and also September 21 and October 17, 2023; in *Military Report* [军事报道] on April 13 and December 21, 2022; and in *China Military Network* [中国军网] on July 25, 2023. Chinese sea mine demolition frogmen teams were also profiled in the eight-part documentary series released in August 2023 "Chasing the Dream." On that series, see, for example, Simina Mistreanu, "China Releases Documentary Showcasing Army's Ability to Attack Taiwan," Associated Press, August 6, 2023, https://apnews.com/article/china-taiwan-documentary-attack-invasion-chasing-dreams-4105d5f0bde59337d90f1e67d149b32c.
[161] Lei Lei, Zhang Yuan and Fan Lin [雷蕾, 张媛, 范霖], "Unmanned Surface Craft: Emerging on the Naval Battlefield" [无人水面艇：海战场上崭露头角], *PLA Daily* [解放军报], September 1, 2023, http://www.81.cn/szb_223187/szblb/index.html?paperName=jfjb&paperDate=2023-09-01&paperNumber=09, 9.
[162] See Lyle Goldstein, "Chinese Fisheries Enforcement: Environmental and strategic implications," *Marine Policy* 40 (2013), 189; "China," World Factbook, CIA, https://www.cia.gov/the-world-factbook/countries/china/#transportation.
[163] "Ningbo," Shipnext: the Shipping Platform, https://shipnext.com/port/ningbo-cnngb-chn.
[164] "2023 Report on Military and Security..." 28.
[165] "2023 Report on Military and Security..." 42.
[166] "D-Day Timeline," D-Day Story Museum, https://theddaystory.com/discover/d-day-timeline/.
[167] Michael Dahm and Conor Kennedy, "Civilian Shipping: Ferrying the People's Liberation Army Ashore," CIMSEC, September 9, 2021, https://cimsec.org/civilian-shipping-ferrying-the-peoples-liberation-army-ashore/.
[168] "New Hybrid Ro-Ro Ferry Launched in China for Finnlines," Maritime Executive, April 26, 2021, https://maritime-executive.com/article/new-hybrid-ro-ro-ferry-launched-in-china-for-finnlines.
[169] Thomas Shugart, "Mind the Gap: How China's Civilian Shipping Could Enable a Taiwan Invasion," War on the Rocks, August 16, 2021, https://warontherocks.com/2021/08/mind-the-gap-how-chinas-civilian-shipping-could-enable-a-taiwan-invasion/.
[170] "RO-PAX Ferry Vessels," Global Security.org, https://www.globalsecurity.org/military/world/china/stuft-ro-pax.htm.
[171] For further evidence that Chinese strategists are studying this problem, see "The Brilliant Setting Sun Outside Antwerp: The Sept 1944 German Retreat from the Scheldt Estuary" [安特卫普港外回光返照: 1944年 9 月德军的斯凯尔德河口撤退行动], *Weapon*[兵

器], March 2023, 90–98. In this author's own survey of Taiwan ports northeast and northwest of Taipei, very little evidence of defensive preparations or security forces was evident.

[172] See, for example, the extensive discussion in Dahm and Kennedy, "Civilian Shipping…"

[173] Mike Yeo, "China Reportedly Converted Civilian Ferries for Amphibious Assault Operations," Defense News, August 4, 2021, https://www.defensenews.com/naval/2021/08/04/china-reportedly-converted-civilian-ferries-for-amphibious-assault-operations/.

[174] The information from this paragraph is drawn from Chris Buckley, Christoph Koettl, and Agnes Chang, "China's New Barges Could Make a Tough Task Easier: Invading Taiwan," New York Times, April 1, 2025, https://www.nytimes.com/2025/04/01/world/asia/china-invasion-barges-taiwan.html; and H.I. Sutton, "China Suddenly Building Fleet of Special Barges Suitable for Taiwan Landings," Naval News, January 10, 2025, https://www.navalnews.com/naval-news/2025/01/china-suddenly-building-fleet-of-special-barges-suitable-for-taiwan-landings/.

[175] Ian Urbina, "How China's Expanding Fishing Fleet Is Depleting the World's Oceans," Yale Environment 360, 2020, https://e360.yale.edu/features/how-chinas-expanding-fishing-fleet-is-depleting-worlds-oceans.

[176] Ryan Martinson, "No Ordinary Boats: Cracking the Code on China's Spratly Maritime Militias," Center for International Maritime Security, May 17, 2021, https://cimsec.org/no-ordinary-boats-cracking-the-code-on-chinas-spratly-maritime-militias/.

[177] "2022 Report on Military and Security…" 57–58.

[178] "2022 Report on Military and Security…" 129.

[179] Cancian, Cancian, and Heginbotham, "First Battle…" 108. The 2023 CSIS Taiwan wargame estimate does include large RO-RO ferries, but nevertheless rejects Chinese employment of most civilian vessels and simultaneously the related use of small craft for ferrying troops based on the single example of Gallipoli. Yet that is a poor example to choose from given that it was plagued at all levels by poor intelligence, ad hoc preparation, dysfunctional command, and sub-standard execution. The Chinese, moreover, will not be landing in "rowboats," as the Allies did at Gallipoli. Overall, the PLA has strongly emphasized integration of military and civilian resources, so these problems have likely been solved, including with intensive training. For more, see Cancian, Cancian, and Heginbotham, 48, note 120, and 85, note 242.

[180] Cancian, Cancian, and Heginbotham, "First Battle…" 97.

[181] Cancian, Cancian, and Heginbotham, "First Battle…" 107.

[182] On the other hand, many successful military operations have been undertaken without full-scale rehearsals, for example the German invasions of Norway and France in 1940 or the UK campaign in the Falklands in 1983.

[183] An admittedly dated precedent for the large and sudden sortie of Chinese fishing vessels into a conflict zone, such as the Diaoyu/Senkaku zone in 1978. Hajime Hirose, "Japan's Effective Control of the Senkaku Islands," Sasakawa Peace Foundation, June 10, 2013, https://www.spf.org/islandstudies/research/a00005.html.

[184] "2023 Report on Military and Security…" 79.

[185] This entire paragraph is drawn from Henley, "Civilian Shipping and Maritime Militia," 2–4. For independent confirming evidence, see, for example, Lyle Goldstein, "America Cannot Ignore China's Military Logistics Modernization," *National Interest*, October 21, 2021, https://nationalinterest.org/blog/reboot/america-cannot-ignore-chinas-military-logistics-modernization-194807.

[186] See, for example, CCTV7, *Military Report* [军事报道], December 8, 2021; and January 2, March 24, March 28, May 2, May 11, May 19, and May 20, 2022. A June 2, 2022 segment is particularly significant, as it shows a truck transporting such assault boats going aboard a ferry.

[187] Jan Wilhelm, "PLA training with small landing crafts. Deploying from the cargo hold of civilian merchant marine. Similar to Hong Kong based vessel used to drone swarm US warship…" X, June 13, 2022, https://twitter.com/jan_von_wilhelm/status/1536402243670495232.

[188] To appreciate how such light craft are used by the U.S. Navy, see, for example, J.R. Potts, "F470 Zodiac: Combat Rubber Raiding Craft," Military Factory, August 22, 2019, https://www.militaryfactory.com/ships/detail.php?ship_id=F470-CRRC-Combat-Rubber-Raiding-Craft.

[189] "The New Type High Speed Patrol Vessel for China's Ground Forces" [中国陆军新型高速巡逻艇], *Naval and Merchant Ships* [舰船知识], January 2020, diagram insert. On this vessel, see also H.I. Sutton, "China Patrol Boat 928D," *Covert Shores*, September 19, 2020, http://www.hisutton.com/Chinese-Type-928D-Assault-Boat.html.

[190] Zhang Yilong [张亦隆], "Analysis of the PLA's Combat Capability against Taiwan" [解放军对台作战能力分析], *Naval and Merchant Ships* [舰船知识], July 2020, 23.

[191] *The Military Balance 2024*, 256, 259. Photos of some of these exercises are at: "516 'Jiujiang' Amphibious fire support ship," Global Security.org, accessed January 16, 2022, https://www.globalsecurity.org/military/world/china/jianghu-516.htm. Another approach that would allow the extensive use of medium-range rocket artillery would be for the PLA to seize the Penghu Island group as an initial move. That island group, comprised of 90 smaller islands of 141 square kilometers in area, could serve as an effective artillery "raft" located just 25 miles from the critical battleground of west-central Taiwan.

[192] Li Danyang, Wang Peng, and Wang Wenyue [李丹阳, 王鹏, 王文岳], "Guided Artillery Shells: Suitable for Hitting 'Point' and 'Surface'" [制导炮弹：打"点"击"面"两相宜], *PLA Daily* [解放军报], September 15, 2023, 9, http://www.81.cn/szb_223187/szbxq/index.html?paperName=jfjb&paperDate=2023-09-15&paperNumber=09&articleid=915313.
[193] Su Lei et al, "Simulation Deductions in the Battle of Motherland Reunification," 41.
[194] Carl Bialik, "The Challenge of Counting D-day's Dead," FiveThirtyEight, June 6, 2014, https://fivethirtyeight.com/features/the-challenge-of-counting-d-days-dead/.
[195] Michael Beckley, "The Emerging Military Balance in East Asia: How China's Neighbors Can Check Chinese Naval Expansion," *International Security* 42, no. 2 (fall 2017), 89.
[196] China's potential use of a massive armada of military and especially adapted civilian ships is a practice learned in part from the Falklands experience. On Chinese assessments of the Falklands campaign, see, for example, Han Dong and Kai Xiankui [韩冻 , 开先奎], "The Characteristics and Enlightenment of British Logistics Mobilization in the Falklands War" [马岛战争英国后勤动员特点及其启示], *Military Economic Research* [军事经济研究], no. 4 (2017), 12–16.
[197] As one description of the campaign that followed the June 1944 Normandy invasion puts it, "The main roads were almost bumper to bumper with vehicles… [It was a] a logistician's nightmare…." Lida Mayo, "Chapter 15: The Race Across France," in *The US Army in WW2: The Ordnance Department—Beachhead to Battlefront* (Washington, DC: U.S. Army Center of Military History, 1991), 262–263, https://history.army.mil/books/wwii/beachhd_btlefrnt/ChapterXV.html.
[198] CPT Michael Johnson and LTC Brent Coryell, "Logistics Forecasting and Estimates in the Brigade Combat Team," U.S. Army/Fort Benning, October 2016, https://www.benning.army.mil/armor/earmor/content/issues/2016/OCT_DEC/4Johnson-Coryell16.pdf.
[199] Cancian, Cancian, and Heginbotham, "First Battle…" 107.
[200] See, for example, "The Chinese Navy Marines' Use of Light Tanks" [中国海军陆战队轻型坦克作战使用], *Naval and Merchant Ships* [舰船知识], April 2021, insert; and also Goldstein, "Beijing's Military Experts Are Putting a Microscope…"
[201] Samuel Cranny-Evans, "Details Emerge of New Chinese Armoured Breaching Vehicle," *Janes*, November 26, 2019, https://www.janes.com/defence-news/news-detail/details-emerge-of-new-chinese-armoured-breaching-vehicle.
[202] All these types of operations are amply evident in Chinese military media, but see, for example, *Military Report* [军事报道], January 23, April 28, and July 26, 2022, and December 24, 2021.
[203] On PLA folding rifles for urban warfare, see Military Report [军事报道], December 7, 2021. On the relatively new PLA grenade launcher, see Chen Zhiqi and Zhao Baiquan [陈志奇, 赵百全], "A Shock-oriented Sniper Grenade Launcher" [震慑敌胆的狙击榴弹炮], *Ordnance Science and Technology* [兵工科技] 10 (2022), 69–75.
[204] Cancian, Cancian, and Heginbotham, "First Battle…" 123.
[205] Cancian, Cancian, and Heginbotham, "First Battle…"109.
[206] See, for example, Andrew Kramer, "How a Line of Russian Tanks Became an Inviting Target for Ukrainians," *New York Times*, March 15, 2022, https://www.nytimes.com/2022/03/11/world/europe/ukraine-kyiv-russia-fighting.html. See also, "Urban Warfare 'Nightmare' Looms if Russia Enters Ukraine's Cities," AFP, March 9, 2022, https://www.france24.com/en/live-news/20220309-urban-warfare-nightmare-looms-if-russia-enters-ukraine-cities.
[207] Taiwan's population density is 673 per square kilometer. That is nearly double the density of Japan or the Philippines, for example. See also "Population Density," World Bank, https://data.worldbank.org/indicator/EN.POP.DNST?locations=Z4&most_recent_value_desc=false.
[208] Taiwan's mountainous terrain does preclude large-scale maneuver warfare by armored formations, but Chinese forces could use the mountainous terrain to their advantage. For example, they could choose isolated mountain villages as relatively safe base areas to assemble airborne troops. Moreover, troops assembling in such isolated mountainous areas would be in an advantageous position to strike suddenly against key roads or even to assault cities and bases from the rear. On PLA proficiency in the mountain warfare campaign of the Sino-Indian War, see Cheng Feng and Larry M. Wortzel, "PLA Operational Principles and Limited War: the Sino-Indian War of 1962," in Mark Ryan, David Finkelstein, and Michael McDevitt (eds.), *Chinese Warfighting: the PLA Experience Since 1949* (Armonk, NY: M.E. Sharpe, 2003) 173–197. Mountain warfare training is reported on almost daily in PLA news media. Some recent examples include *Military Report* [军事报道], March 26, and May 23–24, 2022.
[209] Su Lei et al, "Simulation Deductions in the Battle of Motherland Reunification," 43.
[210] Su Lei et al, "Simulation Deductions in the Battle of Motherland Reunification," 33.
[211] Su Lei et al, "Simulation Deductions in the Battle of Motherland Reunification," 42.
[212] "Taiwan Army Training on First M1A2T Abrams Delivered in June," Army Recognition, September 13, 2022, https://armyrecognition.com/defense_news_september_2022_global_security_army_industry/taiwan_army_training_on_first_m1a2t_abrams_delivered_in_june.html. For more on anti-tank tactics and drills, see, for example, CCTV7 *Military Report* [军事报道], October 27 and November 22, 2021 and July 26, 2022.

[213] See, for example, a special issue of this Chinese defense magazine devoted to infantry-deployed anti-tank weapons in the Ukraine war in *Weapon* [兵器], January 2023, 40–66.
[214] Liu Xuanzun, "Man-portable HJ-12 anti-tank missile makes PLA debut in Tibet," *Global Times*, July 25, 2021, https://www.globaltimes.cn/page/202107/1229590.shtml.
[215] Huizhong Wu, "Military Reserves, Civil Defense Worry Taiwan, as China Looms," Associated Press, September 4, 2022, https://apnews.com/article/russia-ukraine-taiwan-china-taipei-0ac81227d1fe37822b8a1d084119e248.
[216] Cancian, Cancian, and Heginbotham, "First Battle…" 75.
[217] Goldstein, "Beijing's Military Experts are Putting a Microscope…"
[218] "Nearly Half of Mariupol Has Suffered Grave Damage," *Economist*, April 23, 2022, https://www.economist.com/graphic-detail/2022/04/23/nearly-half-of-mariupol-has-suffered-grave-damage.
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[220] Mike Yeo, "What's Preventing Taiwan from Preparing for War?" Defense News, March 1, 2021, https://www.defensenews.com/global/asia-pacific/2021/03/01/whats-preventing-taiwan-from-preparing-for-potential-war/.
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[222] "Taiwan's Army 'Ill-prepared' for Chinese Attack," *Deutche Welle*, April 5, 2021, https://www.dw.com/en/taiwans-army-ill-prepared-for-potential-chinese-attack/a-57102659.
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