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Wargaming a Chinese Blockade of Taiwan

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Acknowledgments

This report is funded by a grant from the Smith-Richardson Foundation. The Diana Davis Spencer Foundation provided support for additional game iterations and research.

Chris Park (CSIS) and Grace Deri (CSIS) were instrumental in helping to run the wargames and contributed substantially to the research and report writing. Elisha Clark, Emily Ezratty, Shoshana Gevelber, Kaylin Nolan, and Bridget Will helped with research and running wargame iterations. Brandon Schwartz contributed the legal analysis. Dr. Gabe Collins (Rice University) developed the initial energy analysis. Dr. Collins and Dr. Bonny Lin (CSIS) read the draft report and provided valuable comments.

The authors thank the many wargame players who took a day out of their busy schedules to participate in a game iteration. They not only played the game, thus providing the data on which this report is based, but also provided constructive feedback to identify strategic insights arising from the gameplay. Finally, the authors thank the working group members and many experts interviewed—inside and outside CSIS—who answered questions, critiqued the methodology and emerging results, and provided valuable comments. The contributions of these participants and discussants improved the research and final report, but the content presented here, including any errors, remains solely the responsibility of the authors.

Acronyms and Abbreviations

ASCM – Antiship cruise missile

ASW – Antisubmarine warfare

CCG – Chinese Coast Guard

CGA – Coast Guard Administration (Taiwan)

CTL – Constructive total loss

DOD – Department of Defense

INDOPACOM – U.S. Indo-Pacific Command

ISR – Intelligence, surveillance, and reconnaissance

JASSM – Joint Air-to-Surface Standoff Missile

JASSM-ER – Joint Air-to-Surface Standoff Missile - Extended Range

LNG – Liquefied natural gas

LRASM – Long-Range Anti-Ship Missile

MARAD – U.S. Maritime Administration

MPA – Maritime patrol aircraft

MSA – Maritime Security Administration

MSP – Maritime Security Program

NDRF – National Defense Reserve Fleet

NGO – Nongovernmental organization

PAFMM – People's Armed Forces Maritime Militia

PLA – People's Liberation Army

PLAN – People's Liberation Army Navy

PRC – People's Republic of China

ROCAF – Republic of China Air Force

ROCN – Republic of China Navy

ROE – Rules of engagement

RRF – Ready Reserve Force

SAG – Surface action group

SIGINT – Signals intelligence

SSG – Guided-missile submarines

SSGN – Nuclear-powered guided missile submarine

SSN – Nuclear-powered attack submarines

STS – Ship-to-ship

TOW – Taiwan Operational Wargame

TRANSCOM – U.S. Transportation Command

TSP – Tanker Security Program

VBSS – Visit, board, search, and seizure

VISA – Voluntary Intermodal Sealift Agreement

Contents

Executive Summary

The year is 2028. Xi Jinping decides, whether because of a long-held plan, internal pressures, or some provocative act by Taiwan, that China needs to apply coercive leverage against Taiwan to change the status quo. He turns to his advisers for options. There are purely economic measures, such as sanctions, but their effects are unreliable and work slowly. In the military sphere, the most dangerous course of action would be invasion: It promises a decisive resolution but risks dramatic defeat. At the other end of the spectrum, China could seize outlying Taiwanese islands, but this might simply push Taipei farther away and draw the United States into closer alignment with Taiwan.

Another alternative, which Xi ultimately decides on, is a blockade in which China attempts to stop shipping headed for Taiwan. Xi orders the China Coast Guard and People's Armed Forces Maritime Militia to positions around Taiwan, claiming that this is an internal law enforcement matter. After China boards and seizes several ships, commercial traffic to Taiwan ceases. The action disrupts international trade and the world economy. Taiwan rejects China's legal arguments and decides to resist. What are Taiwan's military options? Would such a conflict escalate, and what would the military dynamics be at each point of escalation? What would happen to Taiwan's 23 million citizens? If the United States became directly involved, what would be its military role and prospects?

A potential blockade of Taiwan burst into the U.S. consciousness in 2022 when China showed its displeasure about then-Speaker of the House Nancy Pelosi's visit to Taiwan by surrounding the

island with missile impacts.[1] This report uses the term "blockade" to refer to any Chinese effort using ships, submarines, and aircraft to interdict maritime traffic to Taiwan, rather than as a legal term. For more details about the legal use of the term, refer to "Legal Aspects of Blockade" in Chapter 2. This appeared to simulate a quarantine or blockade. This possibility was not a surprise to regional experts or the Taiwanese themselves, who had long been aware of this threat.

The "joint blockade campaign" (联合封锁战役) is discussed extensively in Chinese doctrinal writing, and the People's Liberation Army (PLA) has signaled that it would consider such a campaign if it acts against Taiwan.[2] Such a blockade would not just affect China, Taiwan, and the United States. The disruption of international trade, particularly restrictions on computer chip production, would affect every country on the planet.

Given this political and security environment, it would be prudent to study all forms that a Chinese blockade of Taiwan could take in order to inform the policies of Taiwan, Japan, and the United States. Yet, there has been little agreement about what such a blockade would entail, and still less quantitative analysis of possible scenarios.

This report establishes a framework for understanding the range of blockade scenarios, analyzes them with a series of 26 wargames, and assesses the operational challenges that the respective parties would face in implementing and countering a blockade. The project does not argue that conflict, including a blockade, is inevitable or even necessarily likely. However, the project does argue that conflict is possible, given China's commitment to unification, by force if necessary, and its continuing military buildup. This report, therefore, concludes by proposing policy changes to better deter a blockade and to cope with one should it occur.

A Framework for Understanding a Blockade

In the project's framework, all scenarios start with a common set of assumptions about the background of conflict: Tensions between the United States and China have increased, with a focus on Taiwan policy. China seeks to resolve (or at least secure major concessions on) its Taiwan problem through a blockade. It establishes an exclusion zone and declares that all ships entering the zone must first stop at Chinese ports for inspection and approval. Ships that refuse are subject to search, seizure, and attack.

From there, scenarios diverge according to the escalation levels taken by China and the opposing coalition.

China has four escalation levels:

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1 This report uses the term "blockade" to refer to any Chinese effort using ships, submarines, and aircraft to interdict maritime traffic to Taiwan, rather than as a legal term. For more details about the legal use of the term, refer to "Legal Aspects of Blockade" in Chapter 2.

2 See, for example, the 2006 version of the Science of Campaigns, in which the Joint Blockade Campaign is one of only three joint campaigns that receive treatment in a separate chapter. 张玉良 (Zhang Yuliang), ed., 战役学 [Science of Campaigns], National Defense University Press, May 2006.

1. **Boarding:** China's nonmilitary forces—the China Coast Guard (CCG), Maritime Security Administration (MSA), and People's Armed Forces Maritime Militia (PAFMM)—attempt to board and seize merchant traffic to Taiwan without opening fire.
2. **Submarines and Mines:** China employs submarines and mines to interdict merchant traffic to Taiwan outside of Taiwan's territorial waters but within the international waters of the exclusion zone.
3. **Offshore Kinetic:** China employs overt force against merchant ships and escorts outside of Japan's or Taiwan's territorial waters but within the exclusion zone.
4. **Wider War:** The PLA uses overt force not only in the exclusion zone but also against Taiwan itself, the United States, and, potentially, Japan.

Taiwan and the United States also have four escalation levels:

1. **Taiwan Constrained:** Taiwan restricts its use of military force to its territorial waters and contiguous zone.
2. **Taiwan Assertive:** Taiwan allows its military to attack Chinese forces that have attacked or attempted to board merchant ships within the exclusion zone.
3. **U.S. Constrained:** The United States aids an assertive Taiwan with forces that engage in direct combat with the PLA within the exclusion zone.
4. **Wider War:** The United States attacks PLA forces outside the exclusion zone, including on the Chinese mainland.

Combining the Chinese and U.S./Taiwan escalation ladders produces a matrix (Table ES.1) that describes a range of plausible scenarios ranging from a blockade using only Chinese nonmilitary forces against a constrained Taiwan to a wider war between China and a U.S.-led coalition using all conventional means at their disposal. To examine sensitivity to key variables, the project also explores some variation of assumptions within cells. Blacked-out cells were uninteresting because of the imbalance of forces. Twenty-one game iterations were played using the scenarios and variations within them.

These dyads, or cells in the matrix, are useful analytic snapshots, but it is unlikely that a real-world blockade would stay solely within one of them. There would be escalations and, hopefully, de-escalations. However, examining these dyads separately—without escalation or de-escalation—allows for a more complete assessment of dynamics and advantage at each level of conflict and, therefore, the military incentives for escalation that the respective commanders and political leaders might face under those circumstances.

To better understand escalation dynamics, the project also conducted five free-play iterations to see how players approached the problem when there were no constraints on escalation levels. Thus, there were a total of 26 game iterations.

To analyze these scenarios, the project developed models and simulations that fit into three modules, each answering a critical question:

Table ES.1: Scenario Matrix Based on Escalation Levels

Chinese Escalation Level	Coalition Escalation Level 1: Taiwan Constrained	2: Taiwan Assertive	3: U.S. Constrained	4: Wider War
1 Boarding	1x1 Base 1x1 Prepared w/CGA	1x2 Base		
2 Subs and Mines	2x1 Base	2x2 Base 2x2 Prepared 2x2 Prepared w/ Ukrainian-Style Aid	2x3 Base	
3 Offshore Kinetic		3x2 Base	3x3 Base 3x3 Prepared 3x3 Japan Out 3x3 Enhanced Chinese Missiles	3x4 Base
4 Wider War		4x2 Base	4x3 Base 4x3 Hardened	4x4 Base 4x4 Prepared 4x4 Hardened 4x4 Enhanced Chinese Missiles

Source: CSIS Defense and Security Department.

1. **What merchant ships are available for transit to Taiwan?** This module identified ships the United States and Taiwan could call upon to run the blockade and the timeline for their availability.
2. **How much cargo gets through to Taiwan?** The games used three systems depending on China's escalation level:
   - ISR and Intercept modeled how many ships would get through a Chinese blockade at lower escalation levels.
   - Convoy Battle modeled Chinese attacks on convoys and the defense of convoys by Taiwanese, U.S., and, in some scenarios, Japanese forces.
   - The Taiwan Operational Wargame (TOW), developed for the earlier *First Battle of the Next War* project, modeled the Wider War scenarios.[3]
3. **What is the effect of cargo arrivals on Taiwan's economy and society?** This module has three elements—imports, economic outputs, and effects on Taiwanese society—and calculates these for each week of the blockade.

3 Mark F. Cancian, Matthew Cancian, and Eric Heginbotham, "Chapter 3: Building the Taiwan Operational Wargame," in *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan* (Washington, DC: CSIS, January 2023), 40–52, https://www.csis.org/analysis/first-battle-next-war-wargaming-chinese-invasion-taiwan.

Project Focus and Scope Conditions

The Taiwan blockade problem is understudied, and this report is not intended to answer all questions. The analysis focuses on the operational problems faced in implementing and countering a blockade, as well as the immediate material impact on Taiwan. To provide context, the literature review section summarizes legal issues associated with blockades, the broader global economic impact that a blockade might have, and illustrative examples of historical blockades.

Several scope conditions also apply. China has decided on a blockade of the island of Taiwan. The project discusses but does not make conclusions about the political and legal debates that would shape the world's reaction; rather, this project uses scenario variants to explore alternative assumptions about these debates. Taiwan resists. Conflict is limited to conventional domains, and nuclear use is excluded. Finally, there is no use of classified data to allow for the broadest possible dissemination and discussion of the report's findings.

Wargame Results

The project ran 26 wargames. The project did not assign winners or losers; instead, the results specify (1) military losses, (2) how much materiel gets through the blockade to Taiwan, and (3) the impact of those levels of imports on Taiwan's economy and society. Readers can weigh these results against other societal, diplomatic, and economic pressures on the respective actors to judge political outcomes.

Five broad themes emerge from the wargame results:

1. **Almost all scenarios entail casualties.** Even at lower levels of escalation, casualties were in the thousands. At higher escalation levels, the United States lost hundreds of aircraft and dozens of warships. As in the invasion scenario examined in the earlier *First Battle of the Next War* project, the lack of air base hardening proved a critical U.S. weakness in the scenarios involving a wider war.[4] China's losses were also high and were often higher than those of the United States.
2. **Any blockade creates escalatory pressures that are difficult to contain.** In most free-play games, despite a reluctance to escalate, teams responded to perceived escalations with minor escalations of their own and in two games spiraled to a general war. In fixed-escalation games, most dyads produced high casualties and severe economic impacts on Taiwan. There was thus significant pressure on both sides to change the rules of the game and escalate, in turn putting pressure on their opponent.
3. **Taiwan requires U.S. intervention if China uses military force in a blockade.** While Taiwan's military was capable of defeating a nonmilitary effort by China (involving the CCG, MSA, and PAFMM), it struggled against even a limited Chinese military effort. Without U.S. intervention, China's submarines and mines destroyed 40 percent of inbound ships to Taiwan, even with a maximum effort by Taiwan's military and U.S. resupply of munitions

4 Ibid.

(as has been done for Ukraine). A "Ukraine strategy" was attractive but insufficient when applied to Taiwan because Taiwan's needs are too great and, in most scenarios, China's blockade was too tight. If China escalated to using military force, the United States had to accept a Taiwanese capitulation on China's terms or become directly involved in the conflict. With U.S. intervention, in most scenarios, convoys kept Taiwan supplied, but often at a huge cost.

Any blockade creates escalatory pressures that are difficult to contain.

4. **Energy and merchant ships are the critical shortfalls.** In all scenarios, natural gas ran out in about 10 days. Taiwan has substantial inventories of coal and oil, but eventually these ran out also if not resupplied (at 7 weeks and 20 weeks, respectively). Food was not a problem because of what Taiwan produces domestically, its large inventories, and the modest shipping requirements to make up shortfalls. Rapidly acquiring ships to run the blockade was critical because regular shipping companies would not take the risk of getting involved if China begins a blockade. Airlift, submarines, and small blockade runners were inadequate substitutes for cargo ships. These alternatives could provide only a small percentage of Taiwan's regular daily deliveries.
5. **A blockade is not a "low-cost, low-risk" option for China.** Casualties were high across almost all dyads, and the incentives for escalation were always present. Two free-play games reached maximum escalation, with U.S. missiles striking the Chinese mainland and Chinese missiles striking Guam and Japan. In these and other high-escalation scenarios, the combination of U.S. bombers launching standoff missiles, submarines operating offshore, and, to a lesser extent, U.S. tactical aircraft and surface ships proved devastating against Chinese military assets. Blockade was likewise not a good precursor to invasion because the aggressive action put other countries on alert and, in some cases, resulted in the loss of Chinese assets that would be needed in the event of invasion.

Recommendations: Preparing for and Countering a Blockade

This project does not take a position on the likelihood of Chinese military action or on whether the United States should defend Taiwan should Chinese military action occur. However, to the extent that the United States maintains even an ambiguous commitment to Taiwan, it should be prepared to act, should the president decide to do so. Based on the wargaming results and insights, the project developed a set of recommendations for decisionmakers. These recommendations have three goals: (1) to enhance deterrence by showing China that Taiwan and the United States are prepared and cannot be coerced, (2) to allow faster reaction times and produce more effective counter-operations in an emergency, and (3) to discourage other countries from pressuring

Taiwan to submit because they hope that a quick resolution would restart normal commerce. The recommended actions did not always thwart a blockade, but they would buy time for a diplomatic solution or outside intervention.

1. PREPARE THE MERCHANT FLEETS.

The number and type of merchant ships that arrive in Taiwan will largely determine material conditions on Taiwan, which will in turn shape the outcome of a blockade. Therefore, the most important measure for pre-conflict preparations is to increase the availability of merchant ships that can make the hazardous run into Taiwan.

- **Arrange for mobilization of Taiwanese-owned shipping.** The fleet of Taiwanese-*owned* ships is much larger than the fleet of Taiwanese-*flagged* ships. Therefore, Taiwan should ensure that all ships whose beneficial owners are Taiwanese are legally subject to requisition in an emergency.
- **Contract liquified natural gas (LNG) tankers into the Voluntary Intermodal Sealift Agreement (VISA) program and create a Taiwanese equivalent.** Because LNG tankers are the greatest shortfall in energy delivery, both the United States and Taiwan should acquire LNG tankers to hold in reserve for emergencies.
- **Make plans for managing war risk in the commercial sector.** In an emergency, both Taiwan and the United States will need to replace or supplement commercial insurance with guarantees, subsidies, or "reinsurance" to keep maritime and air traffic flowing.
- **Plan for transshipment in Japan, Guam, and Australia.** Because presumably only ships controlled by the coalition countries will travel to Taiwan during a blockade, there needs to be a place where commercial traffic can transfer cargo to coalition-controlled ships to make the shuttle run into Taiwan. Japan is preferable because it is closer and has excellent port facilities, although ports in Australia and Guam could help. The United States, Taiwan, Japan, and Australia should develop plans for such transshipment points in advance.

2. PREPARE TAIWAN'S ENERGY INFRASTRUCTURE.

Energy is the weakest element in Taiwan's resilience against coercion. The overwhelming preponderance of energy must be imported and is thus vulnerable to a blockade.

- **Increase Taiwanese energy reserves.** Taiwan has done a lot to enhance resilience, particularly with its reserves of oil and coal. Additional inventories could come from building more storage facilities or filling the existing logistics chains on the island before a crisis.
- **Maintain and expand resilient energy sources.** Taiwan has shifted its sources of energy from coal and nuclear to natural gas and renewables for environmental reasons, but this has greatly increased Taiwan's energy vulnerability. Taiwan should keep its last nuclear power plant open and capitalize on new technologies to produce safe nuclear energy.
- **Harden energy infrastructure.** Taiwan has already made its electrical system more resilient in the face of extreme weather conditions. More hardening is needed for national security reasons.

- **Expand plans for allocating resources on Taiwan.** To ensure the most effective response during an emergency, the Taiwanese government will need to control imports to focus on the most critical items and distribute them to activities with the greatest need. A free-for-all would reduce resilience and undermine the legitimacy of the government's response.

3. PREPARE CONTINGENCY PLANS FOR THE UNITED STATES TO ASSIST TAIWAN DURING A BLOCKADE.

In most scenarios, Taiwan cannot face China alone. If the United States wants to have the capability for keeping Taiwan autonomous and democratic in the face of a Chinese blockade, then it should have plans ready to support Taiwan at a variety of blockade levels.

- **Rebuild skills and prepare contingency plans to conduct convoys during a blockade.** The U.S. Navy is out of practice because convoys have not been a priority mission since the end of the Cold War. Rebuilding these skills will require wargames, training programs, and peacetime exercises with allies and partners. Rebuilding will also require peacetime planning for establishing a convoy system.
- **Make joint plans with allies and partners, especially Japan.** The United States will need the support of allies and partners in any conflict with China. Therefore, it should conduct planning now with allies and partners on possible blockade scenarios. Japan is critical in nearly all scenarios and deserves special attention. The United States also needs to align its other policies with its national security priority of competition with China. Otherwise, it may find that allies and partners hang back at the time of need.
- **Make contingency plans for an airlift and military resupply of Taiwan while recognizing the severe limitations of these options.** U.S. Transportation Command (TRANSCOM), in conjunction with U.S. Indo-Pacific Command (INDOPACOM), needs to have at least concept plans for an airlift, given the centrality of China in U.S. military planning. In conjunction with other measures, an airlift could potentially complicate China's blockade problem. The president might not execute an airlift or military resupply because of its high cost, political risks, and low deliveries, but TRANSCOM would be derelict in its duties if it did not have plans in place.

4. PREPARE TO COUNTER AND END A BLOCKADE.

If deterrence fails and the United States decides to counter a Chinese blockade, the United States, in coordination with Japan and Taiwan, must be prepared to respond based on plans made well in advance.

- **Do not treat a blockade like an invasion.** Countering a blockade differs from countering an invasion and requires different planning. For example, direct military action against Chinese forces could wait for a week or two until a military and diplomatic coalition can be established.
- **Provide Beijing with off-ramps.** The United States and Taiwan should develop a creative menu of offers and responses ahead of time that could allow China to declare victory and lift the blockade without extracting substantive concessions.

Observations Across Three Projects

This project is the third in a series of studies conducted by the authors on China's threat to Taiwan. In all, these projects have run over 70 wargame iterations covering dozens of scenarios, providing a broad view of what might happen in a U.S.-China conflict over Taiwan.

There are several common elements in the recommendations across the three projects:

- Even successful campaigns exact heavy casualties, such a conflict would be a shock to the United States, which, since the end of the Cold War, has been accustomed to fighting low-casualty wars with few losses of major weapons.
- Off-ramps are valuable because total victory is unachievable when both sides have a secure homeland and nuclear weapons.
- Strong military forces provide the United States with options and, combined with skilled diplomacy, contribute to deterrence.
- Military operational planning needs to include a broad scope of possible scenarios. Planning is a tool for better senior-level decisionmaking, not a statement of intent to wage war.
- Above all, the unexpected can happen. Although war with China is unlikely, it is not impossible, and unlikely events occur. Preparation is vital.

There are also some tensions between preparations for different contingencies. Preparing for a high-intensity conflict drives Taiwan to adopt a porcupine strategy that relies heavily on defensive systems like ground-based antiship missiles, ground-based air defenses, and sea mines. Countering blockades, on the other hand, requires surface ships, aircraft, and some offensive capabilities.

The bottom line across three projects: the United States in coordination with its allies and partners must be prepared to deter and, if necessary, fight a wide variety of scenarios. There is no magic bullet that can bring success across all scenarios. Instead, success requires a deep toolbox of capabilities.

1

Introduction

Why Wargame a Blockade of Taiwan?

What would happen if China initiated a blockade of Taiwan in the coming years? How could the United States, Japan, and Taiwan best prepare for such a contingency? What escalatory pressures would be created in such scenarios, and how could the United States and Taiwan best manage those pressures? This study aims to answer these questions using a series of wargames based on operations research to provide the U.S., Japanese, and Taiwanese defense communities with a shared framework for systematically analyzing this threat.

The Plausibility of Chinese Military Action Against Taiwan

Chinese military action against Taiwan in the coming years is plausible and deserves analysis for five reasons. First, China is increasingly dissatisfied with Taiwan's apparent commitment to separation and what it sees as trends running against unification (including in U.S. policy), and it has not ruled out the use of force. Second, U.S. policy has long emphasized opposition to unilateral changes to the status quo on Taiwan. Third, Chinese military capabilities continue to improve rapidly. Fourth, U.S. military and political officials have expressed alarm about the possibility of Chinese military action against Taiwan and how the United States could respond in such a scenario. Finally, the Taiwanese and Japanese defense communities are also concerned and have begun preparations for such a contingency.

CHINA'S COMMITMENT TO UNIFICATION WITH TAIWAN

Beijing regards Taiwan as an integral part of China. Recognizing what Beijing describes as the "One China" principle (and, in another form, what Washington describes as its "One China" policy) is a

precondition for diplomatic relations with the People's Republic of China (PRC). In an April 2023 press conference, Wang Wenbing, then a spokesman for China's Ministry of Foreign Affairs, blamed U.S.-China tensions on "'Taiwan independence' separatists . . . with the support and connivance of foreign forces" and said, "'Taiwan independence' and cross-Strait peace and stability are as irreconcilable as fire and water."[1] Foreign Minister Qin Gang was equally blunt in a statement made a month prior: "If the United States does not hit the brake but continues to speed down the wrong path . . . there will surely be conflict and confrontation, and who will bear the catastrophic consequences?"[2]

Beijing has not forsworn the possible use of force to resolve the "Taiwan issue." Beijing adopted its Anti-Secession Law in 2005, outlining circumstances in which it might employ force. Indeed, recent statements have been even more pointed. From China's perspective, U.S. measures such as the Taiwan Travel Act blur the line between unofficial and official diplomatic engagement with Taiwan, violating the terms of the Three Communiques.

China frequently conducts threatening military drills in response to unwelcome events as it did with missile tests off Taiwan after President Lee Teng-hui's 1995 visit to Cornell University and, more recently, with military exercises following House Speaker Nancy Pelosi's 2022 visit to Taipei and President Tsai Ing-wen's 2023 meeting in Washington, D.C., with House Speaker Kevin McCarthy.[3]

It is unclear if China would ever use military force against Taiwan and, if so, when that would be; however, it is plausible that China would take military action against Taiwan in the coming years given this rhetoric. This would place it in conflict with long-standing U.S. policy.

U.S. POLICY ON TAIWAN

The United States adheres to a One China policy and a strategy of strategic ambiguity that does not commit it to the defense of Taiwan. Nevertheless, it leaves open the strong possibility of intervention in the event of an attack on the island. The Taiwan Relations Act, which provides the most authoritative statement about U.S. interests with regard to Taiwan's future, does not commit the United States to intervention in the event of an attack. However, it stipulates that the United States would consider "any effort to determine the future of Taiwan by other than peaceful means" as "of grave concern."[4] Moreover, of interest to the question of quarantine and blockade, the definition of "other than peaceful means" explicitly includes "boycotts or embargoes." Another passage stipulates that "it is the policy of the United States . . . to maintain the capacity of the United

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1 "Foreign Ministry Spokesperson Wang Wenbin's Regular Press Conference on April 17, 2023," Ministry of Foreign Affairs of the People's Republic of China, April 17, 2023, https://www.mfa.gov.cn/eng/xw/fyrbt/lxjzh/202405/t20240530_11347505.html.

2 Phelim Kine, "China's new foreign minister slams U.S. 'malicious confrontation'," *Politico*, March 7, 2023, https://www.politico.com/news/2023/03/07/china-foreign-minister-malicious-confrontation-00085800.

3 For a recent assessment of Xi Jinping's policy toward China, as well as Taiwanese and U.S. responses, see Richard Bush, *Difficult Choices: Taiwan's Quest for Security and the Good Life* (Washington, DC: Brookings Institute, 2021).

4 *Taiwan Relations Act*, Pub. L. No. 96-8, 93 Stat. 14 (1979), https://www.congress.gov/bill/96th-congress/house-bill/2479/text.

States to resist any resort to force or other forms of coercion that would jeopardize the security, or the social or *economic system*, of the people on Taiwan."[5]

The United States would consider "any effort to determine the future of Taiwan by other than peaceful means" as "of grave concern."

Over the last 15 years, as the idea that the United States is engaged in a strategic competition with China has taken hold, Republican and Democratic administrations alike have increasingly emphasized a commitment to Taiwan's security. This embrace of Taiwan occurred due to growing concerns about the strategic positions of China and the United States in Asia. In 2011, the Obama administration announced it would "rebalance to Asia" and commit more military forces to the region. The 2015 National Military Strategy labeled China as a "revisionist power."[6] The 2017 National Security Strategy described China as a "strategic competitor."[7] The 2022 National Security Strategy called it "America's most consequential geopolitical challenge."[8]

Against this backdrop, it is perhaps not surprising that members of Congress from both parties have consistently pushed legislation for closer (though ostensibly still unofficial) relations with Taiwan. The Biden and Trump administrations have reaffirmed U.S. interest in Taiwan's security. On three separate occasions, Biden appeared to go beyond established U.S. policy and the provisions of the Taiwan Relations Act in describing a "commitment" to the defense of Taiwan.[9] For example, in 2022, he was asked by a reporter, "Are you willing to get involved militarily to defend Taiwan if it comes to that?" and he replied simply, "Yes . . . that's the commitment we made."[10]

The second Trump administration has not published its strategy documents, so its Taiwan policy has not been clearly articulated. However, several Trump officials are on the record as supporters

5 Ibid., emphasis added.

6 The White House, *National Security Strategy* (Washington, DC: The White House, February 2015), https://obamawhitehouse.archives.gov/sites/default/files/docs/2015_national_security_strategy_2.pdf.

7 The White House, *National Security Strategy* (Washington, DC: The White House, December 2017), https://trumpwhitehouse.archives.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf.

8 The White House, *National Security Strategy* (Washington, DC: The White House, October 2022), https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/10/Biden-Harris-Administrations-National-Security-Strategy-10.2022.pdf.

9 David Sacks, "While Pledging to Defend Taiwan from China, Biden Shifted on Taiwan Independence. Here's Why That Matters," Council on Foreign Relations, September 22, 2022, https://www.cfr.org/blog/while-pledging-defend-taiwan-china-biden-shifted-taiwan-independence-heres-why-matters; and Myah Ward, "Biden says U.S. has 'commitment' to defend Taiwan from Chinese attack," *Politico*, October 21, 2022, https://www.politico.com/news/2021/10/21/joe-biden-taiwan-chinese-attack-defend-516699.

10 Vincent Ni, "Joe Biden again says US forces would defend Taiwan from Chinese attack," *The Guardian*, September 19, 2022, https://www.theguardian.com/world/2022/sep/19/joe-biden-repeats-claim-that-us-forces-would-defend-taiwan-if-china-attacked.

of strengthening the U.S. commitment to Taiwan. Under Secretary of Defense for Policy Elbridge Colby, for example, argued that "the primary threat to core U.S. interests is that China could dominate Asia, and from that position atop more than half the global economy, undermine Americans' prosperity, freedom, and even security."[11] In *The Strategy of Denial*, he wrote that "If, for instance, the United States and any other participating states fail to defend Taiwan effectively and China can subjugate it, this would remove a key blocking point in the first island chain, add Taiwan's wealth and power to the pro-hegemonic coalition while removing it from the anti-hegemonic coalition, and weaken U.S. differentiated credibility."[12] In his confirmation hearings, he reiterated that "Taiwan's fall would be a disaster for American interests."[13] Colby has advocated pressing Taiwan to invest heavily in its defenses and increasing U.S. arms sales to Taiwan. Nonetheless, Colby has remained firm on strategic ambiguity, writing that "the costs of explicitly committing to Taiwan's defense outweigh its benefits."[14]

Secretary of Defense Pete Hegseth made a strong statement of support for Taiwan at the Shangri-La Dialogue in Singapore in May 2025:

> America is proud to be back in the Indo-Pacific—and we're here to stay. The United States is an Indo-Pacific nation. We have been since the earliest days of our Republic. We will continue to be an Indo-Pacific nation—with Indo-Pacific interests—for generations to come. . . .
>
> . . . Let me begin by saying, we do not seek conflict with Communist China. We will not instigate nor seek to subjugate or humiliate. President Trump and the American people have an immense respect for the Chinese people and their civilization. But we will not be pushed out of this critical region. And we will not let our allies and partners be subordinated and intimidated. . . .
>
> . . . To be clear: any attempt by Communist China to conquer Taiwan by force would result in devastating consequences for the Indo-Pacific and the world. There's no reason to sugarcoat it. The threat China poses is real.[15]

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11 Elbridge Colby, "A Strategy of Denial for the Western Pacific," U.S. Naval Institute, *Proceedings* 149, no. 3 (2023), https://www.usni.org/magazines/proceedings/2023/march/strategy-denial-western-pacific.

12 Elbridge Colby, *The Strategy of Denial: American Defense in an Age of Great Power Conflict* (New Haven, CT: Yale University Press, 2021).

13 U.S. Senate Committee on Armed Services, *Hearing to Consider the Nomination of Mr. Elbridge A. Colby to be Under Secretary of Defense for Policy*, 119th Cong., 1st sess., March 4, 2025, https://www.armed-services.senate.gov/imo/media/doc/30425fulltranscript.pdf.

14 Cheng Yu-chen and Matthew Mazzetta, "Taiwan should raise defense spending to 10% of GDP: Top Pentagon pick," Focus Taiwan, March 3, 2025, https://focustaiwan.tw/politics/202503050008.

15 Pete Hegseth, "Remarks by Secretary of Defense Pete Hegseth at the 2025 Shangri-La Dialogue in Singapore (As Delivered)," Department of Defense, May 31, 2025, https://www.defense.gov/News/Speeches/Speech/Article/4202494/remarks-by-secretary-of-defense-pete-hegseth-at-the-2025-shangri-la-dialogue-in/.

Secretary Hegseth's strategic guidance to the Department of Defense (DOD) reportedly gives the defense of Taiwan the highest priority.[16] In the 2025 Interim National Defense Strategic Guidance, Hegseth wrote, "China is the Department's sole pacing threat, and denial of a Chinese *fait accompli* seizure of Taiwan—while simultaneously defending the U.S. homeland is the Department's sole pacing scenario."[17]

Other senior administration officials have emphasized that the administration's stance on Taiwan and China remains unchanged. Secretary of State Marco Rubio said, "We have a longstanding position on Taiwan that we're not going to abandon, and that is: We are against any forced, compelled, coercive change in the status of Taiwan."[18] All of these policy statements come in response to China's rapidly increasing military capabilities, which make a "forced, compelled, coercive change" potentially more feasible.

President Trump's commitment to Taiwan has been less clear. Unlike President Biden, Trump has doubled down on messages of strategic ambiguity. In December 2024, Trump stated that he would "never say" whether he was committed to defending Taiwan. When asked directly in February 2025, Trump replied, "I never comment on that."[19] He has also consistently expressed a desire for a positive relationship with China while suggesting that Taiwan must invest much more in its defenses—up to 10 percent of GDP.[20]

CHINA'S CONTINUING MILITARY BUILDUP

Since the late 1990s, China has embarked on a massive military modernization program. Previously, China's armed forces mainly were land-focused and unable to exert influence at a distance from its borders. Its poor performance in the 1979 border war with Vietnam underscored its weakness, as did the 1996 transit of the Taiwan Strait by a U.S. carrier battle group. A Chinese invasion of Taiwan used to be dismissed as a "million man swim." However, China has been building military muscle for two decades by pursuing advanced symmetric and asymmetric capabilities that challenge U.S. conventional superiority. The DOD's 2024 annual report to Congress on China's military capabilities notes: "In 2023, the PRC continued its efforts to form the PLA into an increasingly capable instrument of national power."[21]

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16 Lily Kuo and Pei-Win Lu, "Taiwan reassured - and surprised - by Pentagon focus on deterring China," *Washington Post*, May 31, 2025, https://www.washingtonpost.com/world/2025/03/31/us-pentagon-taiwan-defense-strategy/.

17 Alex Horton and Hannah Natanson, "Secret Pentagon memo on China, homeland has Heritage fingerprints," *Washington Post*, March 29, 2025, https://www.washingtonpost.com/national-security/2025/03/29/secret-pentagon-memo-hegseth-heritage-foundation-china/.

18 Joseph Yeh, "Trump declines to commit to Taiwan's defense if China invades," Focus Taiwan, February 27, 2025, https://focustaiwan.tw/cross-strait/202502270007.

19 Yeh, "Trump declines to commit."

20 "Taiwan's president says the defense budget will exceed 3% of GDP in military overhaul," Associated Press, March 20, 2025, https://apnews.com/article/china-taiwan-us-defense-budget-b15c2dc872976272ac12ea344fe94b8.

21 Office of the Secretary of Defense, "Preface," in *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China* (Washington, DC: Department of Defense, 2024), v, https://media.defense.gov/2024/Dec/18/2003615520/-1/-1/0/MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA-2024.PDF.

China has been building military muscle for two decades by pursuing advanced symmetric and asymmetric capabilities that challenge U.S. conventional superiority.

Unlike the United States, which has global responsibilities, China's efforts are focused on a narrow range of missions. Its capabilities have focused on air, naval, and missile systems that can project power in areas around China's periphery. Weaknesses remain, and the U.S. military maintains superior capabilities in many areas.[22] However, China's proximity to likely conflict areas, including Taiwan, would make it difficult for the United States to bring those capabilities fully to bear. China has developed capabilities—such as highly accurate and capable land-based ballistic and cruise missiles—to further complicate the threat picture for the United States. While China is producing large warships (destroyers and cruisers) faster than the United States, it can also employ many smaller warships operating from nearby bases. China could use this military power to attempt to resolve the "Taiwan question." It could invade or bombard Taiwan, seize offshore islands, or impose a blockade. These capabilities and grievances against Taiwan have led to deep concerns in the United States.

U.S. CONCERNS ABOUT CHINESE MILITARY ACTION AGAINST TAIWAN

The DOD has identified China as the "pacing" challenge, and Congress formed a Select Committee on Strategic Competition between the United States and the Chinese Communist Party. Conflict over Taiwan has become central to the U.S. national security debate.[23]

Some U.S. military leaders and strategists are concerned that conflict could occur sooner rather than later. The most well known of these warnings came from Admiral Phil Davidson, commander of INDOPACOM until April 2021, when he testified that the Chinese threat to invade Taiwan "is manifest . . . in the next six years."[24] This has become known as the "Davidson window"—the time between when China's buildup continues to strengthen Chinese forces and before new U.S. capabilities come online. Davidson's successor, Admiral Samuel Paparo, made a similar assessment in his 2025 posture statement to Congress: "Beijing's aggressive maneuvers around Taiwan are not

22 For example, although the PLA is bringing an impressive array of power projection platforms online, its overall capacity remains limited today, especially compared to that of the United States. China's submarine fleet, though advanced, remains primarily diesel, and its antisubmarine warfare capabilities remain underdeveloped. While material weaknesses may be corrected relatively quickly, problems with training, doctrine, and organization—the "software" side of military capability—are likely to take longer to fix. For an assessment of Chinese views of the balance of military capabilities, see Eric Heginbotham, "Chinese Views of the Military Balance in the Western Pacific," U.S. Naval War College, *CMSI China Maritime Reports* 14 (2021), https://digital-commons.usnwc.edu/cmsi-maritime-reports/14.

23 Jim Mattis, *Summary of the 2018 National Defense Strategy of The United States of America* (Washington, DC: Department of Defense, 2018), 9, https://media.defense.gov/2020/May/18/2002302061/-1/-1/1/2018-NATIONAL-DEFENSE-STRATEGY-SUMMARY.PDF; and Sean Parnell, "Statement on the Development of the 2025 National Defense Strategy," Department of Defense, May 2, 2025, https://www.defense.gov/News/Releases/Release/Article/4172735/statement-on-the-development-of-the-2025-national-defense-strategy/.

24 Mallory Shelbourne, "Davidson: China Could Try to Take Control of Taiwan In 'Next Six Years'," U.S. Naval Institute, March 9, 2021, https://news.usni.org/2021/03/09/davidson-china-could-try-to-take-control-of-taiwan-in-next-six-years.

just exercises. They are dress rehearsals for forced unification."[25] In January 2023, General Mike Minihan, Air Mobility Command commander, warned in a leaked memo, "My gut tells me we will fight in 2025."[26] Whether because of improved Chinese capabilities or confusion over the meaning of Xi Jinping's speech about preparations for 2027, other senior officers have established targets for U.S. capabilities based on that timeline.[27]

A similar discussion has played out in the academic and policy worlds. An Atlantic Council survey of subject experts found that 65 percent expected a conflict over Taiwan in the next 10 years.[28] Professors Michael Beckley (Tufts University) and Hal Brands (Johns Hopkins School of Advanced International Studies) warn that "today, China's risk indicators are blinking red." They argue that China's territorial disputes are less susceptible to peaceful resolution, its leadership is overly optimistic about the outcome of war, its long-term economic outlook is darkening, and Xi's personalist dictatorship is susceptible to disastrous miscalculations.[29] Dimitri Alperovich (chairman of the think tank Silverado Policy Accelerator), Oriana Skylar Mastro (a China specialist at Stanford University), Robert Blackwill (the Henry A. Kissinger senior fellow at the Council on Foreign Relations), Philip Zelikow (a professor of history at the University of Virginia), Graham Allison (a professor at Harvard University's Kennedy School of Government), and many others have raised the alarm about China's challenge and the immediacy of its military threat.[30]

The overall polling of the U.S. population shows concerns, but not at the level of government leaders and subject experts. A 2024 Chicago Council on Global Affairs survey found that 48 percent of the public considered China's territorial ambitions a critical threat to the United States

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25 Samuel J. Paparo, "Statement of Admiral Samuel J. Paparo, Commander, U.S. Indo-Pacific Command: U.S. Indo-Pacific Command Posture," House Armed Services Committee, April 2025, https://armedservices.house.gov/uploadedfiles/indopacom_posture_statement_2025.pdf.

26 Courtney Kube and Mosheh Gains, "Air Force general predicts war with China in 2025, tells officers to prep by firing 'a clip' at a target, and 'aim for the head'," NBC News, January 27, 2023, https://www.nbcnews.com/politics/national-security/us-air-force-general-predicts-war-china-2025-memo-rcna67967. Minihan later walked the comment back a bit after it received extensive attention outside the Air Force.

27 Lisa Franchetti, *Navigation Plan for America's Warfighting Navy* (Washington, DC: U.S. Navy, 2024), 6, https://www.navy.mil/Portals/1/CNO/NAVPLAN2024/Files/CNO-NAVPLAN-2024-high-res-v2.pdf; and Lisa Franchetti, "CNO Remarks at America's Future Fleet: Reinvigorating the Maritime Industrial Base," U.S. Navy, presented December 3, 2024, published December 5, 2024, https://www.navy.mil/Press-Office/Speeches/display-speeches/Article/3986010/cno-remarks-at-americas-future-fleet-reinvigorating-the-maritime-industrial-base/.

28 "The Global Foresight 2025 survey: Full results," Atlantic Council Scowcroft Center for Strategy and Security, 2025, https://www.atlanticcouncil.org/content-series/atlantic-council-strategy-paper-series/the-global-foresight-2025-survey-full-results/.

29 Michael Beckley and Hal Brands, "How Primed for War Is China?," *Foreign Policy*, February 4, 2024, https://foreignpolicy.com/2024/02/04/china-war-military-taiwan-us-asia-xi-escalation-crisis/.

30 Dmitri Alperovitch and Garrett Graff, *World on the Brink: How America Can Beat China in the Race for the 21st Century* (New York: PublicAffairs, 2024); Oriana Skylar Mastro, "The Taiwan Temptation: Why Beijing May Resort to Force," *Foreign Affairs*, June 3, 2021, https://www.foreignaffairs.com/articles/china/2021-06-03/china-taiwan-war-temptation; Robert Blackwill and Philip Zelikow, *The United States, China, and Taiwan: A Strategy to Prevent War* (New York: Council on Foreign Relations, 2021), 31, https://www.cfr.org/report/united-states-china-and-taiwan-strategy-prevent-war; and Graham Allison, *Destined for War: Can America and China Escape Thucydides's Trap?* (New York: HarperCollins, 2017).

vital interests, as opposed to 60 percent of government leaders.[31] Sam Roggeveen, director of the International Security Program at the Lowy Institute in Sydney, Australia, observed, "The evidence—or rather, the lack of it—suggest[s] Americans are far less preoccupied with China than those who govern them. America's China debate is largely confined to its policy elites."[32]

Asian allies also worry about U.S. priorities as the United States has moved military forces from Asia to the Middle East in recent years. Turmoil at the Pentagon and the White House's approach to Europe have not quieted worries that the administration could be similarly unsettled toward Asia in the future. Zack Cooper, an Asia specialist at the American Enterprise Institute, noted that "too much unpredictability could incentivize Beijing to test Trump's commitment to Taiwan."[33] U.S. allies and partners have their own concerns about the possibility of Chinese military action and how they should prepare.

CONCERNS AMONG TAIWAN AND JAPAN

Taiwan's leadership views Chinese aggression as a reality, not a possibility, and puts great effort into assessing Taiwan's vulnerabilities and responding with resilience efforts. The value of national resilience is twofold: ensuring systemic resilience in moments of crisis and amplifying deterrence through perceived preparedness. Northern European countries, such as Sweden and Finland, have set examples of comprehensive resilience efforts to diminish Russian influence.[34] China's increased gray zone tactics and harassment in recent years have made national resilience central to Lai Ching-te's presidency. In June 2024, President Lai initiated the Whole-of-Society Defense Resilience Committee, an effort to bring together actors across civil society, government, and the private sector to "build a stronger and more robust democratic society in which we safeguard national security and maintain regional peace and stability."[35] Taiwan has put on training and exercises, such as the 2025 Urban Resilience Exercises, to simulate crises or attacks and prepare individuals, hospitals, and forces to respond.[36]

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31 Craig Kafura, Dina Smeltz, Jordan Tama, and Joshua Busby, "Republican Foreign Policy Experts Signal Strong Support for Taiwan," Chicago Council on Global Affairs, February 6, 2025, https://globalaffairs.org/research/public-opinion-survey/republican-foreign-policy-experts-signal-strong-support-taiwan.

32 Sam Roggeveen, "Deep Rivalry or Elite Obsession? Washington's Search for Dominance Over China," *War on the Rocks*, May 5, 2025, https://warontherocks.com/2025/05/deep-rivalry-or-elite-obsession-washingtons-search-for-dominance-over-china/.

33 Zack Cooper, "Trump's Predictable Unpredictability on Taiwan," *The Dispatch*, February 3, 2025, https://thedispatch.com/article/trump-unpredictable-foreign-policy-taiwan/.

34 Daniel Byman, Seth G. Jones, and Jude Blanchette, *Strengthening Resilience in Taiwan* (CSIS, December 2024), https://www.csis.org/analysis/strengthening-resilience-taiwan.

35 Philip Shetler-Jones, "Taiwan's Evolving Response to China's Grey Zone Actions," RUSI, March 21, 2025, https://www.rusi.org/explore-our-research/publications/policy-briefs/taiwans-evolving-response-chinas-grey-zone-actions; and "Whole-of-Society Defense Resilience Committee," Republic of China Office of the President, https://english.president.gov.tw/Page/669.

36 Republic of China Office of the President, "President Lai presides over second meeting of Whole-of-Society Defense Resilience Committee," press release, December 26, 2024, https://english.president.gov.tw/NEWS/6891.

Taiwan's recent efforts to increase resilience across these domains and many others, such as the energy sector, are extensive and the subject of various in-depth reports.[37] Taiwan relies on imports for 97 percent of its energy supply and operates a highly centralized system.[38] However, by 2026, Taipei hopes that 20 percent of all energy will be renewable, sourced mainly from wind and solar power. Its offshore wind sector currently exceeds two gigawatts, ranking seventh globally in terms of installed capacity, and is still expanding.[39] Taiwan still imports the vast majority of its energy and is working to diversify from where these are sourced. It is reducing dependence on countries with strong ties to China, such as Qatar, Saudi Arabia, and Russia, and importing from alternative suppliers like Australia and the United States instead.

Taiwan is expanding its storage capacity and developing more strike-resistant facilities to enhance its current reserves of critical energy supplies like oil, coal, and LNG.[40] Taipower has launched a Grid Resilience Strengthening Construction Plan, which includes targets such as the creation of microgrids, more sustainable indigenous energy production, and increased oil and coal stockpiles.[41] Taiwan has also engaged in significant food and water stockpiling, as a 2021 statistic reported that approximately 70 percent of the average Taiwanese caloric intake is imported.[42] Finally, Taiwan has created multiple departments and increased international and private cooperation to test and improve its cyber and communications infrastructure.

Naturally, military capabilities have also been a key element of government preparations. A conflict with the PLA would be highly asymmetric, so Taiwan has focused on strengthening international cooperation, maintaining weaponry readiness as a deterrent, and improving psychological preparedness. Taiwan's defense budget has increased annually over the past seven years to 2.5 percent of GDP.[43] Perhaps even more important than military capability is the will of the Taiwanese people and its institutions to resist an invasion or blockade. In May 2025, a show called *Zero Day* launched, depicting a PLA invasion of Taiwan. The show is part of a larger effort to raise awareness and spur urgency for civil resilience efforts.[44] Alongside public training exercises, Taiwan aims

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37 See Byman, Jones, and Blanchette, *Strengthening Resilience in Taiwan*; and Franklin D. Kramer, Philip Yu, Joseph Webster, and Elizabeth Sizeland, *Toward resilience: An action plan for Taiwan in the face of PRC aggression* (Washington, DC: Atlantic Council, 2024), https://www.atlanticcouncil.org/wp-content/uploads/2024/07/Toward-resilience-An-action-plan-for-Taiwan-in-the-face-of-PRC-aggression.pdf.

38 Byman, Jones, and Blanchette, *Strengthening Resilience in Taiwan*.

39 Julia Bergstrom, "A Conversation with Taiwan's Energy Administration," Taiwan Business TOPICS, September 26, 2024, https://topics.amcham.com.tw/2024/09/conversation-with-taiwans-energy-administration/.

40 Oliver Konradt, "Strengthening Taiwan's Deterrence: The Importance of Energy Transition," China Observers in Central and Eastern Europe, September 24, 2024, https://chinaobservers.eu/strengthening-taiwans-deterrence-the-importance-of-energy-transition/.

41 Jackson Rice, *The Resilience of Taiwan's Energy and Food Systems to Blockade* (Ford Island, HI: Center for Excellence in Disaster Management & Humanitarian Assistance, 2023), https://www.cfe-dmha.org/LinkClick.aspx?fileticket=sJ7hhD-PJFl8%3D&portalid=0.

42 Foreign Agricultural Service, *Taiwan Food Security Situation Overview* (Washington, DC: U.S. Department of Agriculture, June 2024), 2 https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Taiwan%20Food%20Security%20Situation%20Overview_Taipei_Taiwan_TW2024-0030.pdf.

43 Kramer, Yu, Webster, and Sizeland, *Toward resilience*.

44 Ibid.

to psychologically prepare its society for an imminent clash with the PRC. Since comprehensive resilience requires a long-term effort, the seemingly shortening timeline of PRC action threatens the effectiveness of these resistance efforts.

Japan has also become increasingly cognizant of rising regional tensions and the risk of conflict with China. In 2021, Japanese Prime Minister Abe Shinzo stated that a "Taiwan contingency is a Japan contingency."[45] Japanese leaders recognize how a Taiwanese blockade could draw Japan into military conflict with China, but also of how Chinese ambitions threaten Japanese territory, including the Ryukyu Islands and Okinawa.[46] Chinese gray zone practices and military encroachment have occurred around Japan's Senkaku Islands—not just in the Taiwan Strait.[47] Japan's National Security Strategy, released in 2022, claims, "Japan's security environment is as severe and complex as it has ever been since the end of World War II."[48] Japanese government documents, including the National Security Strategy, National Defense Strategy, and Defense Buildup Program, pay particular attention to the dimensions of China's military buildup and Xi's expansionist statements.[49]

Russia's invasion of Ukraine intensified the demands for remilitarization and preparation among Japanese leadership, as it reinforced the concern that China, like Russia, may not adhere to the rules of international order. Japan's National Defense Strategy illustrates the government's central takeaway: "The military background for Russia's aggression against Ukraine was that Ukraine's defense capability against Russia was insufficient, thus failing to discourage and deter Russian aggression; Ukraine did not possess sufficient capabilities."[50] In light of these events, Japan has embarked on a significant revision of strategy, foreign policy, and rearmament focused on deterrent military capabilities.

PREPARING FOR AN UNCERTAIN FUTURE

Despite agreement about the potential threat posed by China, many regional specialists disagree with U.S., Taiwanese, and Japanese concerns about the immediacy of the threat to Taiwan. They argue that there are no specific indicators that a decision for war has been made.[51]

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45 Gilbert Rozman, "Japanese Perceptions of the Threat from China," Asan Forum, April 24, 2024, https://theasanforum.org/japanese-perceptions-of-the-threat-from-china/.

46 Ibid.

47 Madoka Fukuda, "Heightened Sense of Crisis: China & Taiwan in Japan's New National Security Strategy," Stimson Center, February 17, 2023, https://www.stimson.org/2023/heightened-sense-of-crisis-china-and-taiwan-in-japans-new-national-security-strategy/.

48 National Security Council, *National Security Strategy of Japan* (Tokyo: Japanese Ministry of Defense, December 2022), https://www.cas.go.jp/jp/siryou/221216anzenhoshou/nss-e.pdf.

49 Ibid.; National Security Council, *National Defense Strategy* (Tokyo: Japanese Ministry of Defense, December 2022), https://www.mod.go.jp/j/policy/agenda/guideline/strategy/pdf/strategy_en.pdf; and National Security Council, *National Buildup Program* (Tokyo: Japanese Ministry of Defense, December 2022), https://www.mod.go.jp/j/policy/agenda/guideline/plan/pdf/program_en.pdf.

50 National Security Council, *National Defense Strategy*.

51 See Rachel Esplin Odell et al., "Strait of Emergency? Debating Beijing's Threat to Taiwan," *Foreign Affairs*, August 9, 2021, https://www.foreignaffairs.com/articles/china/2021-08-09/strait-emergency.

- Christopher Johnson, a China scholar affiliated with CSIS, observes that at the 2022 party congress, Xi "held fast to the judgment that stability and economic growth continued to be dominant global trends" and that portrayals of Xi as "itching for war" were "overhyped."[52]
- Bonny Lin (CSIS) and David Sacks (Council on Foreign Relations) argue that China views the use of force as a last resort to achieve unification.[53]
- Lonnie Henley, a former defense intelligence officer for East Asia at the Defense Intelligence Agency, sees China's use of force as conditional: "I do not think [the Chinese] will attack Taiwan as long as they believe unification without war remains a viable course of action. They will attack, however, despite the enormous cost and despite any doubts about their own military capabilities, if they judge that peaceful unification is no longer possible, that military force is the only remaining option. That, in turn, is driven by their assessment of political developments in Taipei and Washington."[54]

The former director of the Central Intelligence Agency, William Burns, stated that "President Xi has instructed the PLA, the Chinese military leadership, to be ready by 2027 to invade Taiwan. But that doesn't mean that he's decided to invade in 2027 or any other year as well."[55] Former Chairman of the Joint Chiefs of Staff Mark Milley similarly emphasized that Xi's statement was likely about developing a capability to invade Taiwan rather than a concrete plan or intent to do so. Concerning Xi's speech, he said, "It's a capability, not an intent to attack or seize."[56] Xi personally rejected the notion of a timeline, and, notably, his formulation is similar to those used for decades by Chinese leaders to establish capabilities and targets for the military.[57] As discussed above, there is no denying that China's increasing military strength makes an attack on Taiwan increasingly feasible; although invasion is the most direct and obvious threat, China is not, for example, procuring large numbers of inexpensive amphibious craft that would signal an imminent invasion.[58]

This project does not take a position on the likelihood of Chinese military action or on whether the United States should defend Taiwan if Chinese military action occurs. It does argue that military action is plausible given China's military buildup and aggressive rhetoric and that the United States

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52 Christopher Johnson, "Why China Will Play It Safe: Xi Would Prefer Détente – Not War – with America," *Foreign Affairs*, November 14, 2022, https://www.foreignaffairs.com/china/why-china-will-play-it-safe.

53 Bonny Lin and David Sacks, "Strait of Emergency?"

54 Cancian, Cancian, and Heginbotham, *The First Battle of the Next War*, 14.

55 "CIA Director William Burns on 'Face the Nation with Margaret Brennan' | full interview," YouTube video, posted by Face the Nation, February 26, 2023, 24:18, https://www.youtube.com/watch?v=HN4bgqKq2MU.

56 Sam Lagrone, "Milley: China Wants Capability to Take Taiwan by 2027, Sees No Near-term Intent to Invade," U.S. Naval Institute, June 23, 2021, https://news.usni.org/2021/06/23/milley-china-wants-capability-to-take-taiwan-by-2027-sees-no-near-term-intent-to-invade.

57 Noah Robertson, "How DC became obsessed with a potential 2027 Chinese invasion of Taiwan," Defense News, May 7, 2024, https://www.defensenews.com/pentagon/2024/05/07/how-dc-became-obsessed-with-a-potential-2027-chinese-invasion-of-taiwan/.

58 Standard economic analysis shows about 2 percent of Chinese GDP devoted to defense, as contained in sources like the "SIPRI Military Expenditure Database," Stockholm International Peace Research Institute, https://milex.sipri.org/sipri; however, some economists prefer analysis based on purchasing power parity, arguing that using market exchange rates undervalues the Chinese military effort.

might respond with military action defending Taiwan. Therefore, studying the nature and dynamics of potential conflicts is a prudent precaution. One way that China could use military force against Taiwan is through a blockade.

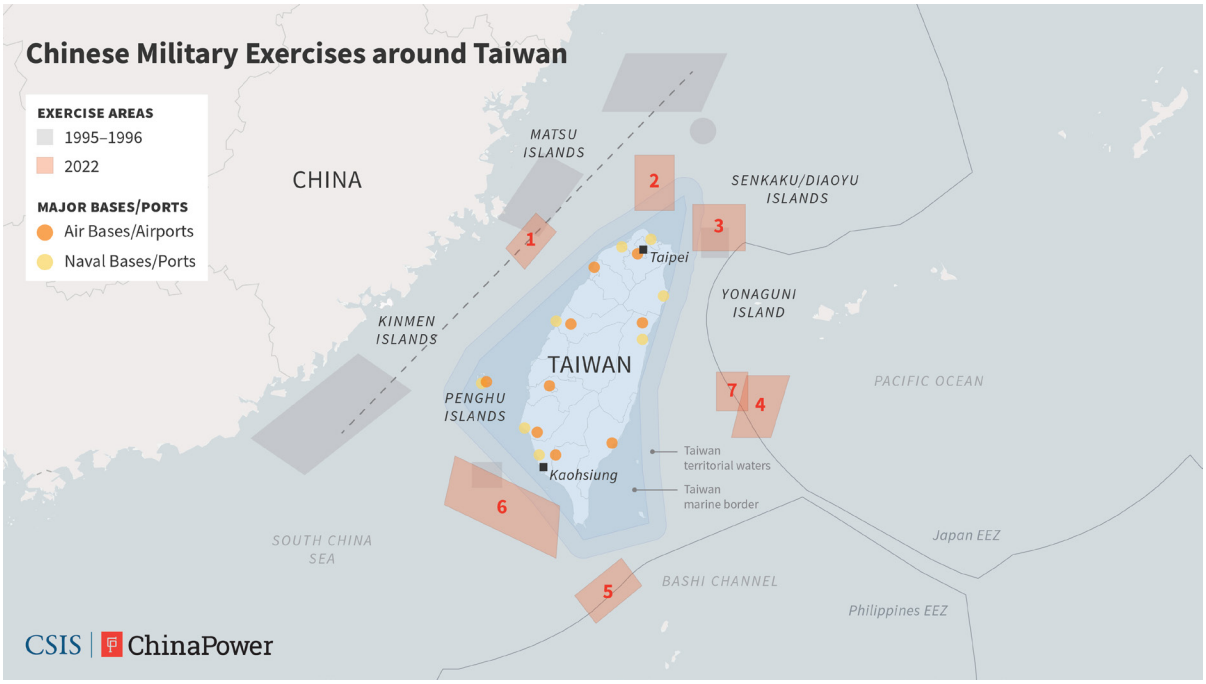
This project does not take a position on the likelihood of Chinese military action or on whether the United States should defend Taiwan should Chinese military action occur.

Chinese Preparation of Blockade Capabilities

Chinese military exercises seem to simulate a blockade of Taiwan. The most dramatic was the August 4, 2022, exercise in connection with then-Speaker of the House Nancy Pelosi's visit to Taiwan.

As Figure 1.1 shows, these exercises have become more aggressive. In the 1990s, China's military exercises focused on its coastal area and appeared defensive. By 2022, those exercises surrounded Taiwan and, combined with China's strident rhetoric, appeared to be highly aggressive.

Figure 1.1: Comparison of China's Military Exercises, 1995–1996 and 2022



Source: Bonny Lin et al., "Tracking the Fourth Taiwan Strait Crisis," ChinaPower, CSIS, updated November 8, 2023, https://chinapower.csis.org/tracking-the-fourth-taiwan-strait-crisis/.

This pattern has continued. On October 14, 2024, the PLA conducted the exercise Joint Sword-2024B, a few days after President Lai Ching-te's first National Day address in Taipei. The exercise involved multiservice drills in the sea and air space around Taiwan and included a specific component in which PLA forces practiced their blockade capabilities.[59] This was later followed by Strait Thunder-2025A on April 2, 2025, conducted by the PLA Eastern Theater Command in the Taiwan Strait's middle and southern sea areas.[60] This exercise focused on joint force capabilities inside and outside the first island chain. The PLA simulated strikes on defense infrastructure such as command centers, arsenals, air defense command posts, and specific locations like the Hengshan Wartime Command Post. It also focused heavily on simulating operations against Taiwanese energy infrastructure and ports, particularly LNG terminals.[61]

Observing the U.S. interventions in the Gulf War and Kosovo in the 1990s, the PLA began investing heavily in sea denial capabilities to counter U.S. power projection. An island blockade of Taiwan was one of the campaigns identified under the "winning local wars in an informatized environment" strategy described in Chinese defense white papers in the 1990s and 2000s.[62] China has also invested in implementing the PLA's operational doctrine to support "integrated joint operations" in which the PLA envisions unified operations of units from all services under a single command and control network. From the concept's adoption in the late 1990s, the PLA identified a blockade campaign as an operation the PLA would have to prosecute as a joint force.

In the second edition of the PLA textbook, Science of Campaigns, a "joint blockade campaign" is described as a combined arms, joint offensive campaign with a unified command to "sever enemy economic and military connections with the outside world."[63] PLA writings have also used the term "strategic blockade," which intends to isolate and weaken an enemy's combat capabilities "so as to directly achieve strategic goals or create conditions for the implementation of the next strategic

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59 John Dotson, "The PLA's Joint Sword 2024B Exercise: Continuing Political Warfare and Creeping Territorial Encroachment," Global Taiwan Institute, *Global Taiwan Brief* 9, no. 20 (2024), https://globaltaiwan.org/2024/10/the-joint-sword-2024b-exercise/.

60 Li Jiayao, ed., "Chinese military launches 'Strait Thunder 2025' exercise in middle and southern sea areas of Taiwan Strait," Ministry of National Defense of the People's Republic of China, April 2, 2025, http://eng.mod.gov.cn/xb/News_213114/TopStories/16378460.html.

61 John Dotson and Jonathan Harman, "The PLA's 'Strait Thunder-2025A' Exercise Presents Further Efforts to Isolate Taiwan," Global Taiwan Institute, *Global Taiwan Brief* 10, no. 8 (2025), https://globaltaiwan.org/2025/04/the-plas-strait-thunder-exercise/.

62 M. Taylor Fravel, "China's Military Strategies since 1993: Informatization," in *Active Defense: China's Military Strategy since 1949* (Princeton, NJ: Princeton University Press, 2019), 218; and Josh Campbell, *Charting the Course: How the PLA's Expected Regional and Global Strategies Should Influence the U.S. Air Force's Lines of Efforts* (Washington, DC: National Defense University Press, October 2024), 20, https://www.airuniversity.af.edu/CASI/Display/Article/3932924/charting-the-course-how-the-plas-expected-regional-and-global-strategies-should/.

63 Zhang Yuliang, ed., *Science of Campaigns*, trans. China Aerospace Studies Institute (Washington, DC: National Defense University Press, 2006), 329, https://www.airuniversity.af.edu/CASI/Display/Article/2421219/in-their-own-words-plas-science-of-campaigns/.

action."[64] More recently, Chinese military officials have begun to use the term "joint blockade and control," emphasizing maintaining control over the blockaded region.[65]

If China imposed a blockade on Taiwan tomorrow and the United States was drawn in, no one would slap their forehead and exclaim, "Didn't see that coming!" However, the form that a blockade would take is not clear.

If China imposed a blockade on Taiwan tomorrow and the United States was drawn in, no one would slap their forehead and exclaim, "Didn't see that coming!"

Blockade Can Take Many Forms

A blockade constitutes a fundamentally different challenge than an invasion because both sides are potentially fighting at levels below total war. Invasion constitutes China's most dangerous course of action. For that reason, CSIS's earlier project *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan* examined a Chinese invasion of Taiwan.[66] China's commitment to an invasion must be total for it to succeed. There are no half-measures by which China could have only some of its forces committed and try to occupy only part of Taiwan. While any Chinese effort to use military force against Taiwan risks a broader war, a blockade might be able to accomplish political aims without all of the risks entailed by an invasion. As Cold War strategist Thomas Schelling put it, "Blockade, harassment, and 'salami tactics' can be interpreted as ways of evading the dangers and difficulties of compellence."[67] Thus, a blockade could take many forms depending on how much military and political risk China wanted to assume.

In its least escalatory form, China could impose a non-kinetic blockade of Taiwan—likely using another term such as "quarantine" or "law enforcement action"—as a coercive measure to slowly force Taiwan into compliance while avoiding armed confrontation. A 2024 CSIS report by Bonny Lin et al. describes two potential law enforcement-led approaches: (1) a limited maritime quarantine that focuses on one port, and (2) a full maritime quarantine.[68] In each scenario, China aims to

64 Xiao Tianliang, ed., *Science of Military Strategy*, trans. China Aerospace Studies Institute (Washington, DC: National Defense University Press, 2015), 228, https://www.airuniversity.af.edu/CASI/Display/Article/2913216/in-their-own-words-2020-science-of-military-strategy/.

65 Li Bingxuan and Han Xueyang, "东部战区接续开展联合演训组织联合封控和联合保障行动"[The Eastern Theater continues to carry out joint exercises and training, organize joint containment and joint support operations], Xinhua News Agency, August 9, 2022, http://www.mod.gov.cn/topnews/2022-08/09/content_4917758.htm.

66 Cancian, Cancian, and Heginbotham, *The First Battle of the Next War*.

67 Thomas Schelling, *Arms and Influence* (New Haven, CT: Yale University Press, 1966), 77.

68 Bonny Lin et al., "How China Could Quarantine Taiwan: Mapping Out Two Possible Scenarios," CSIS, *CSIS Briefs*, June 5, 2024, https://www.csis.org/analysis/how-china-could-quarantine-taiwan-mapping-out-two-possible-scenarios.

punish Taiwan, assert sovereignty over Taiwan, test international shipping responses, and pressure China's adversaries. Instead of hermetically sealing Taiwan, a quarantine is presented as a less-provocative alternative that allows gradual escalation while still demonstrating Chinese authority.

Similarly, Isaac Kardon (Carnegie Endowment for International Peace) and Jennifer Kavanagh (Defense Priorities) argue that while Taiwan has been the target of increasing gray zone activities, these are not necessarily a prelude to an invasion. Instead, China could use persistent coercive measures to subjugate Taiwan "in the ways that matter" without requiring formal capitulation.[69] Robert Manning (Stimson) made a similar argument, arguing that China has already adopted a "non-Kinetic strategy."[70] Finally, an analysis by RAND also concluded that China could use a non-kinetic quarantine or blockade of this nature to put the escalation burden on the United States or Taiwan.[71]

A blockade could also involve broader military action, although the parameters of such action may vary widely. In a 2024 CSIS report that surveyed 35 Taiwanese experts and 52 U.S. experts, 89 percent and 64 percent, respectively, responded that Beijing was likely or very likely to resort to a blockade of Taiwan if China sought forceful unification in the next five years.[72] In 2004, Michael Glosny, an Asia expert at the Naval Postgraduate School, examined a scenario where China uses submarines and sea mines to blockade Taiwanese ports.[73] He argued that a PLA submarine blockade would not succeed, as the limited damage it would inflict would not be sufficient to force Taiwan to capitulate, especially given Taiwan's will to resist. However, much has changed in the ensuing two decades.

Michael O'Hanlon, a national security scholar at Brookings Institution who has done extensive work on a Chinese blockade of Taiwan, identified two kinetic scenarios: a maritime fight centered on submarines (similar to Glosny) and a broader subregional war.[74] He highlights the unpredictability of the outcomes for the United States and China, arguing that the conflict ought to be avoided, as it would be highly escalatory but would not end in a resolution of Taiwan's status.

Michael Casey, former director of the National Counterintelligence and Security Center, argues that a joint blockade campaign would not only target maritime trade but also include limited strikes on

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69 Isaac Kardon and Jennifer Kavanagh, "How China Will Squeeze, Not Seize, Taiwan," *Foreign Affairs*, May 21, 2024, https://www.foreignaffairs.com/china/how-china-will-squeeze-not-seize-taiwan.

70 Robert A. Manning, "Is a Chinese Invasion of Taiwan the Most Likely Scenario?," Stimson Center, October 27, 2023, https://www.stimson.org/2023/is-a-chinese-invasion-of-taiwan-the-most-likely-scenario/.

71 Bradley Martin et al., *Implications of a Coercive Quarantine of Taiwan by the People's Republic of China* (Santa Monica, CA: RAND Corporation, May 2022), https://www.rand.org/pubs/research_reports/RRA1279-1.html.

72 Bonny Lin et al., *Surveying the Experts: U.S. and Taiwan Views on China's Approach to Taiwan in 2024 and Beyond* (Washington, DC: CSIS, January 2024), https://chinapower.csis.org/surveying-experts-us-and-taiwan-views-china-approach-taiwan-2024/.

73 Michael A. Glosny "Strangulation from the Sea? A PRC Submarine Blockade of Taiwan," *International Security* 28, no. 4 (Spring 2004): 125–160, https://www.jstor.org/stable/4137451.

74 Michael E. O'Hanlon, "Can China take Taiwan? Why no one really knows," Brookings Institution, August 9, 2022, https://www.brookings.edu/research/can-china-take-taiwan-why-no-one-really-knows/.

Taiwanese ports, airfields, and other infrastructure.[75] These attacks would aim to degrade Taiwan's defenses before a subsequent amphibious invasion.

Some experts see a blockade as a prelude to or follow-on to an invasion. Lonnie Henley, a senior fellow at the Foreign Policy Research Institute, describes how if the PLA wanted to launch an invasion, a joint blockade campaign would focus on setting the conditions for a landing campaign—gaining air superiority, isolating Taiwan from U.S. reinforcements, and crippling Taiwan's communications and logistics infrastructure.[76] He has separately detailed how a blockade could follow an unsuccessful invasion attempt.[77]

With so many permutations of a "blockade" scenario, a shared framework for analysis is needed.

The Need for a Shared Framework

National leaders have not missed the necessity of understanding a blockade scenario. Congress has expressed concern about China imposing a blockade in the Taiwan Strait. Senator Tom Cotton recently published a book on the threat he believes China represents to the American people and has emphasized how an invasion of Taiwan threatens American power and prosperity.[78] In FY 2023 and FY 2024, the National Defense Authorization Act has included provisions requiring preparations for Taiwan to defend against a Chinese blockade. In FY 2024, Congress requested an independent study of such a scenario and its potential economic impact.[79]

Previous analyses provided important insights about how and why a blockade might occur, but they have not holistically analyzed the broad set of military and quasi-military capabilities available to China. Therefore, the state of analysis in the area of coercive blockade is underdeveloped.

This report aims to fill this gap in the literature by appraising the range of blockade scenarios wherein China uses ships, submarines, and aircraft to interdict maritime traffic to Taiwan outside of an invasion in 2028. While this does not include sanctions or invasion, it covers a wide range of Chinese coercive actions that have not previously been included in the analytic conversation. Establishing an analytic structure, identifying important variables, and assessing outcomes under

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75 Michael Casey, "Firepower Strike, Blockade, Landing: PLA Campaigns for a Cross-Strait Conflict," in *Crossing the Strait: China's Military Prepares for War with Taiwan*, eds. Joel Wuthnow, Derek Grossman, Phillip C. Saunders, Andrew Scobell, and Andrew N.D. Yang (Washington, DC: National Defense University Press, 2022), 113–37.

76 Lonnie D. Henley, "China Maritime Report No. 26: Beyond the First Battle: Overcoming a Protracted Blockade of Taiwan," U.S. Naval Warfare College, *CMSI Maritime Reports* 26, (2023): 5, https://digital-commons.usnwc.edu/cmsi-maritime-reports/26/.

77 Ibid.

78 Tom Cotton, *Seven Things You Can't Say About China* (New York: Broadside Books, 2025); and Tom Cotton and John P. Walters, "'Seven Things You Can't Say about China' with Senator Tom Cotton," Hudson Institute, February 26, 2025, https://www.hudson.org/events/seven-things-you-cant-say-about-china-senator-tom-cotton-john-walters.

79 *James M. Inhofe National Defense Authorization Act for Fiscal Year 2023*, Pub. L. 117-263, 136 Stat. 2395 (2022), https://www.congress.gov/bill/117th-congress/house-bill/7776/text; and *National Defense Authorization Act for Fiscal Year 2024*, Pub. L. 118-31, 137 Stat. 136 (2023), https://www.congress.gov/bill/118th-congress/house-bill/2670/text.

different assumptions will show how China might impose a blockade and, if imposed, what the United States, Taiwan, and its allies might do to counter it.

Report Structure

The remainder of this report comprises five chapters:

- Chapter 2, "Blockades in History and the Current Literature," provides the context for a notional Chinese blockade of Taiwan. It has a brief history of blockades, a description of why alternatives to supply by sea are insufficient, a legal analysis of blockades, and an assessment of their economic effects and global impact.
- Chapter 3, "A Framework for Analyzing a Blockade," begins by noting the scope conditions of the report. It then describes the escalation levels for China and the coalition and how the escalation levels combine to produce scenarios. It then describes variations within each scenario. Finally, it describes how the wargames in each scenario and variant were conducted.
- Chapter 4, "Wargaming a Blockade," describes how the project used wargames to analyze the various scenarios of the framework. It describes the three modules of wargaming a blockade and the models that were used in each module.
- Chapter 5, "Analysis of Wargame Results," begins by explaining the lack of fixed victory conditions and then summarizes game results. The first result is the "Zero Baseline," which shows what an absolute blockade would do under three different conditions in Taiwan: Base, Prepared, and More Green Energy. The chapter then lays out results from the individual scenarios and variants within them. Additionally, it lays out the results and significant decisions of the free-play games. Although these free-play games were shorter in game time than the others (5 weeks versus 20 weeks), they involved more people and gave insights into escalation dynamics.
- Chapter 6, "Policy Recommendations and Conclusion," lays out recommendations from analyzing the wargame results described in the previous chapter. The recommendations are divided into four groups: preparing the merchant fleet, preparing Taiwan's energy infrastructure, preparing the United States to assist Taiwan during a blockade, and, if a blockade were to occur, actions for countering and ending it. Within each group, recommendations are listed in priority order.
- The appendices provide details on Taiwan's food requirements and supply, available coalition shipping, sea mines, airlift, escalation levels, the stance of other countries, the effects of Chinese attacks on Taiwan's electricity production, and turn-by-turn actions in the free-play games.

2

Blockades in History and the Current Literature

This chapter gives the context for a notional Chinese blockade of Taiwan. It provides a brief history of blockades, a description of why alternatives to supply by sea are insufficient, the legal aspects of blockades, and the likely economic effects and global impact of a blockade of Taiwan.

A Brief History of Blockades

Naval blockades have a long history; they are a common tactic in warfare, being described, for example, by Thucydides 2,400 years ago in his account of the Peloponnesian War. This chapter briefly reviews the literature on blockades and gives a few illustrative examples.

Successful blockades require prolonged military efforts to take effect. The Peloponnesian War saw Sparta build several fleets over decades (with Persian money) to eventually cut off Athens's grain supplies. In the U.S. Civil War, the Union eventually built a fleet large enough to squeeze the Confederacy and inflict considerable damage to the economy and hardship on the population.[1] Similarly, in World War I, Great Britain imposed a "distant blockade" that took years to have a significant effect but eventually caused mass starvation and food riots in Germany.[2] Although the

1 David G. Surdam, "The Union Navy's Blockade Reconsidered," *Naval War College Review* 51, no. 4 (1998): 85–107, https://www.jstor.org/stable/44638206?seq=1.

2 A.C. Bell, *A History of the Blockade of Germany and the Countries Associated with her in the Great War, Austria-Hungary, Bulgaria, and Turkey, 1914-1918* (London: His Majesty's Stationery Office, 1961), 671–72.

blockading party maintained economic leverage in each of these cases, the target of the blockade was still able to continue military operations for many years.

The tools of blockading have also varied throughout history. For much of history, the tools were ships and fortifications. The twentieth century added sea mines and aircraft. However, technological advancement and globalization have created new complexities and changes to historical blockade tactics. Globalized supply chains create systemic interdependence and offer increased opportunities for alternative suppliers and rerouting. Advanced missile systems, especially antiship missiles, raise the risk of escalation on both sides of the blockade. Other naval defenses, including submarines, threaten blockading forces. Electronic and cyber warfare offer alternative means for pressuring an opponent. Meanwhile, signal disruption could reduce the efficacy of a modern naval blockade.[3] Thus, although blockades are a millennia-old practice, tactics continue to evolve.

Fighting through a blockade requires large amounts of merchant shipping.[4] During World War I, Great Britain relied so heavily on merchant ships for food, resources, and military transport that King George V granted them the "Merchant Navy" title.[5] During wartime, these large merchant fleets also suffered significant losses; Britain's merchant fleet stood at approximately 200,000 sailors in 1939 but lost 29,000 merchant sailors by the end of World War II.[6] Civilian mariners of the U.S. Merchant Marine played similarly crucial but costly roles in the United States' efforts in World War II.[7] Japan's merchant fleet was devastated by U.S. forces. In all, Japan's merchant fleet, the third-largest of the global powers, lost 2,346 ships in the Pacific War.[8]

Intense armed conflict during blockades leads to high attrition among combatants and merchants. Particularly relevant to a blockade of Taiwan is the unsuccessful siege of Malta from 1940 to 1943. In that case, convoys periodically broke through the German-Italian air and naval blockade and sustained the island, though at great cost. For example, the 1942 Pedestal convoy began with 37 warships (2 battleships, 3 carriers, 7 cruisers, and 25 destroyers) escorting 14 merchant ships. It endured continuous air and naval attacks in its three-day passage from the Strait of Gibraltar to

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3 Adam Biggs et al., "Theories of Naval Blockades and Their Application in the Twenty-First Century," *Naval War College Review* 74, no. 1 (2021), https://digital-commons.usnwc.edu/nwc-review/vol74/iss1/9/.

4 For the purpose of this report, the term "merchant" is used to refer to any ship that carries LNG, oil (e.g., tankers), or other cargo. It excludes all passenger ships. The term "cargo ship" falls within the merchant ship category, but is specific to ships carrying cargo, such as bulk carriers and container ships. See Appendix B for further classification of ship types.

5 "A Short History Of The Merchant Navy," Imperial War Museums, https://www.iwm.org.uk/history/a-short-history-of-the-merchant-navy.

6 Ibid.

7 Stephanie Hinnershitz, "Supplying Victory: The History of Merchant Marine in World War II," National World War II Museum, February 7, 2022, https://www.nationalww2museum.org/war/articles/merchant-marine-world-war-ii.

8 Stanley A. Wheeler, "The Lost Merchant Fleet Of Japan," U.S. Naval Institute, *Proceedings* 82, no. 12 (1956), https://www.usni.org/magazines/proceedings/1956/december/lost-merchant-fleet-japan.

Malta. Five warships, including one carrier, were lost, and only four merchant ships survived, but it was enough. Malta held out.[9]

Especially when combined with other forms of military operations, blockades do not need to be 100 percent effective in stopping traffic to accomplish their goals. They need to squeeze enough that the target population feels hardship and its military forces lose some effectiveness. One example is the Union blockade of the Confederacy during the U.S. Civil War. Although the Union fleet failed to interdict over 90 percent of blockade runners, it intercepted enough ships and discouraged enough trade that the blockade was ultimately effective in squeezing the Confederacy.[10] In World War I, Germany continued to receive goods shipped through Scandinavia despite the British blockade. Despite these shipments, the World War I British official history estimates that the urban population of Germany only received 1,000 calories per day in the latter half of 1917, contributing to a death rate that was 32.2 times greater than in peacetime as a result of deaths from starvation and disease.[11]

Ultimately, a blockade's success is contingent on the willpower of both sides. Many blockaded states have outlasted their blockaders despite extreme hardship. As a blockade relies on the targeted state capitulating, there are, therefore, important interactions between diplomacy, willpower, and escalation dynamics.

ESCALATION AND DIPLOMACY DURING BLOCKADES

Naval blockades have been used as a coercive tactic to avoid escalation to kinetic conflict. During the Cuban Missile Crisis, U.S. naval forces established a blockade around Cuba to prevent Soviet military supplies from reaching the island. The U.S. blockade lasted a month, ending once the Soviet Union agreed to remove its missiles from Cuba.[12] In this case, the naval blockade successfully forced enemy ships to turn back, and no shots were fired between U.S. and Soviet vessels. China may opt for a similar option, establishing control over Taiwan's maritime trade while remaining under the threshold of armed conflict.

During the Quasi-War in 1798, French privateers intercepted and seized U.S. merchant ships intended for Great Britain and its colonies. Although the two parties did not declare war, the French navy seized over 300 American merchant ships, including some in U.S. waters.[13] U.S. Navy ships deployed to the Caribbean in response and fought several naval engagements against the French in an "undeclared war." In recent years, China has adopted a similar strategy of interfering with neutral vessels in the South China Sea, albeit at a smaller scale. The Chinese

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9 For a description of the Pedestal convoy, see Ernle Bradford, *Siege: Malta, 1940-1943* (New York: William Morrow and Company, 1986), 247-72.

10 Erik Shuck, "Economic Warfare: The Union Blockade in the Civil War," *Naval History Magazine* 36, no. 5 (2021), https://www.usni.org/magazines/naval-history-magazine/2021/october/economic-warfare-union-blockade-civil-war.

11 Bell, *A History of the Blockade of Germany*.

12 "The Cuban Missile Crisis, October 1962," U.S. Department of State Office of the Historian, n.d., https://history.state.gov/milestones/1961-1968/cuban-missile-crisis. Undisclosed at the time was a U.S. agreement to remove its missiles from Turkey.

13 "The Quasi-War with France," U.S. Constitution Museum, https://ussconstitutionmuseum.org/major-events/the-quasi-war-with-france/.

Coast Guard has routinely interfered with supply shipments to a Philippine marine detachment near the disputed Second Thomas Shoal.[14] In a blockade of Taiwan, China could use a strong maritime law enforcement process and similarly coercive tactics to intimidate neutral vessels and force compliance.

Blockades are also characterized by the diplomatic difficulties for the blockading state. The Union struggled to keep a tight blockade of the Confederacy when faced with British and French blockade runners, at times having to relax its blockade to avoid escalation. Roles were reversed in World War I, when U.S. shipments to Germany continued for the initial years of the war despite British protests. In the Soviet blockade of Berlin in 1948–1949, Soviet aircraft harassed allied cargo aircraft but backed off after some crashes and casualties. A U.S. airlift into Taiwan would pose a similar dilemma to China—shoot down aircraft with humanitarian supplies and take worldwide criticism or allow the flights, hoping that they would not alter the outcome of the blockade.

CONVOYS AND SHUTTLES AGAINST BLOCKADES

States subject to blockade also often find that establishing a shipping "shuttle" is the best use for the merchant ships under its control.

Such a shuttle has, as its two terminal points, the blockaded nation's ports on the one hand and one or more designated ports outside the blockade zone as the other terminals. From the external terminal, inbound goods are transshipped onto the shuttle fleet for running into the blockaded country, and outbound goods are transshipped onto regular commercial shipping for their final destinations.

Such a shuttle recognizes that most commercial merchant ships will not accept the extreme risk of operating in a combat zone. Only ships mobilized by the belligerents will do that. A shuttle offers two additional benefits. First, it allows the blockade-running fleet to move goods out of the dangerous area quickly, increasing the circulation of such shipping and making the most of a relatively small fleet. Second, it allows planners to optimize merchant fleets for effective or efficient blockade running. The combined benefits outweigh the burden of transferring cargo from one ship to another. Some examples illustrate this point:

- During the American Revolution, U.S. and other ships running the British blockade similarly leveraged bases in French and Dutch territories in the Caribbean to transship goods to and from European continental ports.
- During the U.S. Civil War, Confederate and European (primarily British) blockade runners ran shipping between southern ports, such as Charleston, South Carolina, and transshipment points in the Bahamas.[15] The trip between Nassau (Bahamas) and Charleston, at 563 nautical miles (nm), was far shorter than that to the ultimate points of origin or

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14 Andrew Taffer, "The Puzzle of Chinese Escalation vs. Restraint in the South China Sea," War on the Rocks, 2024, https://warontherocks.com/2024/07/the-puzzle-of-chinese-escalation-vs-restraint-in-the-south-china-sea/.

15 On the Civil War case, see Lance E. Davis and Stanley L. Engerman, *Naval Blockades in Peace and War: An Economic History Since 1750* (Cambridge, UK: Cambridge University Press, 2006); Michael Brem Bonner and Peter McCord, *The Union Blockade in the American Civil War, A Reassessment* (Knoxville, TN: University of Tennessee Press, 2021); and

destination, whether Liverpool (3,200 nm) or Amsterdam (3,700 nm). A transshipment point maximized the employment of the specialized ships employed in blockade running—maneuverable steamships of shallow draft and relatively small capacity, poorly designed for safely or efficiently hauling cargoes on Atlantic crossings.

- During the Iran-Iraq War (1980–1988), Iran and Iraq engaged in extensive mutual attacks on shipping and infrastructure, with a focus on limiting oil production and shipping.[16] A total of 329 ships bound for or coming from Iran were damaged or sunk throughout the war, including 212 by Exocet missiles. In February 1985, Iran established an escorted shuttle service to move oil from Kharg Island, roughly 100 nm from the Iraqi coast, to Sirri, where oil could be safely transshipped onto general shipping. The shuttle enabled Iran to maximize the use of ships (originally 17 in number) operated by risk-acceptant foreign firms, often under long-term (six-month or one-year) insurance contracts for operations within the hazardous waters around Kharg. Similarly, under threat from Iranian attack, Kuwaiti shipping shuttled between Kuwait and the port of Khor Fakkan on the United Arab Emirates' east coast, outside the Strait of Hormuz. Kuwait employed its own tankers on this route, 11 of which were reflagged under U.S. colors after the start of Operation Earnest Will.
- Since it invaded Ukraine, Russia has also engaged in oil transshipment to avoid international sanctions. Due to its dark fleet and transshipment regime, Russia's GDP has increased despite the pressures of wartime and sanctions. After leaving Russian Baltic and Black Sea ports, uninsured tankers perform ship-to-ship (STS) transfers in international waters. Automatic Identification System data and satellite imagery show that most Russian STS transfers are occurring around a few key water hubs: the Gulf of Laconia (near Greece), Ceuta (near Spain), Hurd's Bank (near Malta), and Constanța (Romania).[17] Receiver vessels, which are often reflagged and sail with protection and indemnity insurance, flow from these hubs in the Mediterranean to final destinations worldwide, evading sanctions by concealing the oil's transshipment and origins.

The Insufficiency of Alternatives to Merchant Shipping

Chinese intelligence, surveillance, and reconnaissance (ISR) would make it almost impossible for large merchant ships to evade detection during a blockade. As discussed in the description of Module 2 in Chapter 4, this ISR system would be highly effective against conventional shipping.

David G. Surdam, *Northern Naval Superiority and the Economics of the American Civil War* (Columbia, SC: University of South Carolina Press, 2001).

16 This paragraph and the next draws primarily from Martin S. Navias and E.R. Hooton, *Tanker Wars: The Assault on Merchant Shipping During the Iran-Iraq Crisis, 1980–1988* (New York: IB Tauris & Co. Ltd, 1996). See also Lee Allen Zatarain, *America's First Clash with Iran, The Tanker War, 1987–1988* (Haverton, PA: Casemate, 2008).

17 Alessio Armenzoni, Giangiuseppe Pili, and Gary C. Kessler, "Red Flags: Russian Oil Tradecraft in the Mediterranean Sea," U.S. Naval Institute, *Proceedings* 150, no. 6 (2024), https://www.usni.org/magazines/proceedings/2024/june/red-flags-russian-oil-tradecraft-mediterranean-sea.

The difficulties that merchant ships would have in reaching Taiwan during a blockade have encouraged analysts to consider alternative means of transportation. One possibility is airlift; some have referenced the Berlin Airlift of 1948-1949 as an analogous case.[18] Another possibility involves unconventional maritime means, such as blockade running, "cocaine logistics," "ant logistics," and submarines. While some alternative means of transportation can help in certain circumstances—and are therefore included in the project's modeling—none are adequate alternatives to merchant ships.

While some alternative means of transportation can help in certain circumstances—and are therefore included in the project's modeling—none are adequate alternatives to merchant ships.

AIRLIFTS AND THE BERLIN AIRLIFT PRECEDENT

The Berlin Airlift successfully sustained the city until diplomacy resolved the crisis, and under the right circumstances, an airlift to Taiwan might similarly buy time. Importantly, those circumstances are not guaranteed to hold. (Appendix D, contains additional details on a Taiwan airlift, and a backup paper has the full analysis.[19])

The Berlin Airlift

The Berlin Airlift ran from June 1948 to September 1949 after the Soviet Union cut all land connections between the U.S., UK, and French occupation zones in Berlin and western Germany. The Soviet Union did not interfere with air traffic, so the Western allies organized an airlift. Supplies went by sea to German ports and then by rail to nine airfields in the western zone. Cargo aircraft flew from there along three air corridors to Berlin.

The challenge was enormous. The supply demands were set at 4,500 short tons per day.[20] Daily food requirements were 1,500 tons, while coal for electricity and heating purposes totaled 3,500 tons. With a population of 2.8 million, this amounted to 3.2 pounds per person per day. In total, 2,325,000 tons of supplies arrived between June 1948 and September 1949. At its peak, in August 1949, daily cargo flights reached 924. Overall, they averaged 680 flights per day.

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18 For examples of speculation about an airlift, see Reid Yankowski and Robert Wes, "A Taipei Airlift: Lessons From Berlin," War on the Rocks, May 13, 2025, https://warontherocks.com/2025/05/a-taipei-airlift-lessons-from-berlin/; and Gustavo F. Ferreira and Jamie. A. Critelli, "Taiwan's Food Resiliency—or Not—in a Conflict with China," U.S. Army War College, *Parameters* 53, no. 2 (2023), 55, https://press.armywarcollege.edu/cgi/viewcontent.cgi?article=3222&context=parameters.

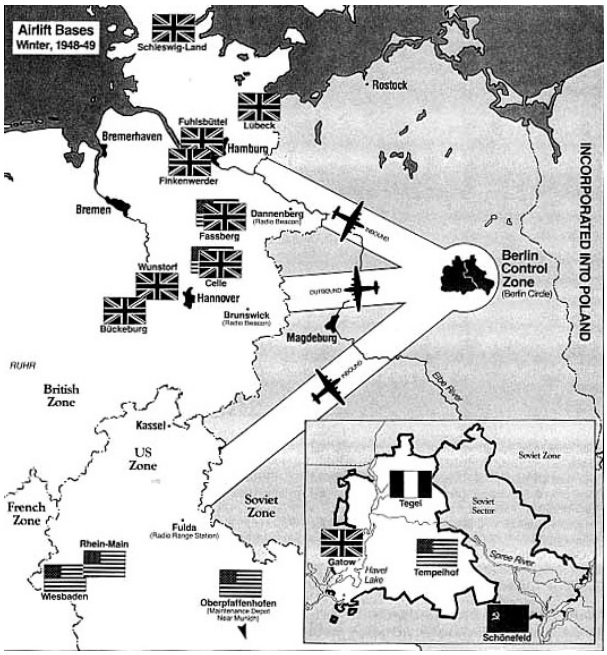
19 Data for this chapter and Appendix A come mainly from two primary sources: Roger G. Miller, *To Save a City: The Berlin Airlift, 1948-1949* (College Station, TX: Texas A&M University Press, 2008); and United States Air Forces in Europe, *Berlin Airlift: A USAFE Summary* (Ramstein Air Base, Germany: U.S. Air Forces in Europe, 1949), https://ia803208.us.archive.org/28/items/Berlinairlift00Unit/Berlinairlift00Unit.pdf.

20 This airlift analysis is in short tons (2,000 pounds) since the U.S. and UK historical documentation uses that metric.

Three measures greatly enhanced the airlift's capacity: First was a steady increase in lift capacity with the commitment of more high-capacity U.S. C-54 Skymasters. Second was the expansion of Berlin's airport infrastructure, including constructing new runways at Tempelhof and a new airport, Tegel. Third was an increase in efficiency. Over time, the average turnaround time in Berlin was reduced to 30 minutes.

Ultimately, demand was met, and the blockade failed. Economic activity in Berlin came to a standstill, but daily calorie intake in West Berlin went above the West German and UK average by the end of the airlift (2,300 kcal/day). The Soviet Union lifted the blockade in July 1949. The blockade proved a diplomatic and political disaster for the Soviet reputation. U.S. prestige soared. The creation of NATO and West Germany were indirect results.

Figure 2.1: Map of Berlin Airlift



Source: "Map of the Berlin Air Bases - Winter, 1948-1949," Department of Defense, n.d., https://www.defense.gov/Multimedia/Photos/igphoto/2001148129/.

Case Comparison: Berlin (1948–1949) and Taiwan (2028)

In their seminal work on historical analogy, Richard Neustadt and Ernest May encourage analysts to probe "whether the folk wisdom [about the past] really applies 'now.' What are *likenesses* and *differences*?"[21] How does the Taiwan case compare to the Berlin blockade? Table 2.1 below compares the Berlin Airlift with a hypothetical Taiwan airlift across key characteristics to illuminate these likenesses and differences.

In both cases, the United States and its partners have immense resources they can bring to bear and the capability to execute, or at least attempt, an airlift. As in the Berlin case, there would also likely be strong public support for a Taiwan airlift. The differences are also important. The most significant difference is scale. Taiwan's population is eight times that of Berlin's in 1948. Aircraft supporting a Taiwan airlift would also have to fly much longer distances, though the difference is partially offset by the greater capacity and range of today's aircraft. Taiwan's economy is far more energy intensive than Berlin's, and at least some of its chief power sources, especially natural gas, would be difficult, if not impossible, to transport by air. Partly offsetting the problem, there is a reduced need for heating because Taipei's average winter temperatures are warmer than those of Berlin (by between 25 and 30 degrees Fahrenheit).

21 Richard E. Neustadt and Ernest R. May, *Thinking in Time: The Uses of History for Decision-Makers* (Los Angeles: The Free Press, 1986), 41, 70, 251. Emphasis in original.

Table 2.1: Comparison of the Berlin Airlift with a Hypothetical Taiwan Airlift

	Berlin Airlift	Hypothetical Taiwan Airlift
Blockaded population	2.8 million	23.6 million
Nature of blockade	Ground (road, rail, and barge)	Maritime (offshore)
Reception airfields	Initially two airports; later three	Four international airports; many regional and military airports
Aircraft capability (avg)	~10 tons per sortie (C-54)	~40 tons per sortie (C-17)[22]
Flying distance	270 miles	410–1,700 miles
Energy intensity of economy	Relatively low, postwar	High
Participants	United States, United Kingdom, France (minimal)	United States, others likely (especially Japan)
Duration	15 months	?
Counterblockade	East German products	?
U.S. domestic support	High	Likely high, but uncertain

Source: Authors' research and analysis.

Analysis and Results

The project assessed the ability of an airlift by the United States and its partners to keep the Taiwanese population fed and minimally supplied with other essentials. The assessment considers Taiwan's requirements, the number and capacity of available U.S. cargo aircraft, sortie duration and frequency, cargo loading and unloading, and the potential contribution of U.S. allies. The analysis benchmarks Taiwan's requirements to those of Berlin during the Berlin Airlift (3.65 pounds per day). For Taiwan's population of 23.6 million, the total subsistence requirement would be 86 million pounds (43,070 tons) per day. Of that, most would be energy supplies and the rest food and emergency materials like medical items and spare parts for critical systems. Satisfying this demand would require 860 sorties per day based on standard aircraft loading.

Subject to the important conditions noted below, the analysis finds that an airlift could provide this minimum level of existence in Taiwan and prevent catastrophic loss of life. Under particularly favorable circumstances, an airlift could provide a somewhat higher level of support. However, an airlift does not represent a long-term solution. It would require nearly all U.S. strategic mobility assets, greatly reducing the United States' ability to respond to other global crises. Moreover, even the highest levels of delivery would not stave off the collapse of the Taiwanese economy. The key problem would be energy, since all the materials are heavy and natural gas is difficult or impossible

22 Although a C-17 can carry up to 85 tons in theory, on average they carried 42 percent of that full load in Desert Storm, and that figure was used here. Desert Storm usage rate from Thomas A. Keaney and Eliot A. Cohen, Gulf War Airpower Survey, Volume 5, Statistical Summary and Chronology (Washington, DC: U.S. Department of the Air Force, 1993), 80, "Strategic Airlift Summary by Aircraft Type," https://media.defense.gov/2010/Sep/27/2001329816/-1/-1/0/gulf_war_air_power_survey-vol5.pdf.

to transport without specially designed transportation systems. Total electricity production might be reduced to 20 percent of pre-blockade electricity levels. Nevertheless, assuming that the necessary circumstances aligned, an airlift could provide some breathing room for diplomats to resolve a crisis.

Important conditions apply to these moderately positive conclusions. First, key partners must support the effort. An airlift operating from U.S. territory alone (Guam) could not bring enough supplies. Adding U.S. bases in Japan would be adequate, though just barely. Including bases in the Philippines and civilian airports in Japan would increase the flow and hedge against adverse events. Allies and partners might find participation in an airlift to be politically easier than in a kinetic military operation because of the former's humanitarian nature and the generally lower risk involved.

A second condition is a permissive environment and no substantial Chinese attack on the airflow or bases. An airlift opposed by China's full military power would be impossible to execute. Notably, the Soviet Union did not interfere with the Berlin Airlift. China might conclude that an attack would cause significant numbers of fatalities and make China look like the aggressor in ways that boarding or seizing ships would not. It might also hope that the airlift would fail even without attack. Interference beyond harassment would push the situation from an airlift to a kinetic war, with all the risks associated with such an escalation.

UNCONVENTIONAL MARITIME METHODS

A variety of unconventional maritime sources would arise spontaneously or be proposed. Examples include private blockade running, submarine resupply, "cocaine logistics" (the use of small covert means), and "rat logistics" (the use of military craft during periods of limited visibility).

These smaller ships might evade Chinese surveillance by hiding in the regular stream of traffic and making a dash to Taiwan, disguising themselves as a fishing or research vessel, or using low observability to evade detection. Numbers would also be an advantage. These advantages would increase in a contested blockade where Chinese ships were driven back or forced to defend themselves. This would make the blockade more porous. The advantages that the "mice" would have in this cat-and-mouse game of blockade and blockade running mean that alternatives to traditional cargo shipping deserve examination.

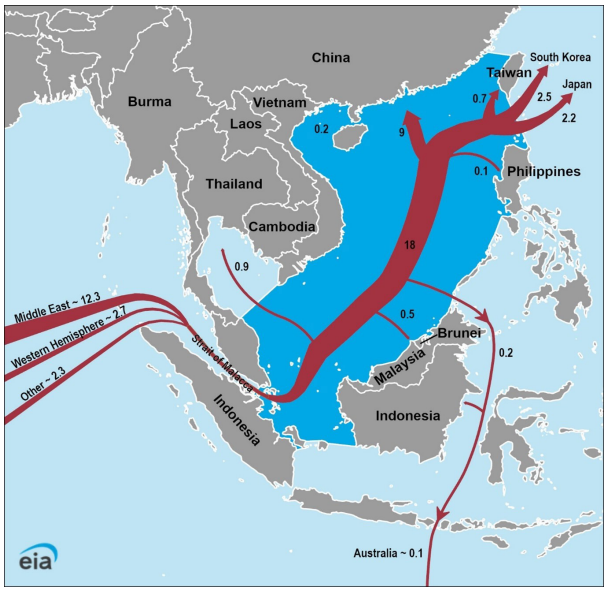
Private and Quasi-Private Blockade Running

Basic economics drives efforts at blockade running in virtually all historical cases. Blockades reduce the supply of certain goods, and this drives up prices. At some point, the high price justifies the risk of interception and use of inefficient means of transportation. In other words, crisis spawns entrepreneurship. Official or unofficial authorization of such trade by Taiwan and the ports of embarkation (likely Japan or the Philippines) permits a much larger amount of imports. Blockade runners can then focus on getting past the adversary's obstruction rather than loading, landing, and offloading successfully. Nevertheless, some blockade running would happen even if not authorized.

Although materials for blockade running might come from great distances, a two-stage process typically evolves similarly to, though separate from, the system for official blockade convoys (see the convoy shuttle section above).

A Chinese blockade of Taiwan would induce the emergence of private blockade runners of many sorts, mainly ships, though some private aircraft might risk the trip. Blockade running could use a wide variety of navigational approaches to Taiwan and employ techniques that would not be available to official shipping, such as using disguised identities, showing different national flags, turning off location transponders, and operating with forged papers. Russia, for example, has created a "ghost fleet" and used these techniques to evade sanctions on its oil.[23] Blockade-running vessels could hide among the mass of shipping in East Asia and then dash into Taiwanese territorial waters. Figure 2.2 shows how heavy just one element of this traffic is.

Figure 2.2: Crude Oil Trade Flows in East Asia



Source: "South China Seae," U.S. Energy Information Administration, March 21, 2024, https://www.eia.gov/international/analysis/regions-of-interest/South_China_Sea.

Blockade runners could be as large as container ships or as small as private yachts. Smaller ships, although inefficient for regular sea transportation, are easier to conceal, an acceptable trade-off during a blockade. Because of their generally smaller sizes, blockade runners could use a wider variety of ports and airfields, thus avoiding Chinese surveillance of the larger ports.

Nongovernmental organizations (NGOs) and private charities might send supplies to Taiwan using their own means. These NGOs might operate overtly as humanitarian relief under international law or clandestinely to avoid engagement with the Chinese government. The war in Ukraine has seen such organizations arise spontaneously outside official channels to provide everything from medical supplies to weapons. The Taiwanese diaspora would likely take the lead in creating such NGOs. Existing NGOs might participate with a strictly humanitarian focus, while others would spring up in response to the blockade.

Blockade running would not bring in the full range of products needed by Taiwan. Historically, runners have focused on high-value items to maximize profits. These unofficial sources are particularly helpful in providing nonessentials that ease the sacrifices that the blockades impose on daily life. Ship and cargo compatibility also shapes what blockade runners can transport. A

23 Benjamin Jensen, "How to Exorcise Russia's Ghost Fleet," CSIS, *Commentary*, January 7, 2025, https://www.csis.org/analysis/how-exorcise-russias-ghost-fleet.

wide variety of ships can carry dry, non-bulk products without tailored configurations. Although oil products require specialized ships and offloading facilities, the ships are widely available, as are offload facilities in Taiwan. Smuggling LNG would be nearly impossible because it requires access to specialized ships, which would be much more challenging to secure.

Given this history, the wargame includes mechanisms for blockade running.

"Cocaine Logistics"

"Cocaine logistics" refers to the use of covert, expendable, and often improvised platforms that drug runners use to smuggle illegal drugs into the United States and other countries. It represents a subcategory of blockade running. One possibility is a manned or unmanned semi-submersible (technically "low-profile vessels"). Low silhouettes make these hard to detect. They are not submersible; that capability requires a sophisticated design and a highly trained crew. Several U.S. military officers have suggested that such craft might be used to resupply dispersed Marine Corps units inside the Chinese defensive bubble during a conflict, and the concept could be expanded to blockade running.[24] However, a typical semi-submersible has a roughly five-ton capacity—sufficient for smuggling high-value cargoes like cocaine but too small to meet Taiwan's needs. Supplying an island of 23 million is vastly more challenging than resupplying 100 Marines in a small enclave.

The situation is similar with aircraft. Criminal organizations use slow and small single-engine aircraft to transport drugs because the aircraft are hard to detect when flying at low altitudes in remote areas. These aircraft have a range of only ~300 nm, so they must launch from nearby airfields. Criminal organizations use private jets for transoceanic flights to intermediate airfields and then use these small aircraft to transport cargo from intermediate airfields to consumption centers.[25] Because the small aircraft can carry only 500 pounds of cargo, they are well suited for delivering high-value, low-weight products (like cocaine) but unsuited for general cargo delivery. Even 100 daily flights by such aircraft—a heroic assumption—would provide only 25 tons, or .06 percent of Taiwan's 43,070-ton daily requirement. By contrast, a single C-17 sortie can deliver about 40 tons, 10 times as much as a semi-submersible and 200 times as much as a small aircraft. Further, the C-17 is a versatile aircraft with a range of 2,400 nm and can operate on austere airfields with short, narrow runways.[26]

Japanese "Ant" and "Rat" Logistics

During World War II, Japan developed an alternative logistics system that used barges ("ant" logistics), fast destroyers at night ("rat" logistics), and submarines to make covert deliveries. These methods employed new tactics that used night, reduced visibility, and geography to evade U.S. air superiority. During the 1942–1943 Solomon Islands campaign, the U.S. Navy called this effort

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24 Walker D. Mills, Dylan Phillips-Levine, and Collin Fox, "'Cocaine Logistics' for the Marine Corps," War on the Rocks, July 22, 2020, https://warontherocks.com/2020/07/cocaine-logistics-for-the-marine-corps/.

25 Martin Verrier, "The Invisible Force: The Increasing Threat of Drug Flights," Royal United Services Institute, May 1, 2020, https://rusi.org/networks/shoc/informer/invisible-air-force-increasing-threat-drug-flights.

26 "C-17 Globemaster III," U.S. Air Force, n.d., https://www.af.mil/About-Us/Fact-Sheets/Display/Article/1529726/c-17-globemaster-iii/.

the "Tokyo Express" and devoted considerable effort to interdict it.[27] The Japanese effort was only partially successful. Japan had to supplement these meager logistics with covert gardens and mass extractions from locals. Many garrisons held out until the end of the war, albeit with mass deaths from starvation and illnesses resulting from malnourishment.

Such a system has only limited parallels with a Taiwan blockade. With the advent of near-persistent satellite coverage, long-loitering high-altitude unmanned aerial vehicles, and synthetic aperture radars that can see through clouds and darkness, there would not be any comparable window for military blockade running to Taiwan during a conflict with China.

Submarine Supply

There is also a historical precedent for supply by submarine. Germany built specially designed cargo submarines in World War I (*Deutschland* and *Bremen*) and World War II (Type XIVs, nicknamed "milk cows"), as did Italy (R class and 10 submarine conversions). Japan used submarines to resupply bypassed and isolated garrisons during World War II. Thus, submarine resupply has sometimes been suggested as a possibility for Taiwan.[28] Although such covert means have intuitive appeal, the amount of cargo carried would be negligible, and any use of U.S. submarines for the task would divert them from critical warfighting capabilities.

Submarines could not deliver substantial cargo because they are poorly configured for that purpose. There is little storage space, and efforts to increase loading could endanger buoyancy. Further, there are no means to load or offload rapidly. Hatches are small, and everything would need to be moved manually. Only the four nuclear-powered guided missile submarines (SSGNs) have substantial storage space because of their origins as ballistic missile submarines and their current secondary mission of special forces insertion.[29]

An example of potential offload is instructive: Assume all four U.S. guided-missile submarines (SSGs) and 12 additional nuclear-powered attack submarines (SSNs) are taken from other missions. Optimistically, a regular SSN might carry 200 tons of cargo and an SSGN might carry 500 tons. Operating from Guam, the forward-most U.S. submarine base, each round trip would require eight days (three days for each leg and one day on each for loading and unloading). On average, then, one SSGN would arrive in Taiwan every two days and three SSNs every two days. Average daily deliveries would be 650 tons. Given a minimum island delivery requirement of 43,070 tons (see previous section on airlift), that satisfies only 1.5 percent of the total requirement.

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27 For a description of the Tokyo Express, see Tameichi Hara, "The Tokyo Express" in *Japanese Destroyer Captain: Pearl Harbor, Guadalcanal, Midway—The Great Naval Battles as Seen Through Japanese Eyes* (Annapolis, MD: Naval Institute Press, 1967).

28 Lauren Reilly, "Narco-Submarines: The Key to Modernizing Resupply Strategies," Navy League of the United States, Winter 2022, https://www.navyleague.org/wp-content/uploads/2022/12/Narco-Submarines-The-Key-to-Modernizing-Resupply-Strategies.pdf; Bill Rivers and Matt DiRisio, "For survivable resupply, look to autonomous submarines," C4ISRNET, November 8, 2023, https://www.c4isrnet.com/opinion/2023/11/08/for-survivable-resupply-look-to-autonomous-submarines/; and Luis Simón and Toshi Yoshihara, "Can Europe Fight for Taiwan?," War on the Rocks, January 8, 2025, https://warontherocks.com/2025/01/can-europe-fight-for-taiwan/.

29 "Guided Missile Submarines - SSGN," U.S. Navy, last modified November 15, 2023, https://www.navy.mil/Resources/Fact-Files/Display-FactFiles/Article/2169613/guided-missile-submarines-ssgn/.

However, this comes at a huge warfighting cost because it wastes submarine capabilities, a prime warfighting asset. The *First Battle of the Next War* report noted that in repeated wargame iterations, "inside the [Taiwan] strait, U.S. submarines wreaked havoc on Chinese shipping." It was called the "happy time" for U.S. submarines.[30] Virtually every analysis of Navy force structure recommends increasing the number of submarines.[31] However, U.S. submarine force levels will decline in the near term because of low production rates in the 1990s and will not reach the current level again until the mid-2030s. Industrial base constraints prevent any additional submarines from getting to the fleet before the late 2030s beyond those already planned.[32]

The bottom line: The combination of small deliveries and major warfighting decrement means that this option is a nonstarter.

Summary of Unconventional Methods

Despite their shortcomings in volume, alternate means of supply could be useful in three ways. First, the existence of blockade runners might force China to institute a close blockade that would include a heavy presence "on station" in areas off Taiwan's coasts. This would potentially place blockading ships in exposed positions close enough to shore to be struck by land-based antiship missiles—an advantage for Taiwan if the blockade turns kinetic. Second, a swarm of low-profile vessels and aircraft could distract Chinese blockaders from larger vessels. Although a cost-benefit approach for China might be to ignore these small vessels as insignificant, that would be hard to do given their visibility and symbolism. Finally, they would produce a psychological boost to the Taiwanese population. Blockade runners make for tales of heroism, and crews would become celebrities.

However, these potential benefits are ancillary compared to the lack of volume that alternate methods could deliver. It would take about 5,000 of the largest narco-submarines ever caught to equal the size of the smallest class of bulk carriers.[33] A fleet of these would have to be rapidly available to provide a consistent stream of traffic to Taiwan. An airlift might sustain Taiwan at a subsistence level in a scenario of lower Chinese escalation levels, but it could not provide the volume needed to maintain Taiwan's economy. At higher escalation levels, China could interdict these large and slow transport aircraft. This method is also incapable of transporting the desperately needed LNG. Thus, although any analysis should account for deliveries by airlift and

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30 Cancian, Cancian, and Heginbotham, *The First Battle of the Next War*. "Happy time" is a reference to two periods in Germany's World War II U-boat campaign when hunting was good, and losses were few. The first was between July 1940 and April 1941, when U-boats acquired access to bases in France but Great Britain had not yet developed its convoy defenses. The second period was between December 1941 and July 1942, when U-boats struck the East Coast of the United States, and the United States took many months to develop effective defenses.

31 For specifics on these proposals from the DOD, the Navy, and research organizations, see Mark F. Cancian, *Security in the Western Pacific: Building Future Capabilities in the Time of AUKUS* (Washington, DC: CSIS, 2024), 22, Fig. 1, https://www.csis.org/analysis/security-western-pacific-building-future-capabilities-time-aukus.

32 For a detailed discussion of submarine force levels, see Mark F. Cancian, "Submarines: The Unobtainable Solution" in ibid., 21–25.

33 The largest narco-submarine carried 7.7 tons. Module 1 contains sizes for stranded ships. See Associated Press, "US Navy seizes submarine with seven tonnes of cocaine on board," *The Guardian*, last modified July 14, 2017, https://www.theguardian.com/world/2015/jul/23/us-navy-seizes-submarine-with-seven-tonnes-of-cocaine-on-board.

blockade runners when appropriate, these alternative methods cannot replace merchant ships. This report therefore focuses on conventional merchant ships as the primary mover of supplies to Taiwan during a blockade.

Legal Aspects of Blockades

Although the belligerents might not feel tightly bound by international law in the extreme conditions of a conflict, the global community would examine it closely. China has spent years building its case and legal arsenal, deliberately mobilizing lawyers and academics by encouraging their creative, and sometimes confusing, scholarship and enacting domestic laws useful to a government preparing for war. The United States, too, has efforts underway. The legal domain will, therefore, be part of any U.S.-China conflict.[34]

A strong case under international law would help the United States and its partners build a broader global coalition to counter the blockade.

A strong case under international law would help the United States and its partners build a broader global coalition to counter the blockade. It would, for example, facilitate the imposition and enforcement of sanctions. It would also help shore up domestic support to endure hardships and set the stage for whatever settlement and regional order can be achieved after the confrontation. While most countries would prefer to avoid the legal and diplomatic issues that arise from a blockade of Taiwan, the blockade's unavoidable disruption of the global economy will force almost every state to take a stance.[35] Ultimately, the global community will decide the status and effectiveness of a "blockade" by their reaction to it. The United States might decide to shape some military operations to secure a favorable international reaction.

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34 For China's preparations, see Cheng Deng Feng and Tim Boyle, "Exposing China's Legal Preparations for a Taiwan Invasion," War on the Rocks, March 11, 2025, https://warontherocks.com/2025/03/exposing-chinas-legal-preparations-for-a-taiwan-invasion/; and Masavoshi Dobashi and Rena Sasaki, "PRC Uses Legal Warfare to Support Maritime Blockade Against Taiwan" Jamestown Foundation, *China Brief* 25, no. 5 (2025), https://jamestown.org/program/prc-uses-legal-warfare-to-support-maritime-blockade-against-taiwan/. For U.S. preparations, see Lonnie D. Henley, "Beyond the First Battle: Overcoming a Protracted Blockade of Taiwan," U.S. Naval War College, *CMSI China Maritime Reports* 26 (2023), https://digital-commons.usnwc.edu/cmsi-maritime-reports/26; "J06 Office of the Staff Judge Advocate," U.S. Indo-Pacific Command, n.d., https://www.pacom.mil/Contact/Directory/J0/J06-Staff-Judge-Advocate/#legalarticles; and "In Their Own Words," Air University, https://www.airuniversity.af.edu/CASI/In-Their-Own-Words/. For international law as a battlefield, see Jill I. Goldenziel, "Law as a Battlefield: The US, China, and the Global Escalation of Lawfare," *Cornell Law Review* 106, no. 5 (2021), 1085-1171, https://publications.lawschool.cornell.edu/lawreview/2021/09/23/law-as-a-battlefield-the-u-s-china-and-the-global-escalation-of-lawfare; and Michael N. Schmitt, "Regaining Perspective on the Law of Armed Conflict," Lieber Institute West Point, September 12, 2024, https://lieber.westpoint.edu/regaining-perspective-law-armed-conflict/.

35 Charlie Vest, Agatha Kratz, and Reva Goujon, *The Global Economic Disruptions from a Taiwan Conflict* (New York: Rhodium Group, 2022), https://rhg.com/research/taiwan-economic-disruptions/.

HOW DOES THIS AFFECT THE BLOCKADE WARGAME?

It is worth beginning by considering how legal matters affect the wargame. The items below are decisions in the wargame that depend on the attitudes of other countries. Legal arguments influence these decisions by creating a favorable or unfavorable global political environment for the United States and Taiwan.

- **Operations from U.S. bases in foreign countries.** This is especially important for bases in Japan.
- **Transshipment of cargo in Japan or Australia.** To be viable, convoys need ports where global shipping can transfer cargo onto ships willing to make the risky run into Taiwan.
- **Provision of national merchant shipping and escorts by other nations.** Some countries might be willing to have their national merchant fleets run the gauntlet protected by their own warships.
- **Authorization of overflight and logistics by countries such as Singapore, which will not be directly involved.** Overflight and logistics help the United States because the conflict is being conducted 8,000 miles from the U.S. mainland.
- **Humanitarian supplies being shipped to Taiwan with China's acquiescence.** Humanitarian organizations will want to send emergency supplies to Taiwan, but China will prohibit this unless put under enough pressure.
- **Airlift and blockade running.** These require bases in other countries, particularly Japan and the Philippines.
- **Open-market sales of merchant ships during a crisis.** In some scenarios, the United States and Taiwan need additional merchant ships, especially to fill gaps and replace losses. Without the cooperation of other countries, these purchases would be difficult.

WHAT IS A BLOCKADE?

The analysis begins with a definition: A blockade is a "belligerent operation to prevent vessels and/or aircraft of all States, enemy and neutral, from entering or exiting specified ports, airfields, or coastal areas belonging to, occupied by, or under the control of an enemy State."[36] A vast body of international law governs the operation of a blockade. There are, for example, requirements for notification, effectiveness (no paper blockades), impartial application to all states, treatment of neutral vessels and ports, the location of blockading forces, and methods of inspection.[37] A blockade

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36 Navy Warfare Development Command, *The Commander's Handbook on the Law of Naval Operations* (Washington, DC: Department of the Navy, March 2022), https://stjececmsdusgva001.blob.core.usgovcloudapi.net/public/documents/NWP_1-14M.pdf; Wolff Heintschel von Heinegg, "Blockade," Max Planck Encyclopedia of Public International Law, October 2015, https://opil.ouplaw.com/display/10.1093/law:epil/9780199231690/law-9780199231690-e252; and Wolff Heintschel von Heinegg et al., "Section 7.4" in *Newport Manual on the Law of Naval Warfare*, 2nd ed. (Stockton Center for International Law, 2025),

37 von Heinegg et al., "Section 7.4." The London Declaration of 1909 describes in 64 articles how blockades should operate. See "Declaration Concerning the Laws of Naval War. London, Feb 26, 1909," International Committee of the Red Cross, https://ihl-databases.icrc.org/en/ihl-treaties/london-decl-1909.

is therefore an action between sovereign nations and an act of war. However, because so few countries recognize Taiwan as a sovereign entity, applying this vast corpus of law will be difficult.

IS THIS AN INTERNATIONAL ARMED CONFLICT OR A DOMESTIC DISPUTE?

This is the key issue. China regards Taiwan as a renegade province and will, therefore, frame the conflict as an internal issue controlled by Chinese domestic law and not subject to foreign interference. The fact that the United States does not recognize Taiwan as an independent country will complicate its argument that blockade actions are improper. Legally, the United States is in a weak position.

This is the key issue. China regards Taiwan as a renegade province and will, therefore, frame the conflict as an internal issue controlled by Chinese domestic law and not subject to foreign interference.

However, the United States could employ several legal arguments to justify a range of options available to it to support Taiwan or alleviate the effects of PRC action.[38] The United States could:

- Point to the Taiwan Relations Act, which established U.S. policy that reunification had to be voluntary rather than by force, and to the Three Communiqués between the United States and the PRC, which state that the Taiwan issue should be resolved peacefully.
- Invoke collective self-defense to maintain international peace and security under the UN Charter (but not by action of the Security Council, since China and likely Russia would veto any unfavorable action).[39]
- Argue that the blockade is inhumane and that China must allow certain goods into Taiwan to alleviate civilian suffering.[40]

HOW IS A BLOCKADE DISTINGUISHED FROM A QUARANTINE, AN EXCLUSION ZONE, AND OTHER ACTIONS?

Because the term "blockade" carries so much legal import, words will be carefully chosen. China will use alternative terms instead, such as "quarantine," which the United States employed during

38 Raul Pedrozo, "The Defense of Taiwan: Possible Legal Justifications," Naval War College, *International Law Studies* 103, no. 344 (2024), https://digital-commons.usnwc.edu/ils/vol103/iss1/10/.

39 Ibid.

40 The argument will be stronger in public opinion and the media than in law. Pictures of suffering on Taiwan will be powerful. However, even if starvation were China's unstated but apparent goal in blockading Taiwan, China could identify several other reasons for the blockade. The *Newport Manual* notes, "[A] denial of the blockading power's consent to relief consignments will be arbitrary [and, hence, prohibited] only in exceptional circumstances, in which the very survival of the civilian population is at stake and when the authorities of the blockaded area are incapable of providing such goods or of having them provided."

the 1962 Cuban Missile Crisis; "inspection process," driven by public health to prevent another pandemic; or "law enforcement action," driven by self-defense against a "militarizing" Taiwan. However, these actions have requirements under international law that, if not met, render the action potentially unlawful—thereby presenting opportunities to assist Taiwan.

The *Commander's Handbook on the Law of Naval Warfare* (NWP 1-14M) differentiates between blockade and quarantine, specifically regarding the 1962 quarantine, stating, "Quarantine is selective in proportional response to the perceived threat. Blockade requires impartial application to all States—discrimination by a blockading belligerent renders the blockade legally invalid."[41] In 1962, President Kennedy authorized a limited operation to interdict offensive weapons bound for Cuba.[42] China would likely throw this precedent back at the United States. The United States might respond that these were nuclear weapons and inapplicable to any situation on Taiwan.

NWP 1-14M provides an additional U.S. response where it notes, "The goal of quarantine is de-escalation and return to the status quo ante or other stabilizing arrangement." Therefore, if China demands that Taiwan make extreme concessions in exchange for lifting the "quarantine" and those concessions go beyond this limited framework, then the PRC action would not constitute a lawful quarantine. Extreme concessions would include ones that compromise Taiwan's political autonomy, system of government, or defensive capabilities. Another example would be a broad PRC "quarantine" that prohibits the importation of food and medical necessities, and perhaps even defensive weaponry, which would also go beyond the scope of a lawful quarantine.

Exclusion zones and similar areas do not afford belligerents unlimited action within them.[43] The *Commander's Handbook* illustrates this point well:

> The total exclusion zone announced by the United Kingdom and Argentine declaration of the South Atlantic as a war zone during the Falklands/Malvinas conflict were problematic in that they deemed any neutral vessel within the zones without permission as hostile and liable to attack. The zones declared by both Iran and Iraq during the 1980s Gulf War appeared to unlawfully operate as free-fire zones for all vessels entering therein.[44]

Thus, the United States and others might have grounds to challenge China's declared "exclusion zone."

WHAT CAN THIRD PARTIES DO TO COUNTER A BLOCKADE AND WHAT ARE THE CONSEQUENCES?

In most historical precedents—be it the American Civil War, the Cuban Missile Crisis, World Wars I and II, the Tanker War, the Falklands War, the Korean War, or the Vietnam War (sealing Haiphong harbor)—the pertinent question was how other states reacted.

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41 Navy Warfare Development Command, *The Commander's Handbook*, 4-10.

42 James Kraska, Raul Pedrozo, and Michael N. Schmitt, "Annotated Supplement to the Commander's Handbook on the Law of Naval Operations," *International Law Studies* 102, no. 1 (2024): 4.73–4.76, https://digital-commons.usnwc.edu/ils/vol102/iss1/14/.

43 von Heinegg, "War Zones."

44 Navy Warfare Development Command, *Commander's Handbook*, 7-13.

The obvious first step is a diplomatic protest. As Wolff Heintschel von Heinegg observed regarding reactions to blockades, "The usual reaction will be an official protest of the blockading power addressed to the government of the respective neutral State."[45] Countries that are unwilling to take forceful action might be willing to join such a diplomatic effort.

The Defense Department's *Law of War Manual* provides a broad overview of possible avenues for addressing violations of international law. These include national and international investigations and prosecutions, demand for compensation, retorsion (unfriendly conduct that is not inconsistent with international obligations and is done in response to an internationally wrongful act), reprisals (acts that would otherwise be unlawful), prize court adjudications, publication of facts to influence public opinion, and solicitation of intervention by neutral states, and other avenues.[46]

The United States could take more active measures, though these measures carry the risk of confrontation and violence. For example, it could argue that China's action is invalid for the reasons specified earlier and send ships (or inspire other states to send ships) with humanitarian supplies to alleviate suffering in Taiwan.

The United States could argue that it was taking measures to protect U.S. and other foreign nationals in Taiwan.

If China remains immune to pressure, the United States could, as a last resort, threaten to recognize Taiwan's statehood and bring the conflict more clearly into the realm of international law.

WHAT PROTECTIONS APPLY TO THE TAIWAN STRAIT?

Regardless of the terms that China uses for a blockade, the Taiwan Strait is an international strait, which denotes a special status in international law. As von Heinegg points out, "A blockade may not be established and maintained in, and over, international straits or archipelagic sea lanes unless the blockading power provides for safe and free passage of international navigation and aviation not destined to the blockaded area."[47] This prohibition would apply even if the conflict were considered an internal matter. Thus, if China denies access to the straits or mines the strait, it would be susceptible to intervention, even with a paralyzed UN Security Council.[48]

Economic Context and Global Impact

This project is scoped to the operational aspects of a Chinese blockade and its immediate impact on Taiwan's material position; it does not model the wider economic or political impact of conflict.

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45 von Heinegg, "War Zones."

46 U.S. Department of Defense, *Department of Defense Law of War Manual* (Washington, DC: U.S. Department of Defense, updated July 2023), Chapter XVIII - Implementation and enforcement of the Law of War, https://media.defense.gov/2023/Jul/31/2003271432/-1/-1/0/DOD-LAW-OF-WAR-MANUAL-JUNE-2015-UPDATED-JULY%202023.PDF.

47 von Heinegg, "Blockade."

48 David Letts, "Naval Mines: Legal Considerations in Armed Conflict and Peacetime," *International Review of the Red Cross* 98, no. 2 (2016): 543-65, https://international-review.icrc.org/sites/default/files/irc98_9.pdf; and "United Nations Convention on the Law of the Sea: Part II: Territorial Sea and Contiguous Zone," United Nations, https://www.un.org/depts/los/convention_agreements/texts/unclos/part2.htm.

Nevertheless, it is possible to summarize a growing body of literature on that topic, which provides important context for such a conflict. Considering the possible long duration of such a campaign and its inherently economic nature, the literature highlights the pressures that would be brought to bear on the respective actors.

BACKGROUND: THE SCALE OF IMPACT DIFFERS FROM THE WAR IN UKRAINE

The scale of the economies involved is critical to appreciating the economic impact of conflict. Here, a comparison to Russia's Ukraine invasion is instructive. At $18.8 trillion in 2024, China's GDP is roughly eight times that of Russia ($2.4 trillion). Similarly, at $793 billion, Taiwan's economy is four times the size of Ukraine's ($180 billion in 2024, $200 billion in 2021).[49] (All figures cited in this section are in market exchange rates.)

The degree and nature of integration with the global economy are as important as economic size. The export of primary goods powers the Russian and Ukrainian economies. Russia's largest export sectors are metals and minerals (60 percent) and agriculture (10 percent), while Ukraine's are food (40 percent) and metals (12 percent).[50] Losing output drives up global prices but does not fundamentally disrupt global economic activity. China and Taiwan, on the other hand, are deeply embedded in global supply chains.

Subcomponents often cross borders multiple times before being incorporated into final products. Several of China's largest export sectors also account for much of its imports. For example, electronics account for 23 percent of China's exports and 13 percent of its imports, while machinery comprises 18 percent of exports and 8 percent of imports.[51] Incoming and outgoing foreign direct investment is also concentrated in these sectors.[52] War in Asia would sever these supply chains and halt output. Finding and retooling alternative suppliers would take significant time. The Taiwan Semiconductor Manufacturing Company manufactures more than 60 percent of the world's contract semiconductors and more than 90 percent of all advanced chips (primarily 3-nanometer chips).[53] These chips are embedded in a wide range of products, from smartphones to cars and appliances, and producing comparable fabs elsewhere could take a decade.

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49 Hon-min Yau, "Lessons from, and Implications of, the Russia-Ukraine War for a Future Taiwan Strait Scenario," in *Contemporary Chinese Political Economy and Strategic Relations* 8, no. 3 (2022): 519–51, https://www.proquest.com/openview/b19ba8f8201f1b02aabc974b0fc960c5/1?pq-origsite=gscholar&cbl=2042768.

50 Harvard Growth Lab, "Russia: Export Basket in 2023," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/countries/643/export-basket.

51 Harvard Growth Lab, "What did China import in 2023?," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/explore/treemap?exporter=group-1&productLevel=1&importer=country-156; and Harvard Growth Lab, "What did China export in 2023?," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/explore/treemap?exporter=country-156&productLevel=1.

52 Charlie Vest and Agatha Kratz, *Sanctioning China in a Taiwan crisis: Scenarios and risks* (Washington, DC: Atlantic Council and Rhodium Group, June 2023), https://www.atlanticcouncil.org/in-depth-research-reports/report/sanctioning-china-in-a-taiwan-crisis-scenarios-and-risks/.

53 Jeremy Bowman, "This 1 Number May Ensure TSMC's Market Dominance," The Motley Fool, August 17, 2024, https://www.fool.com/investing/2024/08/17/this-1-number-may-ensure-tsmcs-market-dominance/.

MAJOR VARIABLES: NATURE, INTENSITY, AND DURATION OF CONFLICT

The global GDP loss from the war in Ukraine has been estimated at between 0.7 percent and 1.5 percent since 2022.[54] Analysts suggest that a better point of comparison for war in Asia would be the impact of the Covid-19 pandemic (estimated at 8.5 percent through 2022). Some estimates of Taiwan scenarios range significantly higher.[55]

Specific estimates depend on the imagined conflict's nature, intensity, and duration.[56] At the low (or contained) end, the Rhodium Group assessed the impact of a Chinese blockade of Taiwan that did not escalate to the lethal use of military force. The authors estimated that losses over a single year would be $2 trillion, or about 2 percent of global GDP.[57] Two papers by Bloomberg estimate losses in two scenarios. The first posits that China blockades Taiwan, and the United States, rather than using military force, imposes sanctions in response. The authors assess that losses to the global economy would total $5 trillion over one year (or roughly 4 percent of GDP).[58] In the second scenario, China launches an (unspecified) attack on Taiwan, the United States intervenes militarily, and the United States and its allies impose sanctions. In this case, they conclude that losses could total $10 trillion per year.[59]

A 2016 study by the RAND Corporation examined different war scenarios defined by the war's severity (mild or severe) and the duration of conflict (weeks to a year). Although the RAND team did not offer an assessment of aggregate world GDP losses, its estimate of losses to the U.S. and Chinese economies in a severe and long war were about 50 percent higher than the estimates provided for those countries under Bloomberg's "war" scenario. Thus, global losses might be as high as 15 percent of world GDP annually.[60]

UNEVEN IMPACT ON ACTORS

The recent studies cited above agree that the distribution of economic costs would be uneven. Taiwan is the most vulnerable, as its commerce with the outside world could be almost entirely severed (a proposition the current study evaluates). The Bloomberg studies conclude that losses to

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54 Cornelia Auer et al., "Cascading socio-economic and financial impacts of the Russia-Ukraine war differ across sectors and regions," *Communications Earth & Environment* 6, no. 194 (2025), https://www.nature.com/articles/s43247-025-02119-1.

55 Jennifer Welch et al., "Xi, Biden and the $10 Trillion Cost of War Over Taiwan," Bloomberg, January 8, 2024, https://www.bloomberg.com/news/features/2024-01-09/if-china-invades-taiwan-it-would-cost-world-economy-10-trillion?embedded-checkout=true.

56 On the impact of Covid-19, see Katia Dmitrieva, "Five Years On, COVID-19 Pandemic Effects Linger in World Economy," Bloomberg, March 14, 2025, https://www.bloomberg.com/news/newsletters/2025-03-14/covid-economic-effects-five-years-on?embedded-checkout=true.

57 Charlie Vest, Agatha Kratz, and Reva Goujon, "The Global Economic Disruptions from a Taiwan Conflict," Rhodium Group, December 14, 2022, https://rhg.com/research/taiwan-economic-disruptions/.

58 Jennifer Welch and Gerard DiPippo, "Taiwan Blockade Could Be $5 Trillion Global Hit," Bloomberg Global Insight, May 21, 2024.

59 Jennifer Welch and Gerard DiPippo, "Simulating Catastrophe: A War Over Taiwan," Bloomberg Global Insight, May 20, 2024.

60 Astrid Stuth Cevallos, Cristina L. Garafola, and David C. Gompert, *War with China: Thinking Through the Unthinkable* (Santa Monica, CA: RAND Corporation, 2016), 47, https://www.rand.org/pubs/research_reports/RR1140.html.

the Taiwanese economy would be 12 percent of GDP in the non-kinetic scenario and 40 percent in the kinetic scenario.[61]

If the United States were to support Taiwan and intervene in the conflict, China would likely suffer losses second only to Taiwan and several times those suffered by the United States, according to recent assessments.[62] War would decouple China from some of its most important economic partners, starting with Taiwan. The United States could orchestrate sanctions, making it difficult for Chinese firms to operate overseas. Foreign-invested enterprises, which account for 25 percent of China's high-tech exports, would likely be unable to continue operations. Trade to some of China's most important ports could be disrupted in a kinetic conflict.

Analysts also concur that other Asian economies—including U.S. allies—would suffer damage almost as severe as China. As a percentage of total trade, South Korea does twice as much trade with China as the United States does, while Australia does almost three times as much.[63] Supply chains for Japanese and especially South Korean firms are deeply embedded in China. Australia's economy relies so heavily on Chinese markets that finding substitutes on the same scale might be impossible.

Although the U.S. economy is less exposed to disruptions emanating from an Asian conflict, it would still suffer substantial damage. The available analyses suggest it could sustain losses of up to 5 to 10 percent of total GDP in a kinetic conflict lasting one year.

CAVEATS AND NON-GDP EFFECTS

Most macroeconomic models are primarily demand driven and therefore are not well-suited to modeling disruptions in supply. In part for that reason, authors of the Rhodium study emphasize that their estimates represent a "floor." The "full scope of imperiled activity," they assert, "would surely be greater" and would "materialize almost immediately."[64] Indeed, many economists emphasize the possibility that second-order effects could be significant. Christopher Neely, a senior economic policy adviser at the Federal Reserve Bank of St. Louis, argues that a conflict over Taiwan

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61 Welch and DiPippo, "Taiwan Blockade Could Be $5 Trillion Global Hit"; and Welch and DiPippo, "Simulating Catastrophe."

62 In addition to the previously cited studies, see George J. Gilboy and Eric Heginbotham, "America Needs a Single Integrated Operational Plan for Economic Conflict with China," Lawfare, December 17, 2023, https://www.lawfaremedia.org/article/america-needs-a-single-integrated-operational-plan-for-economic-conflict-with-china.

63 Harvard Growth Lab, "Where did the United States of America export All Products to in 2023?," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/explore/treemap?exporter=country-840&view=markets; Harvard Growth Lab, "Where did the United States of America import All Products from in 2023?," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/explore/treemap?exporter=group-1&view=markets&importer=country-840; Harvard Growth Lab, "Where did South Korea import All Products from in 2023?," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/explore/treemap?exporter=group-1&view=markets&importer=country-410; Harvard Growth Lab, "Where did South Korea export All Products to in 2023?," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/explore/treemap?exporter=country-410&view=markets; Harvard Growth Lab, "Where did Australia export All Products to in 2023?," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/explore/treemap?exporter=country-36&view=markets; and Harvard Growth Lab, "Where did Australia import All Products from in 2023?," The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/explore/treemap?exporter=group-1&view=markets&importer=country-36.

64 Vest, Kratz, and Goujon, "The Global Economic Disruptions from a Taiwan Conflict."

Table 2.2: Estimates of GDP Losses to Blockade and War Scenarios

	Scenario	World	Taiwan	China	Japan	United States
Rhodium Group (2023)	Blockade, one year	2%				
Bloomberg (2024)	Blockade and sanctions	5%	12%	9%	6%	3%
Bloomberg (2024)	War and sanctions	10%	40%	17%	14%	7%
RAND (2016)	Severe and prolonged war			25–35%		5–10%

Source: Charlie Vest, Agatha Kratz, and Reva Goujon, "The Global Economic Disruptions from a Taiwan Conflict," Rhodium Group, December 14, 2022, https://rhg.com/research/taiwan-economic-disruptions/; Jennifer Welch and Gerard DiPippo, "Taiwan Blockade Could Be $5 Trillion Global Hit," Bloomberg Global Insight, May 21, 2024; Jennifer Welch and Gerard DiPippo, "Simulating Catastrophe: A War Over Taiwan," Bloomberg Global Insight, May 20, 2024; and Astrid Stuth Cevallos, Cristina L. Garafola, and David C. Gompert, *War with China: Thinking Through the Unthinkable* (Santa Monica, CA: RAND Corporation, 2016), https://www.rand.org/pubs/research_reports/RR1140.html.

might imperil foreign (non-Chinese) banks. UK banks are particularly exposed, with 19 percent of total global exposure to Chinese overseas debt.[65]

One likely result of conflict would be a "flight to safety" by investors, which might drive down stocks but buttress the dollar and lower U.S. bond yields. As one former Bank of Japan official observed, however, a flight to safety would see money fleeing countries with preexisting financial conditions. Greece, he observed, was driven into a financial corner (and ultimate default, with enormous political consequences) by investors' flight to safety during the 2007–08 global financial crisis.[66] Countries far from Asia could be tipped into insolvency by a war over Taiwan.

To the extent that the United States attempted to discipline and orchestrate a unified allied reaction to the blockade, Washington could be subject to dual domestic and foreign pressures.

Electoral mechanisms make democratic states sensitive to economic feedback, especially during election years. Western business leaders and consumers might demand an off-ramp if conflict tanked markets and spiked inflation. To the extent that the United States attempted to discipline and orchestrate a unified allied reaction to the blockade, Washington could be subject to dual domestic and foreign pressures.

Before embarking on a blockade, Beijing would have modeled the potential economic effects, and it would not launch the operation unless it were willing to bear a high level of economic hardship.

65 Christopher J. Neely, "The Economic Effects of a Potential Armed Conflict Over Taiwan," *Federal Reserve Bank of St. Louis Review* 107, no. 3 (2025): 7, https://doi.org/10.20955/r.2025.03.

66 Author interview with Bank of Japan official, September 9, 2022.

However, as the popular reaction against draconian zero-Covid policies showed, the Chinese public does not always follow the government's script. The scars of Tiananmen, when the Chinese Communist Party's authority was openly challenged, still show in the state's sensitivity to any signs of emergent social organization tied to dissent.[67] In this context, the dislocation of the blockade and the consequent upsurge in unemployment could cause pressure for de-escalation that might match the pressure faced by the United States.[68] With a tight lid on free expression, such pressure likely would not manifest itself to the outside world until it had reached dangerous levels. However, the government would measure each pascal of rising social pressure with mounting concern.[69]

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67 Threat Lab, "30 Years Since Tiananmen Square: The State of Chinese Censorship and Digital Surveillance," Electronic Frontier Foundation, June 4, 2019, https://www.eff.org/deeplinks/2019/06/30-years-tiananmen-square-state-chinese-censorship-and-digital-surveillance.

68 On potential employment effects, see Eric Heginbotham and Jung Jae Kwon, *Deterring Chinese Economic Coercion of Taiwan: Lessons from an Economic Statecraft Simulation* (Cambridge, MA: MIT Wargaming Lab, 2023), https://www.dropbox.com/scl/fi/3md0z9h2j37mehmefb5bj/Deterring-Economic-Coercion_MIT-Wargaming-Lab.pdf?rlkey=n5snro6lwocbtxas18qjug5yw&e=1&dl=0.

69 On social organization and repression in China, see Ma Haotian, "Covid protests: A repressed China needs an outlet to return to equilibrium," trans. Grace Chong, Think China, November 29, 2022, https://www.thinkchina.sg/society/covid-protests-repressed-china-needs-outlet-return-equilibrium; George J. Gilboy and Benjamin L. Read, "Political and Social Reform in China: Alive and Walking," *Washington Quarterly* 31, no. 3 (2008): 143–64, https://doi.org/10.1162/wash.2008.31.3.143; and Bei Qin, David Strömberg, and Yanhui Wu, "Social Media and Collective Action in China," *Econometrica* 92, no. 6 (2024): 1993–2026, https://doi.org/10.3982/ECTA20146.

3

A Framework for Analyzing Blockade

This chapter begins with the scope conditions that define what this framework does and does *not* analyze. Next, it posits a framework for analyzing blockade scenarios based on the escalation levels of China on one side and the opposing coalition on the other. It details those escalation levels and how they combine to produce scenarios in a matrix covering aspects from non-kinetic boarding and seizure to a conflict with all conventional capabilities available. It then investigates a number of variants within the escalation pairings to conduct a sensitivity analysis on how critical but uncertain factors might influence the campaign's outcome and how certain policies might improve Taiwan's situation if enacted before the conflict.

Scope Conditions

This study focuses on the military conduct of a blockade and its consequences for Taiwan's economy. It does not include other issues critical to a complete understanding of a blockade and its consequences. Therefore, a full description of these scoping conditions is needed to set out what the study does and does not do.

- **Blockade of the main island of Taiwan.** For analytic purposes, the project assumes that China has decided to institute a blockade of the main island of Taiwan (and not just some outlying islands). The Chinese government could reach such a decision for various reasons related to domestic politics, faulty intelligence, inaccurate military assessments,

and international pressure.[1] As noted in Chapter 1, this assumption does not mean that a blockade is inevitable, only that it is plausible.

- **Noneconomic tools employed.** China could harm Taiwan's economy with purely economic means. Beyond ceasing cross-strait trade, China could sanction companies that do business with Taiwan. Taiwan would then have to find shippers willing to forego trade with China, while major shippers would likely reconfigure their supply lines to transship goods through non-Taiwanese ports. However, the dynamics and effects of such a purely economic "blockade" below the threshold of direct action are beyond the scope of this report. Several other CSIS reports have covered this topic.[2] Conversely, the United States and other countries could respond to any Chinese action with sanctions or other economic tools. As this report focuses only on the economic impacts to Taiwan, these economic tools are not analyzed (for a review of the possible impacts of these economic tools, see the section in Chapter 2 on Economic Context and Global Impact).
- **Focus on blockade events.** The reaction of the world to a Chinese blockade would be shaped by the legal arguments that would be made and the diplomatic, political, and economic pressures that would pertain. Recognizing that the global reactions can not be predicted, this project uses scenario variants to explore alternative assumptions about them.
- **No nuclear escalation.** The project examines conventional conflict only. Nuclear operations are unlikely in most blockade scenarios since the level of violence is low. Although it becomes possible at higher levels of violence since both major combatants are nuclear armed, it is plausible that concerns about escalation would keep the conflict at a conventional level. Readers interested in the implications of nuclear escalation are welcome to read the project team's previous report, *Confronting Armageddon: Wargaming Nuclear Deterrence and Its Failures in a U.S.-China Conflict over Taiwan*.[3]
- **Taiwan resists.** This set of wargames, like the previous sets, assumes Taiwanese resistance. If Taiwan capitulates, even partially, the United States and its coalition will not contest a blockade either. They will only fight for what Taiwan is willing to fight for. However, a recent CSIS study noted how "vexing" it was to estimate Taiwanese willingness to resist, given the inconclusiveness of the data.[4] This is not to devalue resilience, which would be critical to

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1 For a discussion about why countries make unexpected decisions about launching wars, see Mark F. Cancian, *Coping with Surprise in Great Power Conflicts* (Washington, DC: CSIS, 2018), https://www.csis.org/analysis/coping-surprise-great-power-conflicts, particularly Chapter 4, "Strategic Surprise."

2 For example, Bonny Lin et al., "How China Could Quarantine Taiwan: Mapping Out Two Possible Scenarios," CSIS, June 5, 2024, https://www.csis.org/analysis/how-china-could-quarantine-taiwan-mapping-out-two-possible-scenarios; and Benjamin Jensen, Bonny Lin, and Carolina G. Ramos, "Shadow Risk: What Crisis Simulations Reveal about the Dangers of Deferring U.S. Responses to China's Gray Zone Campaign against Taiwan," *CSIS Brief*, February 16, 2022, https://www.csis.org/analysis/shadow-risk-what-crisis-simulations-reveal-about-dangers-deferring-us-responses-chinas.

3 Mark F. Cancian, Matthew Cancian, and Eric Heginbotham, *Confronting Armageddon: Wargaming Nuclear Deterrence and Its Failures in a U.S.-China Conflict over Taiwan* (Washington, DC: CSIS, 2024), https://www.csis.org/analysis/confronting-armageddon.

4 Byman, Jones, and Blanchette, *Strengthening Resilience in Taiwan*.

Taiwan's survival. On the contrary, the policy recommendations in this report—coupled with what Taiwan has already done—would directly contribute to increasing the material basis for continued Taiwanese resistance. However, this report does not cover recommendations about information operations needed to make continued Taiwanese resistance more likely.[5]

This set of wargames, like the previous sets, assumes Taiwanese resistance. If Taiwan capitulates, even partially, the United States and its coalition will not contest a blockade either. They will only fight for what Taiwan is willing to fight for.

- **Effects of counterblockade not analyzed.** The analysis does not examine the effects of a counter-blockade against China.[6] U.S. and coalition actions to blunt a blockade of Taiwan could easily become a counter-blockade against Chinese maritime trade. The result would squeeze the Chinese economy (and the world economy).

  In all scenarios examined here, China would suffer significant economic damage from the interruption of trade with the global economy and a possible U.S. counter-blockade. However, deciding whether China would cease its blockade because of damage to its economy would depend on a myriad of factors, mostly unknowable but, in any case, not covered in this report. See the victory conditions in Chapter 5 for a discussion of national endurance and the literature review in the previous chapter for a discussion of the wider economic effects of a blockade.

  Although the project does not forecast "surrender/back off" decisions, the foundational research on blockades does inform readers about how and under what circumstances countries have made these decisions in the past. Thus, readers are positioned to draw their own conclusions.

- **Not a recommendation about U.S. Taiwan policy.** The project does not argue for or against any U.S. policy regarding commitment to the defense of Taiwan. That requires a broad discussion of U.S. foreign policy objectives in the Pacific, the political sustainability of such objectives, and how such objectives fit into a global strategy. The project proposes actions that the United States and its partners could take if they want to be more successful

5 For example, see Jason Vogt, Nina Kollars, and Michael Poznansky, "Should Taiwan Attempt to Replicate the Zelensky Playbook?," War on the Rocks, May 15, 2024, https://warontherocks.com/2024/05/should-taiwan-attempt-to-replicate-the-zelensky-playbook/.

6 For an excellent article on force requirements for a U.S. blockade of China, see Fiona S. Cunningham, "The Maritime Rung on the Escalation Ladder: Naval Blockades in a US-China Conflict," *Security Studies* 29, no. 4 (August 7, 2020): 730–68, https://doi.org/10.1080/09636412.2020.1811462.

in countering a blockade, but such proposals do not constitute a recommendation regarding broader policy.

- **No use of classified data.** As with the *First Battle and Confronting Armageddon* reports, this project uses only unclassified data so that its products can be disseminated widely and without restraint. It can then inform public debate.

  In some ways, reliance on unclassified data is not a major limitation. Unclassified information is more detailed and accurate than ever before, and much previously classified information is now available from open sources. For example, *The Military Balance* by the International Institute for Strategic Studies provides detailed equipment numbers, and Janes's databases contain detailed information about equipment capabilities. Google Earth provides imagery that only highly classified systems provided in the past. A vast trove of economic and shipping data is available online, as shown in the report's footnotes. Classified data is undoubtedly superior to unclassified data for some elements of weapons effects. However, in most other areas (particularly the shipping data that is most relevant to blockades), unclassified data is comparable in quality.

Scenarios

A blockade could take many forms depending on the political risk accepted by both sides and the military tools they choose to employ. All of the scenarios here begin with China establishing a maritime exclusion zone, although the means by which China enforces this exclusion zone—and the response that Taiwan and other countries take—varies widely. A "blockade" of Taiwan could range widely, from boarding by the China Coast Guard while Taiwan is constrained and the United States is uninvolved to an unrestricted conventional war between China and a coalition including the United States, Taiwan, and Japan.

For consistency, all scenarios are assumed to start with a common backstory: Tensions between the United States and China increase, with a focus on Taiwan. China seeks to resolve (or at least improve) its Taiwan problem through a blockade. It issues a notice to mariners that establishes an exclusion zone where ships are subject to search, seizure, and attack if the PRC deems them noncompliant. Major international shippers subsequently halt most traffic through the exclusion zone.

Following that common backstory, scenarios diverge based on the escalation levels taken by China and the opposing coalition. Although there are an infinite number of gradations, the project categorizes them into four levels for each side.

CHINESE ESCALATION LEVELS

China's four escalation levels are summarized below. (More complete descriptions are found in Appendix E.)

1. **Boarding:** The China Coast Guard (CCG), Maritime Security Administration (MSA), and People's Armed Forces Maritime Militia (PAFMM) attempt to board and seize merchant

traffic to Taiwan without opening fire (visit, board, search, and seizure, or VBSS, in maritime parlance). Many merchant ships would comply and heave to, allowing even much smaller ships in the PAFMM to board and escort the seized merchant to the mainland.[7] For ships that do not comply, CCG or MSA teams would use helicopters to land on merchant ships, which are much larger than even the largest former People's Liberation Army Navy (PLAN) ships in the CCG. All these boardings occur outside of Taiwanese and Japanese territorial waters but within the contours of the "10-dash line." Cross-strait trade continues as normal, as PRC officials deem that traffic to conform with the inspection regime.

2. **Submarines and Mines:** The PLAN employs submarines launching torpedoes, the PAFMM, and submarine-laid mines to interdict merchant traffic to Taiwan outside of Taiwan's territorial waters. All of these actions occur outside of Taiwanese and Japanese territorial waters but within the contours of the exclusion zone (within international waters). The PRC allows cross-strait trade to continue, but it decreases in proportion to overall traffic reductions.
3. **Offshore Kinetic:** China now employs overt force against merchants and escorts outside of Taiwan's territorial waters but within the exclusion zone. Although ships would be the most likely targets, the attackers would largely not be surface ships of the PLAN but rather ground- and air-launched antiship missiles. Only select elements of cross-strait trade would continue (due to both the PRC's increased willingness to escalate and Taiwan's reluctance to permit continued trade under these conditions).
4. **Wider War:** The PLA uses overt force not only in the exclusion zone but also against Taiwan itself, the United States, and Japan. Against Taiwan, these munitions could target ships in port, port infrastructure, and the energy grid (particularly power plants). At this point, cross-strait trade will cease.

COALITION ESCALATION LEVELS

The second variable used to categorize scenarios is the coalition escalation level, focusing on the United States and Taiwan, which is similarly broken down into four levels.

1. **Taiwan Constrained:** Taiwan restricts its military forces to its own territorial waters and contiguous zone. In one variant, Taiwan's Coast Guard Administration (CGA) can go into international waters to escort merchants and deter boardings, though it is outmatched by the larger, better-armed, and more numerous CCG. No other country is involved.

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7 Although the PAFMM has many purpose-built ships that are larger than fishing boats, these still pale in comparison to the much larger ships that make up commercial marine traffic. For example, a typical PAFMM ship is between 100 and 500 tons, while a midsized container ship is between 72,000 and 120,000 tons: Andrew S. Erickson, "Numbers Matter: China's Three 'Navies' Each Have the World's Most Ships," *National Interest*, February 26, 2018, https://nationalinterest.org/feature/numbers-matter-chinas-three-navies-each-have-the-worlds-most-24653; and "Big 5 Breakdown: Size, Fuel Burn, and Carrying Capacity," ShipUniverse, March 13, 2024, https://www.shipuniverse.com/big-5-breakdown-size-fuel-burn-and-carrying-capacity/#container. For an excellent discussion, from which many of this report's estimates about their strengths and capabilities come, see Andrew S. Erickson, ed., *Maritime Gray Zone Operations: Challenges and Countermeasures in the Indo-Pacific* (London: Routledge, 2023).

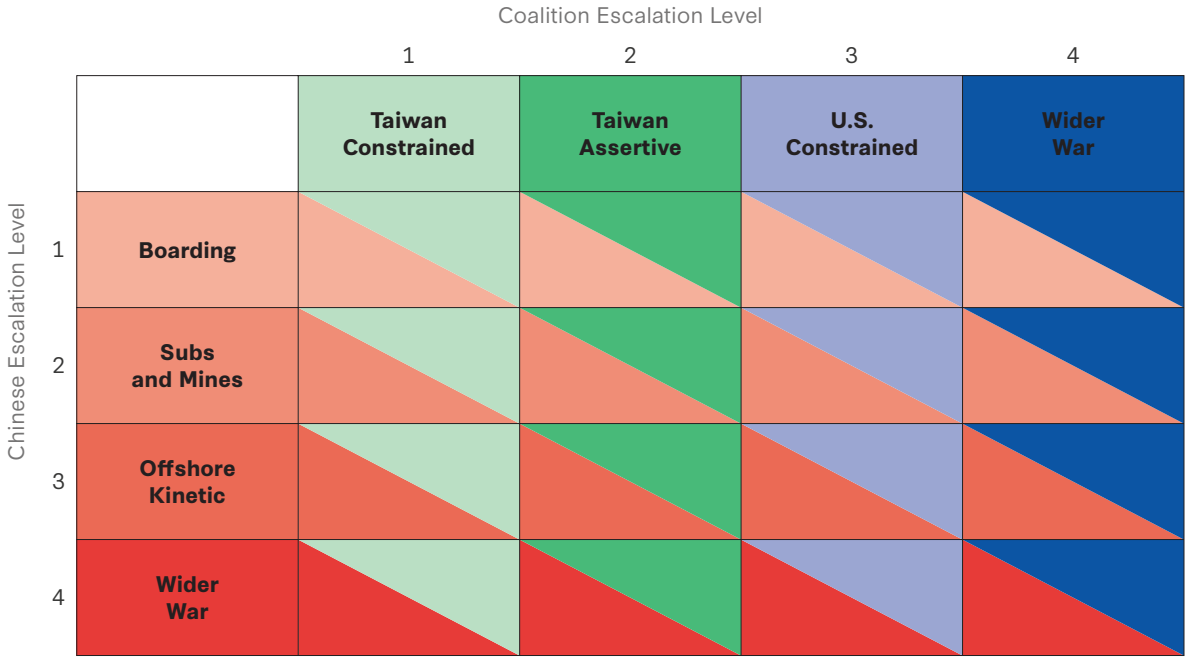
2. **Taiwan Assertive:** Taiwan allows its military to intervene against any Chinese forces that have attacked or attempted to board merchant ships within the exclusion zone. If China is boarding merchant ships, the Republic of China Navy (ROCN) and the Republic of China Air Force (ROCAF) can directly attack the boarders. Although the PLA is much stronger than the Taiwanese military, the Taiwanese military is more capable than the PAFMM and even the ex-PLAN ships in the CCG. This is true even if Taiwan restricts itself to attacking only Chinese ships that have attacked merchants. Against submarines and minelayers, the sides are more evenly matched. Against a PLA engaging in direct combat operations, the Taiwanese military would benefit from operating from sanctuary in scenarios where the PLA is not attacking Taiwan itself. However, the ROCAF and ROCN would be outmatched by the PLA's modern and voluminous hardware. Again, no other country is involved.
3. **U.S. Constrained:** The United States is now involved. The United States aids an assertive Taiwan with forces able to engage in direct combat with the PLA within the declared exclusion zone. However, the United States does not attack Chinese forces outside the exclusion zone.
4. **Wider War:** The United States can attack PLA forces outside the exclusion zones, including on the Chinese mainland.

Combining the Chinese and U.S./Taiwan escalation ladders produces a matrix that broadly describes a range of plausible scenarios ranging from an attempt by China to impose a customs regime on a constrained Taiwan using boarding only, all the way up to a war between China and a U.S.-led coalition using all conventional means at their disposal. For convenience, the project references the table in numeric format, the first digit being China's escalation level and the second being the United States and Taiwan's level. Thus, for example, a "2x2" scenario is the PRC using submarines and mines against an assertive Taiwan without any U.S. aid. A "dyad" is a cell in the matrix.

Some of these scenarios deserve more scrutiny than others. First, some are uninteresting because of the force mismatch: No one could doubt that a China willing to embark on a wider war against a constrained Taiwan could completely cut off imports to Taiwan (cell 4x1); conversely, even constrained kinetic action by the United States could defeat the weakly armed CCG (cell 1x3). Second, cells where escalation levels are roughly matched (1x1, 2x2, 3x3, 4x4) are more interesting than others because it seems likely that the results are more sensitive to assumptions; for example, changing the number of ships available to Taiwan probably would not change the outcome of a "China Wider War–Taiwan Constrained" dyad (1x4), but more ships could plausibly shift the balance in an "Offshore Kinetic–U.S. Constrained" dyad (3x3).[8] Therefore, the analysis avoids investigating uninteresting scenarios and focuses attention on this diagonal and cells adjacent to it, as highlighted in Figure 3.2.

8 "Dyad" means a combination of Chinese escalation level and a U.S./Taiwan escalation level, represented in the scenario matrix as a single cell.

Figure 3.1: Scenario Matrix



Note: The bottom-left triangle in a cell is colored with the China escalation level and the upper-right triangle with the U.S./Taiwan escalation level. China is depicted as red, Taiwan as green, and the United States as blue. The intensity of the color indicates the assertiveness of the escalation level.

Source: CSIS Defense and Security Department.

Although it is impossible to cover every permutation of every variable, some should be analyzed to examine the sensitivity of results to the most important variations. The following section explains this report's approach to sensitivity analysis within individual scenarios.

VARIANTS FOR SENSITIVITY ANALYSIS

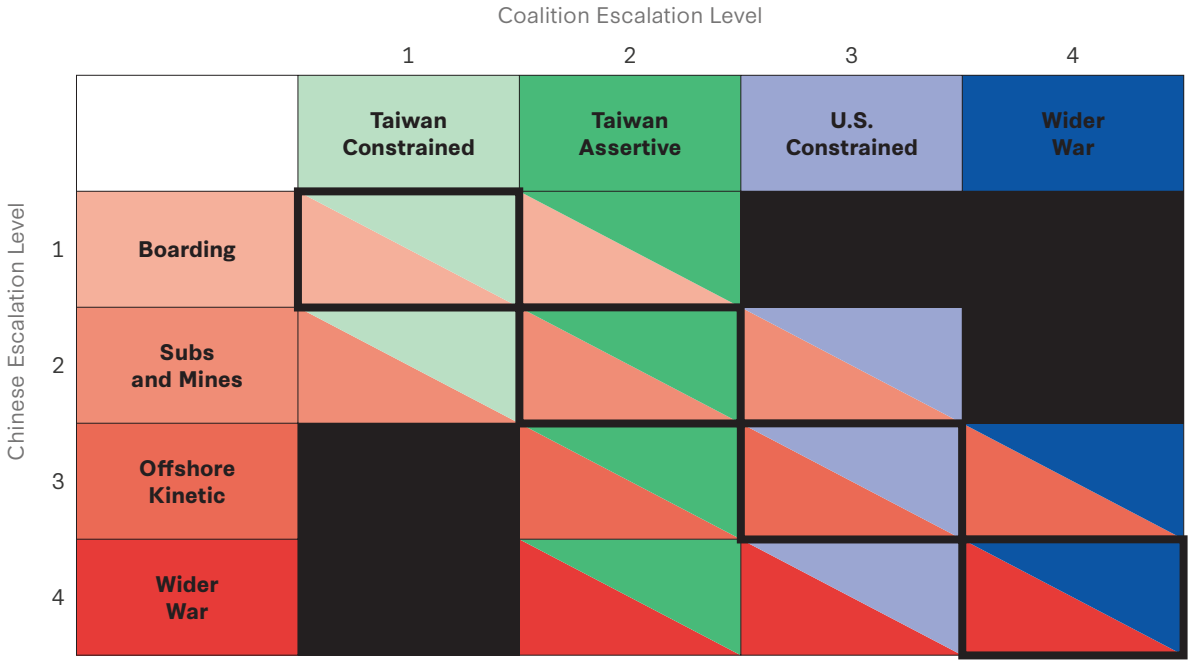
Sensitivity analysis is a key element of campaign analysis because it allows researchers to address the uncertainty of key inputs to ensure a full range of outcomes.[9] This is true for both strict modeling exercises and wargames.[10] The escalation levels described above cover major elements of sensitivity analysis, but within each dyad, alternative yet plausible assumptions could affect outcomes.

Below is an overview of the variants—variants being the changes to "Base" assumptions. The appropriate module descriptions and appendices contain details about the derivation of "Base" and variant conditions. These variants are explored in dyads of interest, particularly those diagonal dyads with roughly matched escalation levels. Note that not all variants are explored

9 Rachel Tecott Metz and Andrew Halterman, "The Case for Campaign Analysis: A Method for Studying Military Operations," *International Security* 45, no. 4 (2021): 44–83, https://doi.org/10.1162/isec_a_00408.

10 Jon Compton, "The Obstacles on the Road to Better Analytical Wargaming," War on the Rocks, October 9, 2019, https://warontherocks.com/2019/10/the-obstacles-on-the-road-to-better-analytical-wargaming/.

Figure 3.2: Matrix of Scenarios with Uninteresting Ones Blacked Out and the Most Interesting Highlighted



Source: CSIS Defense and Security Department.

in all diagonals. "Base" assumptions represent the most likely circumstances and are used in all iterations, unless specified.[11]

- **Variant 1: Taiwan's Coast Guard Administration rules of engagement (ROE)**

  This variant examines how changes in the CGA rules of engagement could increase the effectiveness of an otherwise constrained Taiwan. It therefore only applies to the China Boarding-Taiwan Constrained dyad (1x1).

  - Extent of CGA engagement:
    - Base: The CGA remains in territorial waters.
    - CGA Active: The CGA escorts incoming merchants and opens fire on any Chinese ship that attempts to seize merchants.

- **Variant 2: Pre-war preparations**

  To test the efficacy of several pre-blockade measures that research suggests would improve outcomes, the "Prepared" variant assumes that the following policy recommendations (see Chapter 6) relating to preparing the maritime fleet have been implemented.

  - Taiwan's ability to requisition ships:

11 "Iterations" in this report refer to one running of the wargame with a single set of assumptions. Iterations are different from scenarios because particular scenarios might be run several times with the same or different assumptions.

    - Base: Taiwan is limited to Taiwanese-flagged vessels.
    - Prepared: Taiwan's access is extended to 75 percent of Taiwanese-owned vessels.
- Taiwan's ability to purchase ships:
    - Base: Taiwan purchases the ships most readily available on the market.
    - Prepared: Taiwan can purchase the most capable ships (subject to crew availability).
- LNG tankers available to Taiwan and the United States:
    - Base: There are two Taiwanese-owned and Taiwanese-flagged LNG tankers available in 2028.[12]
    - Prepared: The U.S. Maritime Administration (MARAD) and Taiwan have each brought five additional LNG tankers under contract for national emergencies. These tankers appear in weeks 4 and 10.
- The responsiveness of Taiwanese seafarers:
    - Base: Fifty percent of Taiwanese seafarers are willing to crew ships running the blockade.
    - Prepared: Ninety percent of Taiwanese seafarers are willing.
- The responsiveness of foreign seafarers:
    - Base: Ten percent of foreign seafarers on Taiwanese-owned ships are willing to continue crewing blockade-running ships.
    - Prepared: Twenty-five percent of foreign seafarers are contracted to continue working on Taiwanese ships running the blockade.
- The ability of Taiwan to hire foreign seafarers:
    - Base: Taiwan is able to quadruple its peacetime hiring rate over two months.
    - Prepared: Taiwan is able to octuple its peacetime hiring rate over one month.
- Taiwan's pre-crisis purchases of coal and LNG.
    - Base: No pre-crisis purchases occur.
    - Prepared: The Taiwanese government sees a crisis developing and pushes industry to purchase an additional two weeks of energy inventories.
- Taiwan's ability to dictate resource distribution:

12 Although there are currently no Taiwanese-flagged LNG ships, at least one ship that will be partially Taiwanese owned is under construction. The assumption here is that there will be two. See "U-Ming ventures into LNG shipping through partnership with K Line," Lloyd's List, January 22, 2025, https://www.lloydslist.com/LL1152303/U-Ming-ventures-into-LNG-shipping-through-partnership-with-K-Line.

    - Base: Taiwan faces uneven rationing and allocation, prewar allocations continue, and the population feels austerity earlier.
    - Prepared: Taiwan establishes and publicized emergency rationing and allocation plans, allowing for a smooth transition to rationing and allocation.

- **Variant 3: Japan's participation**

  The invasion project identified Japanese concurrence in using U.S. bases in Japan as essential for U.S. denial of a Chinese victory. A similar test of the necessity of Japanese cooperation is needed for this project.

  - Level of Japan's participation:
    - Base: Japan allows transshipment in its ports and the United States to conduct combat operations from its bases in Japan.
    - Japan Out: Japan does not participate in the coalition, allowing neither the transshipment of goods through its territory nor U.S. combat operations from bases in Japan.

- **Variant 4: Chinese antiship missile capabilities**

  The game rules limit the ability of both sides to coordinate force packages in the time steps played, and they assume that antimissile countermeasures are relatively effective. Because some limits might have a large impact on the outcome of convoys attacks, the project explores the impact if those assumptions were more favorable for China.

  - Salvo sizes:
    - Base: China may employ up to 8 salvos (200 missiles) against a convoy during the final (five-hour) phase of movement to Taiwan.
    - Enhanced Chinese Missiles: China may employ up to 16 salvos (400 missiles) against a convoy during the final phase.
  - Impact of passive seekers:
    - Base: Both sides' passive missile seekers automatically target the desired ship in a group 33 percent of the time (with remainder randomly distributed).
    - Enhanced Chinese Missiles: China's passive missile seekers automatically target the desired ship 66 percent of the time (remainder randomly distributed).
  - Enhanced and flexible command and control:
    - Base: Both sides declare and then execute all attacks in a turn.
    - Enhanced Chinese Missiles: China can execute part of its attacks against convoys then select weapons or systems for subsequent attacks.

- **Variant 5: Hardness of Taiwan's electrical infrastructure**

At the highest Chinese escalation level, China teams were able to bombard Taiwanese infrastructure. If China could destroy Taiwanese energy infrastructure (either by attacking power plants or transformers), then it would not matter if the coalition were able to get coal, oil, and LNG to Taiwan. The effectiveness of potential Taiwanese hardening of its electrical infrastructure therefore needed to be investigated.

- The resilience of Taiwan's energy infrastructure:
  - Base: Every ton of bombs dropped reduces electrical capacity by 8.2 megawatts (MW).[13] Every week, Taiwan can restore 3 percent of total capacity, or 1,738 MW.
  - Hardened: The hardening of electricity production, expansion of dual-fired capacity, and increase in repair capabilities means that every ton of bombs only destroys 4.1 MW and that each week Taiwan can restore 6 percent of total capacity, or 3,476 MW.

- **Variant 6: Provision of "Ukrainian-style" aid**

  In most iterations of coalition escalation level one and two, the United States is not involved at all. Coalition escalation level three introduces U.S. combat forces. There is therefore a middle ground of equipment aid, similar to what has been supplied to Ukraine, that needs to be investigated.

  - Provision of Ukrainian-style aid:
    - Base: No U.S. involvement in scenarios with coalition escalation level one or two
    - Ukrainian-Style Aid: The United States provides munitions to Taiwan while continuing to withhold direct combat forces.

DYADS AS ANALYTIC AND NOT PREDICTIVE TOOLS

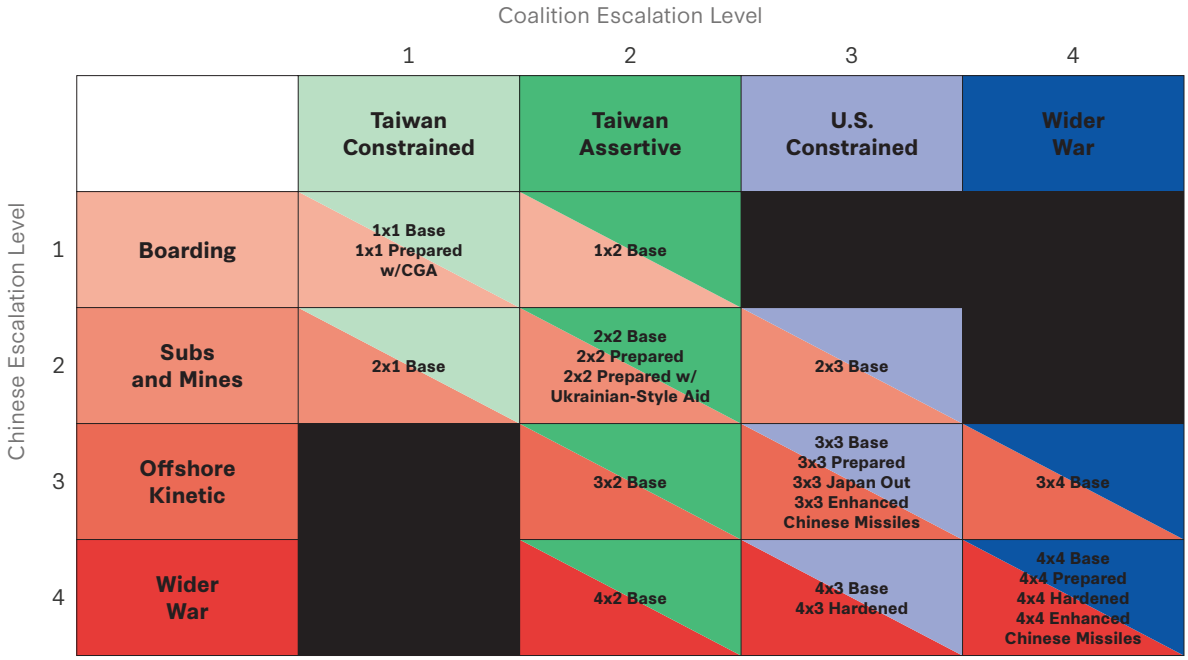
Unlike the scenarios posited by these dyads, it is unlikely that a blockade in the real world would be locked into one escalation dyad and continue indefinitely there. There would be escalations and (hopefully) de-escalations. Thus, these dyads are tools for analysis and not predictions about how entire campaigns would play out.

A plausible course of events through the scenarios is that China begins with boarding. While initially constrained, Taiwan sees that to be successful it has to adopt a more assertive stance and begins using military force against the Chinese CCG, MSA, and PAFMM. In response, China initiates a submarine and mining campaign against Taiwan, leading to constrained U.S. action, and so on.

However, it is analytically necessary to examine each dyad because it is not immediately clear what the results of combat would be. Even less clear is how sensitive those results are to different assumptions. Wargaming these dyads and their variants provides a baseline for understanding the outcome if countries remained at these dyads and provides insight into the escalatory pressures

13 Based on data from Desert Storm, as described in Appendix H, "Calculating the effects of Chinese attacks on Taiwan's energy system".

Figure 3.3: Matrix of Scenarios with Game Iterations



Note: In addition to these scenarios, the project ran five "free-play" iterations that were not restricted to one dyad.

Source: CSIS Defense and Security Department.

that would exist. Analyzing how both sides might react to those escalatory pressures requires a different approach.

Free Play to Observe Escalation

To better understand these transitions and off-ramps, the project conducted five free-play iterations in addition to these structured scenarios to see how players approached the problem when there were no constraints.

In these iterations, the China team was told to reunite Taiwan at the lowest possible cost to Chinese forces and the Taiwanese economy. The U.S., Taiwan, and Japan teams were told to maintain Taiwan's political status quo with the fewest friendly losses and least damage to the Taiwanese economy. These iterations gave insights into escalation dynamics.

The next chapter describes the modules used to adjudicate the scenarios, whether fixed dyads or free play.

4

Wargaming a Blockade

This chapter describes the modules—bundles of models—used to adjudicate the scenarios, whether fixed dyads or free play. They provide rigorous rule sets for analyzing the three central questions of the blockade problem examined in the wargames: (1) What merchant ships are available for transit to Taiwan? (2) How much cargo gets through to Taiwan? (3) What is the material effect of the arriving cargo on Taiwan?

Within each module, choices are available to players, and the results of those choices are adjudicated according to established rules. These rules are either deterministic (e.g., each U.S. F-15 can carry and launch two JASSM missiles) or probabilistic (e.g., a particular type of missile has a 60 percent probability of striking its intended target). All rules are based on operations research conducted by the team. In some cases, this modeling and the resulting rules are relevant to all scenarios, while some rules are relevant only to a subset of scenarios. All models assume a conflict date of 2028.

Module 1: What Merchant Ships Are Available for Transit to Taiwan?

Module 1 first characterizes ships' cargo capacity and the type of cargo that ships can carry—tankers for oil, specialized vessels for liquified gas, or containerized or bulk carriers for goods ranging from food to semiconductor manufacturing materials. These determine the goods that reach Taiwan to sustain its economy (more on this in Module 3). The module includes the timeline for when these ships can arrive in Japanese ports to load up, which is affected by their day-to-day location and

readiness status. In all scenarios, merchant ships that would typically go directly to Taiwan instead stop in Japanese ports because they would be unwilling to take the risk of a direct journey.[1] Their goods are transferred onto the ships that are available for shuttle duty in Japanese ports.

THE BREAKDOWN OF NORMAL COMMERCE

A Chinese blockade of Taiwan, in whatever form, would cause all commercial traffic to Taiwan to stop. The shipping experts interviewed in researching this topic were unanimous in saying that commercial shipping lines would comply with notices to mariners issued by China. Furthermore, almost all shipping charters contain a "Five Powers War Risk Exclusion" clause that automatically terminates maritime insurance in affected areas in case of hostilities between any of the five permanent members of the UN Security Council.[2]

Conflict—with the prospect of ships being detained, impounded, sunk, or otherwise taken out of circulation—produces a large increase in hull insurance and cargo insurance. Shipping insurance often rapidly adjusts premiums to account for conflict and allow commerce to resume. War risk insurance covers losses associated with a variety of military scenarios as detailed in the specific policy. Although such coverage is highly customizable, it typically excludes losses to major power wars and travel into restricted areas.[3] States frequently have to either provide insurance themselves or put their credit toward insurance underwriters.[4] Even in war zones covered by commercial insurance, rates often exceed actual shipping losses several times over. Thus, a war zone through which 1 percent of shipping traffic is lost will produce hull insurance of 3–4 percent. The inference is that, although an insurance scheme might work when attrition is in the low single digits, it theoretically cannot work at attrition rates higher than 25 percent. In practice, this breaks down in the upper single digits of attrition rates.

With the initial shock of a blockade leading straight toward an assessment of double-digit attrition rates of merchants bound toward Taiwan, coalition governments will have to operate all ships bound for Taiwan during a blockade. States subject to blockade find it more reliable, cheaper, and more efficient to create a nationally controlled fleet, for which the state either provides insurance directly or finds other means to underwrite and subsidize commercial insurance. These states will often also reflag ships to their own country as part of a national insurance and subsidy operation. However, although these ships are willing to sail to Taiwan, they are relatively few in number compared to the tonnage needs to bring goods (particularly energy) from around the globe to

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1 The exception is the variant where the Japanese government prohibits transshipment via Japanese ports. In this case, goods from around the world are offloaded in Apra and Australia (with concomitant delays in the availability of ships to run the blockade).

2 Richard L. Kilpatrick Jr., "Revisiting the Five Powers War Risk Exclusion," National University of Singapore, Law Working Paper, no. 2024/002 (2024), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4709051.

3 Richard L. Kilpatrick Jr., "Revisiting the Five-Powers War Risk Exclusion," *International and Comparative Law Quarterly* 73, no. 3 (July 2024): 551–57, https://doi.org/10.1017/S0020589324000204.

4 Carolyn Cohn and Jonathan Saul, "Marsh, Lloyd's Ukraine launch war risk ship insurance to cut grain costs," Reuters, November 15, 2023, https://www.reuters.com/business/marsh-lloyds-launch-ukraine-war-risk-ship-insurance-cut-grain-costs-2023-11-15.

Taiwan. Thus, the government-owned fleets often simply function as a shuttle to bring goods through the final danger to the blockaded area. This drives the need for a transshipment port.

TRANSSHIPMENT SHUTTLES: REGIONAL OPTIONS

As illustrated by prior historical examples, Taiwan will require regional transshipment to run shuttles during the blockade. Numerous allies could play a role in running shuttle convoys, though their practicality and advantages vary considerably. Japan and Guam constitute Taiwan's two leading transshipment stronghold options, with Japan offering far greater capacity. Other states and ports could play a supporting role in facilitating shuttling.

Tokyo's acquiescence or facilitation of transshipment points in Japan would greatly ease the burden on a dedicated shuttle fleet operated or contracted and insured by Taiwan.

Tokyo's acquiescence or facilitation of transshipment points in Japan would greatly ease the burden on a dedicated shuttle fleet operated or contracted and insured by Taiwan. A one-way transit to, say, Los Angeles, California (6,110 nm), might require 15–16 days, while the transit to Osaka (1,000 nm) could be completed in 3–4 days.

One must consider whether Japanese ports can handle the cargo load from ships carrying goods for Taiwan. Japan has around 120 ports that cumulatively have the capacity to load approximately 1,480,496 tons of cargo, 6,849 barrels per day of crude oil, and 663,013,000 kg of LNG a day.[5] Measurements of port throughput do not necessarily correspond to the physical capacity of the ports themselves, as they are affected by economic factors. Developments in faraway facilities, for example, depress the amount of cargo—as was the case in 2021 with the global depression of normal port operations due to obstruction of the Suez Canal by a Japanese-owned, Taiwanese-chartered, and Panamanian-flagged container ship. While loading blockade-running ships and prioritizing these vessels will inevitably disrupt normal commercial operations, the global economic downturn caused by this conflict (and the consequent freeing of port capacity) would facilitate the shuttle operation.

A comparison to Guam reveals a stark capacity differential: Japan's annual port container throughput exceeds Guam's by a factor of 254.[6] Japan is better equipped to transship cargo to Taiwan than to Guam. For example, Japan has 40 LNG terminals and five oil ports, which is a drastic

5 "List of Ports in Japan," Japan Ministry of Land, Infrastructure, Transport, and Tourism, n.d., https://www.mlit.go.jp/kankocho/cruise/list/index.html; "Japan Container Port Throughput," CEIC, https://www.ceicdata.com/en/indicator/japan/container-port-throughput; and "Countries with largest liquefied natural gas (LNG) import capacity in operation worldwide as of 2024," Statista, 2024, https://www.statista.com/statistics/1262088/global-lng-import-capacity-by-country/.

6 "Japan Container Port Throughput," CEIC; and "Guam Container Port Throughput," CEIC, https://www.ceicdata.com/en/indicator/guam/container-port-throughput.

contrast to Guam's lack of a functioning LNG terminal and singular access point for petroleum.[7] If Japan were unavailable for this effort, Guam likely could not handle the intake of Taiwanese shipping. Other countries such as Australia and Singapore would need to supplement.

Undoubtedly, ports in other countries might serve this purpose. Indeed, shuttling from other locations might become necessary if Japan either is deterred from cooperating or is drawn into the conflict and its ports become targets. However, other locations would either increase transit times or require the use of less-developed infrastructure than Japanese ports. Some ports, such as Singapore and Sydney, would be several times as far, while others, such as Apra Harbor, lack the same scale (see Appendix B, Table B.3: Potential Regional Transshipment Shuttling Ports). Since Japan would continue its normal imports and exports, slack or idle capacity would be more important than total capacity. However, given the scale of Japanese ports, they would likely be able to accommodate a large influx of Taiwanese shipping.

SHIP AVAILABILITY

The United States and Taiwan have a number of ships that they can use to run a blockade.

Taiwanese Ships

Taiwan can initially draw from the extensive commercial fleet owned and flagged by Taiwanese shipping companies.

Taiwan's All-out Defense Mobilization Readiness Act provides for the requisition of private property and the coordination of shipping.[8] The bulk of Taiwanese-owned vessels operate under a "flag of convenience." Thus, although Taiwan owns around 1.3 percent of the world fleet, many fewer ships are flagged to Taiwan.[9] Furthermore, there are far fewer Taiwanese-flagged ships than Taiwanese-owned ships (16,220 versus 42,709 deadweight tonnage).

It does not appear that Taiwanese-owned but non-flagged ships could be similarly requisitioned. However, the process of re-registering a vessel is quick and easy. Reflagging for national security objectives is not without precedent. During the Iran-Iraq War, the Kuwaiti government responded to the threat of Iranian attacks on its vessels by requesting that 11 of its tankers be reflagged under the U.S. flag. This meant the tankers were entitled to U.S. naval protection and were escorted by U.S. warships as they transited the Persian Gulf.[10] After the outbreak of World War II in 1939, the

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7 "Japan Oil Security Policy," International Energy Association, August 18, 2022, https://www.iea.org/articles/japan-oil-security-policy; and "Guam Territory Profile and Energy Estimates," U.S. Energy Information Association, April 17, 2025, https://www.eia.gov/state/analysis.php?sid=GQ.

8 "All-out Defense Mobilization Readiness Act," Laws and Regulations Database of The Republic of China (Taiwan), June 19, 2028, https://law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=F0070013; Article 19 covers shipping, 28 requisitioning.

9 "Share of the world merchant fleet value by country of beneficial ownership, annual (analytical)," UN Trade and Development Data Hub, last modified June 5, 2024, https://unctadstat.unctad.org/datacentre/dataviewer/US.VesselValueByOwnership; and Clarksons Research, *World Fleet Monitor* 14, no. 8 (2023): 11. Out of 106,864 vessels, 1,386 are Taiwanese owned; only 323 are flagged to Taiwan.

10 Office of the Secretary of Defense, *A Report to the Congress on Security Arrangements in the Persian Gulf* (Washington, DC: Department of Defense, 1987), ii, https://apps.dtic.mil/sti/pdfs/ADA193900.pdf; and Margaret G. Wachenfeld, "Reflagging Kuwaiti Tankers: A U.S. Response in the Persian Gulf," *Duke Law Journal* 37, no. 1 (1988): 202, https://

U.S. government encouraged the transfer of ships from the U.S. flag to the Panamanian flag to circumvent the Neutrality Act to supply future U.S. allies in the war.[11]

However, the flag of a vessel indicates the nationality of the ship and is thus governed by that country's laws. As such, shipowners typically choose to register their vessels with countries that impose the least financial (labor and tax regulations) and administrative burdens. In accordance with international law, the state has jurisdiction and control over vessels that fly its flag but not the vessels whose beneficial owners are citizens of the state.[12] The consensus from a CSIS working group of shipping experts was that Taiwan could only expect vessels flagged to Taiwan to be available for requisitioning into shuttle service.

The "Base" case estimated that only Taiwanese-flagged ships could be requisitioned; for sensitivity, the scenarios included a variant ("Prepared") where Taiwan has prepared for this contingency by ensuring that 75 percent of Taiwanese-owned ships (regardless of the flag) can be requisitioned.

In the Prepared scenario, Taiwan has taken legal measures to ensure that Taiwanese-owned ships can be requisitioned and reflagged during national emergencies. As mentioned above, the United States was able to put U.S.-owned ships that were Panamanian-flagged under its control during World War II. However, Taiwan's legal solution to this problem would have to be different.[13] Even if all Taiwanese-owned ships were legally required to answer the call, some proportion would be either unsuitable or unwilling (with the owners selling the ships during the lead-up to the blockade, shifting ownership shares to co-owners, or similarly evading the requisitioning process). In this case, an estimated 75 percent of Taiwanese-owned ships can be taken up by Taiwan, regardless of their flag.

Whether considering just Taiwanese-flagged or all Taiwanese-owned vessels, these ships will arrive on a staggered timeline. A limited number of ships are expected to already be in Japan—either docked and reloading cargo—or in the vicinity. These ships would be available from the first week. A certain number are expected to be in Chinese ports and thus presumed to be impounded by the Chinese government. Taiwanese-owned ships are disproportionately container ships (compared to the global distribution of seagoing vessels). Some will be the first ships to arrive in Japan, while others will arrive several months after the activation started. (See Appendix B, Table B.4: Ship Arrival Times and Taiwanese Requisitioning).

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scholarship.law.duke.edu/dlj/vol37/iss1/11.

11 Ira Dye, "Flags of Convenience; The Maritime Dilemma," U.S. Naval Institute, *Proceedings* 88, no. 2 (1962), https://www.usni.org/magazines/proceedings/1962/february/flags-convenience-maritime-dilemma.

12 United Nations Convention on the Law of the Sea, December 10, 1982, 58, https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.

13 For a detailed discussion of the U.S. situation in World War II and the postwar years, see Ira Dye, "Flags of Convenience; Maritime Dilemma," U.S. Naval Institute, *Proceedings* 88, no. 2 (1962), https://www.usni.org/magazines/proceedings/1962/february/flags-convenience-maritime-dilemma.

U.S. Surge Sealift Fleet

The United States can first draw from government-owned ships provided by the National Defense Reserve Fleet (NDRF). Established shortly after World War II to address prewar merchant ship shortages, the NDRF sought to preserve sealift capability for national security needs. Today's fleet comprises 75 government-owned, inactive, and partially manned vessels. Of these, 53 are in the Ready Reserve Force (RRF), a subset of the NDRF intended to be activated on a faster timeline. Most RRF ships are roll-on, roll-off vessels, which are well suited for military use and do not require extensive port infrastructure for loading and unloading but have relatively limited cargo capacity.[14]

Theoretically, ships in the NDRF and RRF should be able to start arriving in theater for shuttle duty in a matter of weeks. The RRF ships are routinely maintained and are designed to sail within 5–20 days' notice. RRF ships have been activated and rapidly deployed in the past. Following Hurricane Katrina, five RRF ships were activated on September 3 and arrived in New Orleans between September 12 and 16. Two days after the 2010 Haiti earthquake, the United States activated two RRF ships that arrived within a week.[15] Non-RRF NDRF ships take longer to activate, requiring between 30 and 120 days.[16] Ships in the NDRF and RRF are moored in the coastal waters of the continental United States: along the West Coast, the Gulf of Mexico/America, and the East Coast. Ship speeds vary, which also affects their potential arrivals.

However, there are reasons to suspect that activation of the entire surge sealift fleet will result in delays in mobilization in a scenario like the one studied in this report. Recent "turbo activation" drills revealed that only 24 percent of RRF vessels were ready to depart within the designated time frame due to the advanced age of ships and shortages of merchant seafarers. These drills involved partial activation—even the largest only accounted for 28 ships.[17] Table B.5: Availability of U.S. Reserve Fleet Ships in Appendix B shows the timeline for NDRF and RRF ships arriving in Japan and ready for shuttle service based on the data and analysis above.

The United States can also access a fleet of commercially operated ships. These are enrolled in three programs: the Maritime Security Program (MSP), the Voluntary Intermodal Sealift Agreement (VISA), and the Tanker Security Program (TSP). During national security crises, the U.S. government is assured access to ships enrolled in these programs. The 60 ships comprising the MSP receive an annual stipend and are also part of either the VISA or TSP. Ships enrolled in VISA or TSP do not

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14 "National Defense Reserve Fleet Inventory for the Month Ending May 31, 2024," U.S. Department of Transportation Maritime Administration, June 1, 2024, https://www.maritime.dot.gov/sites/marad.dot.gov/files/2024-06/2024_05%20Public%20NDRF%20Inventory.pdf.

15 "The RRF Response to Hurricane Katrina," U.S. Department of Transportation Maritime Administration, last modified February 8, 2021, https://www.maritime.dot.gov/history/historical-documents-and-resources/rrf-response-hurricane-katrina.

16 "National Defense Reserve Fleet Inventory," U.S. Department of Transportation Maritime Administration; and Ben Goldman, *U.S. Maritime Administration (MARAD) Shipping and Shipbuilding Support Programs*, CRS Report No. R46654 (Washington, DC: Congressional Research Service, January 2021), https://www.congress.gov/crs-product/R46654.

17 Mike Schuler, "U.S. Orders Large-Scale Turbo Activation Exercise of Ready Reserve Force Ships," gCaptain, September 17, 2019, https://gcaptain.com/us-orders-large-scale-turbo-activation-of-ready-reserve-force-ships/.

receive a stipend but are granted priority access to government cargo in peacetime. In return, the U.S. government can activate the VISA program in three stages, requiring participants to allocate increasing portions of their vessel capacity for government use. The cargo capacity allocated to the U.S. government at different stages of VISA activation is detailed below. During the highest stage of VISA activation, the 60 MSP ships must commit 100 percent of their capacity.[18]

The timeline for the activation of these ships and their arrival in the theater can be estimated from historical trends. Prior to activation, these ships—like Taiwanese-owned vessels—perform their commercial duties. Some MSP ships may be fulfilling government contracts to transport cargo and thus be nearer to the continental United States. Others, such as large Maersk container ships participating in VISA, are likely sailing in faraway places. During Operation Iraqi Freedom, the U.S. Military Sealift Command activated 20 VISA-registered ships in addition to the 84 VISA-registered ships used by the Military Surface Deployment and Distribution Command.[19] Thus, in an optimistic scenario, if the United States is involved, the model can assume that the U.S. government would activate VISA ships operating in the western Pacific in the first weeks of a blockade of Taiwan. These ships would sail to their intended destinations, unload cargo, and then sail to the transshipment port. Ships underway in the rest of the Pacific would be activated next. (See Appendix B, Table B.6: U.S. Commercial Ship Travel Time and Delay, for the estimated arrival timelines of commercial ships available for U.S. government use.)

SHIP PURCHASES

There is a large market of used cargo ships that Taiwan and the United States could purchase to supplement their fleets. With purchases, mobilized shipping can be increased over time. The annual Clarksons report lists 2,401 secondhand ships sold globally in 2022, including 81,494,000 gross tons at a cost of $29.1 billion.[20]

There is a large market of used cargo ships that Taiwan and the United States could purchase to supplement their fleets.

Russia's purchase of its ghost fleet during the Ukraine war serves as a helpful guide for understanding Taiwanese ship purchasing in a blockade. To evade sanctions and price caps, Russia has purchased hundreds of old crude and oil tankers, which now account for 70 percent

18 "Voluntary Intermodal Sealift Agreement (VISA)," U.S. Department of Transportation Maritime Administration, August 1, 2019, https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/national-security/strategic-sealift/office-ship-operations/2731/visa-brochure-8-1-2019.pdf; and "VISA and MSP," U.S. Department of Transportation Maritime Administration, February 2022, https://www.maritime.dot.gov/sites/marad.dot.gov/files/2022-02/MARAD_MSP-VISA_Pamphlet_Web.pdf.

19 "Maritime Administration Fact Sheet: Maritime Security Program (MSP), Voluntary Intermodal Sealift Agreement (VISA)," U.S. Department of Transportation Maritime Administration, https://www.govinfo.gov/content/pkg/GOVPUB-TD11-PURL-gpo9503/pdf/GOVPUB-TD11-PURL-gpo9503.pdf.

20 Clarksons Research, *World Fleet Monitor* 14, no. 8 (2023): 20.

of Russian oil transportation and 20 percent of the global crude vessel fleet.[21] Old oil tankers are more attainable and inexpensive, as most insurers and prominent oil companies avoid these older ships. Before Russia's invasion, ghost fleet ships accounted for only 6 percent of oil tankers flowing in and out of Russian ports, compared to 35 percent in early 2025.[22] Experts at the Kyiv School of Economics estimate that Russia has spent approximately $10 billion on this fleet buildup since 2022.[23] Western European shipping companies are the leading suppliers, with ships from Greece comprising approximately one-third of the fleet. Intermediaries and shell companies facilitated Russian purchases. Russia's procurement from Western vendors illustrates that the market persists even during heightened geopolitical tensions, particularly for aging ships that are otherwise bound for scrap.

However, most ships available to purchase are not conducive to Taiwan's needs. Taiwan would like to purchase larger ships (whose crew-to-tonnage ratio is lower); it would particularly want to purchase LNG ships, which are relatively newer and fewer in number. (The project estimates that only four LNG ships would be destined for scrap in 2028; these would be the easiest to purchase quickly.)

In the Base case, Taiwan purchases merchants each week according to their market availability. In contrast, the Prepared case posits that both Taiwan and MARAD have made contingency contracts to be able to purchase or requisition additional LNG ships. In the Base case, Taiwan is limited to one LNG ship per week. In the Prepared case, both Taiwan and MARAD have each bought (or contracted for) five LNG ships each that appear in weeks 4 and 10, respectively.

CREWING

While buying and insuring ships are purely commercial transactions, getting seafarers to operate the ships involves a human dimension. To what extent will they be willing to enter danger zones? At one level, the answer has long been known, as merchant ships have routinely sailed the oceans during wartime and sometimes taken heavy losses. The Battle of the Atlantic during World War II is well known for this, although just as harrowing was the experience of civilian Italian crews making the dangerous crossing to North Africa or Japanese crews trying to keep the extracted goods from the "Southern Resource Area" as U.S. submarines became increasingly effective. Even if seafarers are willing, there simply might not be enough of them: During World War II, U.S. ships were frequently delayed from launching due to a lack of crews, particularly of specialized ratings.[24] While the United States has a system for crew and ship mobilization with VISA, this is not the case for Taiwan.

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21 Jensen, "How to Exorcise Russia's Ghost Fleet."

22 Robin Brooks and Ben Harris, "Where Did Russia's Shadow Fleet Come From?," Brookings Institution, February 27, 2025, https://www.brookings.edu/articles/where-did-russias-shadow-fleet-come-from/.

23 Ibid.

24 E.S. Land, *U.S. Merchant Marine at War* (Washington, DC: War Shipping Administration, 1944), 24, https://www.ibiblio.org/hyperwar/ATO/Admin/WSA/MMatWar-44/index.html.

The analysis begins with a look at the numbers and composition of the existing crews on Taiwanese ships. First, the authors assume that almost all seafarers on Taiwanese-owned ships (not just Taiwanese-flagged ships) are Taiwanese. However, the crews of Taiwanese-owned ships are not all Taiwanese. In 2021, there were 1.9 million seafarers in the world.[25] As Taiwan owns 1.3 percent of the world fleet, this implies that there are around 24,632 seafarers on Taiwanese-owned vessels.[26] As there were also 8,268 Taiwanese seafarers in 2021, if Taiwanese seafarers are only on Taiwanese-owned ships, this would imply that about one-third of the crew members on Taiwanese-owned vessels are Taiwanese.

The Base case assumes that 50 percent of Taiwanese and 10 percent of foreign seafarers from Taiwanese-owned ships remain and are available. This estimate, like any estimate of individual willingness to fight during wartime, is highly subjective. Prewar polling indicated that 52 percent of Ukrainians said that they were willing to "fight for their country with arms in their hands," but that number jumped to 75 percent following Russia's invasion.[27] Foreign seafarers lack any nationalistic motivations, but this could to some extent be compensated for with higher pay. There was a 25 percent desertion rate per port visit for foreign seafarers on British ships during World War II.[28]

The Prepared case assumes Taiwan has mandated that its seafarers be prepared to serve the country in time of crisis and 90 percent are available; it also assumes that 25 percent of foreign crew have signed similar contracts.

Training new seafarers is too slow. During World War II, U.S. War Shipping Administration training programs varied in duration from around 12 weeks for unlicensed sailors to 64 weeks for deck and engineer officers.[29] In a 20-week wargame, said training programs could not produce a class of new seafarers in the time allotted that would impact the manpower capabilities of the naval merchant fleet. At best, a class of under 18,000 previously untrained sailors could complete training and join the fleet in the last quarter of the scenario.[30] Instead, to increase the number of personnel, pre-trained merchant sailors of all ratings would need to be recruited. In 1943, half of the seafarers added, around 45,000, were recruited from maritime unions and the Recruitment and Manning Organization.[31] Similar organizations that exist today could stand as options for sourcing trained seafarers in a time of need, but the time required for this training far exceeds the scope of the

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25 "Shipping and World Trade: Global Supply and Demand for Seafarers," International Chamber of Shipping, 2021, https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-global-supply-and-demand-for-seafarers.

26 Clarksons Research, *World Fleet Monitor* 14, no. 8 (2023): 11. Out of 106,864 vessels, 1,386 are Taiwanese owned. Sanity check: There are 35,000 foreign sailors in Taiwanese-owned ships, including smaller fishing ships. See Pavel Klinckhamers, "Fishing firms must pay their dues," *Taipei Times*, October 11, 2020, https://www.taipeitimes.com/News/editorials/archives/2020/10/11/2003744962.

27 Tor Bukkvoll and Frank Brundtland Steder, "War and the Willingness to Resist and Fight in Ukraine," *Problems of Post-Communism* 71, no. 3 (2024): 245–58, https://doi.org/10.1080/10758216.2023.2277767.

28 Tony Lane, "Sons of Empire," in *The Merchant Seamen's War* (Manchester: Manchester University Press, 1990), https://www.lascars.co.uk/war.html.

29 Land, *U.S. Merchant Marine at War*, 21.

30 Ibid., 24.

31 Ibid., 25.

starting phase of a blockade scenario. (See Appendix B, Table B.7: U.S. World War II Additional Crewing.)

Recruiting foreign seafarers is a more promising stream. While about 25 percent of Norwegian and British crews during the world wars were foreigners, the market for seafarers is now much more international.[32] While they might lack nationalistic or idealistic motivations, some would likely respond to financial incentives. To get a ballpark of the costs, the authors estimate that a convoy of 50 ships, each with 30 seafarers, would need 1,500 crew members. There would likely be a convoy every week, so 30,000 positions would need to be filled for a 20-week campaign. If crew members were offered a $10,000 bonus for every trip, that would total $300 million in bonuses. For a war that is costing billions in direct costs and trillions in the global economy, that is an affordable number. Further, there are 1.9 million seafarers currently operating, so even without pulling in inactive seafarers, such a campaign would require only a small percentage of the global seafarer community.[33] Bonuses would not be evenly distributed, as low-skilled deckhands would get smaller amounts while highly skilled engineering personnel would get more. Some specialties, like crews for LNG tankers, might require additional incentives.

Even though many seafarers may be willing to brave danger for nationalism or financial compensation, identifying, recruiting, gathering, potentially training, and finally assigning them to ships where their skills are needed takes time.

However, this does not happen instantly. Even though many seafarers may be willing to brave danger for nationalism or financial compensation, identifying, recruiting, gathering, potentially training, and finally assigning them to ships where their skills are needed takes time. Module 1 allows for this delay and phases ship availability accordingly.

An example from antiquity illustrates the challenge. At the beginning of Rome's civil war, Pompey scorned Caesar's ability to march on Rome, declaring, "in whatever part of Italy I stamp upon the ground, there will spring up armies of foot and horse."[34] However, after Caesar's already prepared

32 Bjørn Tore Rosendahl, "The Merchant Seafarers at war," trans. Tim Grov, Forsvaret, February 9, 2024, https://kultur.forsvaret.no/forsvarets-musikk/kongelige-norske-marines-musikkorps/nyheter/The-Merchant-Seafarers-at-war. World War I saw 17.5 percent of British sailors being Lascars; see "Forgotten Seafarers of the First World War," *Historic England Blog*, June 5, 2018, https://heritagecalling.com/2018/06/05/forgotten-seafarers-of-the-first-world-war/. For the British experience in World War I, see Maritime Archaeology Trust, *Black and Asian Seamen of the Forgotten Wrecks of the First World War* (Southampton, UK: Maritime Archaeology Trust, 2020), https://maritimearchaeologytrust.org/wp-content/uploads/2020/05/BME_booklet_v2.pdf.

33 "Shipping and World Trade," International Chamber of Shipping.

34 Plutarch, *Life of Pompey* 57.5, trans. Bernadotte Perrin, https://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A2008.01.0058%3Achapter%3D57%3Asection%3D5.

legions forced him to flee to Greece, he had time to reflect about the timelines required to mobilize manpower during conflict.

The report turns next to existing manpower, before looking at the time required to train and recruit new seafarers. At the outset of any conflict, there will be initial turmoil, some confusion, and a period to figure out what needs to be done. There will then be a crash effort to do what needs to be done and expand administrative machinery—leveraging foreign human resources expertise in shipping (and paying for it).

In the Base case, Taiwan can quadruple its recruitment of foreign sailors over the course of a few months. Assuming that the average seafarer serves 12 years, then the administrative machinery in Taiwan's shipping companies might be set up to find 2,000 sailors a year, or 40 a week. If Taiwan could achieve quadrupling of recruitment over the course of a few months, then the number of foreign seafarers recruited per week would be 0, 0, 40, 60, 80, 120, and 160 each week thereafter.

In the Prepared case, Taiwan can increase its recruitment of foreign sailors by a factor of eight and on a faster timeline. This produces the following numbers of foreign seafarers recruited per week: 0, 40, 80, 160, and 320 each week thereafter.

Next, those crews have to be matched to ships. In the Base case, the 4,800 seafarers initially available (50 percent of Taiwanese seafarers and 10 percent of foreign crews) need to fill 3,018 billets on Taiwanese-owned and Taiwanese-flagged ships. They would need to be transported to Japan to prepare, learn new machinery, sign new contracts, and so on. These Taiwanese seafarers would be available each week on a timeline of 0, 100, 200, 300, 400, 400, and 400 before none are left.

In the case where Taiwan has prepared for conflict by ensuring its ability to requisition all owned ships and the mobilization of seafarers, the numbers change accordingly. It can be assumed that seafarers who do not want to participate in shuttle runs do not leave immediately, or that enough at least enough stay to bring their ship into the theater for shuttle service. Manning 75 percent of Taiwanese-owned ships would require 19,010 seafarers. If 90 percent of Taiwan's 8,268 seafarers remain, then there will be a pool of 7,441 Taiwanese seafarers. If 25 percent of the 17,905 foreign seafarers on Taiwanese-owned ships stay, there will be 4,476 foreign seafarers remaining. There will therefore be a shortfall of 7,093 seafarers which would have to be made up for by newly recruited foreign sailors. In this case, there would be only enough crew members left over to man one new Very Large Crude Carrier or LNG ship every other week.

TRANSITIONING TO MODULE 2

Module 1 thus produces a timeline of merchant ships available for shuttle duty. The behavior of the merchant ships available thereafter depends on China's escalation level.

For China's escalation levels below "Wider War," the shuttle ships would sail through Japanese territorial waters—until reaching Yonaguni Island, the southernmost Japanese island in the Ryukyu

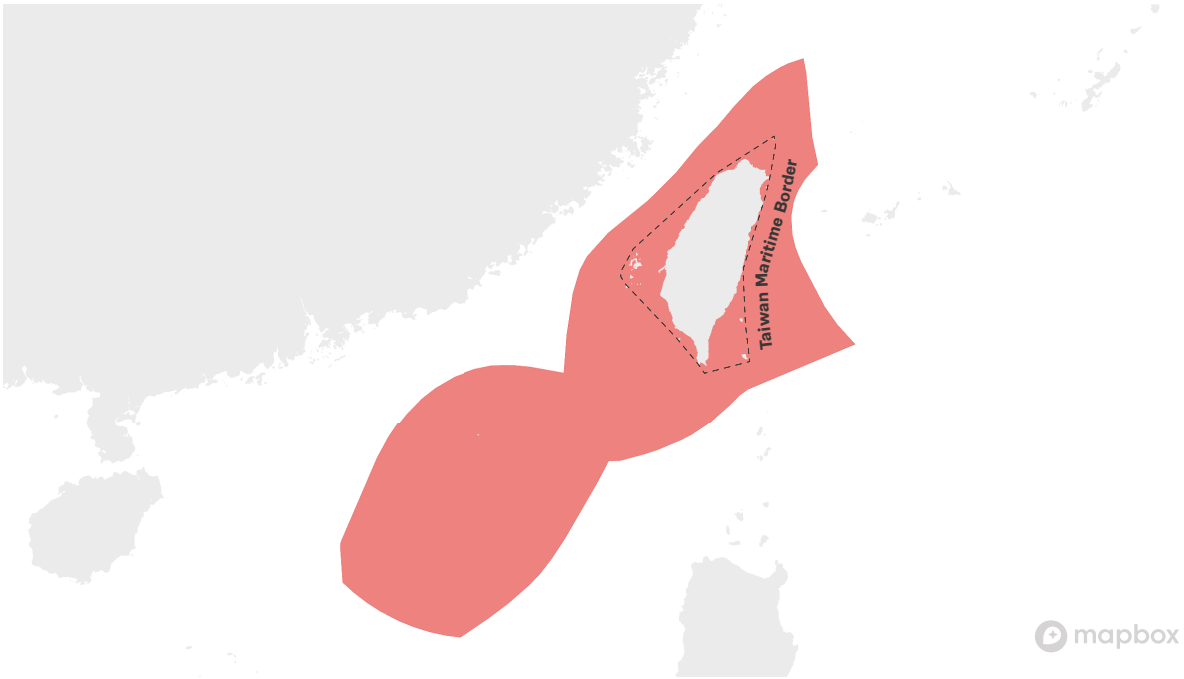
Table 4.1: Base and Prepared Case Summaries

	Taiwanese Ships Available	LNG Ships	Ship Purchases	Taiwanese Seafarer Responsiveness	Foreign Seafarer Hiring	Responsiveness of Foreign Seafarers
Base	All Taiwanese-flagged	Two flagged ships in 2028	According to market availability	50%: 0 / 0 / 100 / 200 / 300 / 400 / 400 / 400	0 / 0 / 40 / 60 / 80 / 120 / 160	10%
Prepared	75% of Taiwanese-owned	Two flagged ships + five Taiwanese and five MARAD contracted	Only one per week but targeted at energy	90% (but go toward Taiwanese-owned ships arriving in theater)	0 / 40 / 80 / 160 / 320 (goes to crewing Taiwanese-owned ships)	25%

Source: CSIS Defense and Security Department.

chain.[35] From Yonaguni, these ships "dash" approximately 70 miles to reach Taiwanese ports. If China's escalation level is "Boarding" or "Submarines and Mines," ships proceed individually; if China's escalation level is "Offshore Kinetic," the ships travel in convoys. Merchant ships' behavior at the Wider War level depends on player decisions.

Figure 4.1: Taiwan Exclusive Economic Zone and Overlapping Chinese Claim



Source: "Overlapping claim Taiwan: Taiwan / China," Marineregion.org, https://www.marineregions.org/eezdetails.php?mrgid=8321.

35 The ships would briefly cross the Miyako Strait, which we assume China does not attempt to interdict because of its greater distance from Chinese military power.

In scenarios where China's escalation level was Wider War, Japanese and Taiwanese territorial waters no longer protected the shuttle ships, and their routing changed accordingly. Goods were transshipped via Australia, with concomitant delays in availability due to increased travel times and reduced port capacity.

In scenarios where the ships were organized into convoys, they were limited to 100 merchant ships, following World War II practice. Larger convoys are difficult to control.[36] This would be especially true in the confined Japanese territorial waters around the Ryukyus. If more than 100 ships were needed to transit, then two convoys sailed in a week. No more than two convoys were allowed per week due to presumed limits on transshipment capacity.

Module 2: How Much Cargo Gets Through to Taiwan?

Having considered what ships are available to move to Taiwan, this section examines how China might try to board, impound, deter, or sink that shipping and how much of that shipping may succeed in evading the Chinese blockade to arrive in Taiwan. The scenarios and rules of engagement (ROE) that might be employed by both sides demand different methods for modeling and wargaming. Each scenario will require differences in approach, and the farther apart the ROE, the greater those differences will be.

Despite those differences, when the component parts of modeling are considered at the most basic level, there is considerable overlap between the scenarios. For example, intelligence, surveillance, and reconnaissance (ISR) problems—finding and identifying ships or other targets—are common to all scenarios. Similarly, although attacking ships with ballistic and cruise missiles may not be common to all scenarios, it is nevertheless a constituent part of more than half of the scenarios.

The discussion of Module 2 is divided into two parts. The first summarizes the most important constituent models (or building blocks) of the wargame. The second stipulates which of the constituent models are relevant to each of the different scenarios. For that discussion, the scenarios are divided into three groups depending on China's escalation level. Having summarized the broad outlines of each group, differences between specific scenarios are also addressed within each of those subsections.

MODELING: INDIVIDUAL ELEMENTS

Wargames can be considered a collection of (often probabilistic) models that are run with periodic pauses during which human players can reallocate resources to different geographic locations or military functions before resuming. Individual aspects of modeling are discussed below. An extensive discussion of military modeling is beyond the scope of this report, but a brief discussion nevertheless provides important context for understanding wargame results.

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36 Charles M. Sternhell and Alan M. Thorndike, "Convoying and Escorting of Shipping" in *OEG Report No. 51: Antisubmarine Warfare in World War II* (Washington, DC: Navy Department, 1946), 110–11, https://www.ibiblio.org/hyperwar/USN/rep/ASW-51/ASW-10.html.

There is significant uncertainty about how systems will perform under wartime conditions, which may differ dramatically from the conditions of peacetime testing.

Notably, many of the systems and weapons that would be employed in these scenarios have not been employed in high-intensity combat. Hence, there is significant uncertainty about how systems will perform under wartime conditions, which may differ dramatically from the conditions of peacetime testing. In general, the modeling described here assumes that weapons deployed by both sides function broadly as intended, though not necessarily at rates (or with effectiveness) that would be reflected in peacetime testing.

The bullet points immediately below outline modeling of nine different constituent parts of the gaming: ISR modeling and animation, intercept and boarding, missile defense (of ships and land targets), survivability of warships and merchant ships, lethality of antiship weapons, air-to-air combat, effects of air base attacks, submarine and antisubmarine warfare, and infrastructure attacks.

1. **ISR Modeling and Animation:** The first problem for China in implementing a blockade is to locate and identify incoming and outgoing maritime traffic. The project developed a program to simulate Chinese earth observation satellites in low Earth orbit. These include over 200 signals intelligence (SIGINT), suspicious activity reports, and electro-optical military and commercial satellites. Each satellite's capabilities are assumed to be comparable to commercial satellites launched in the same year.[37] The program's outputs produce detection timelines for emitting and non-emitting ships (the latter being not visible to SIGINT satellites). That information is fed to the intercept model, which adds in over-the-horizon radars and terrestrial sensors. For example, this study's analysis indicated that a non-emitting ship off the coast of Guam has a 38 percent chance of being identified within 20 minutes; within four hours, it has a 91 percent chance of being identified.
2. **Intercept and Boarding of Individual Ships:** An animated "Hunters and Escorts" model incorporates results from the ISR modeling above and allows players to attempt boarding and attack of merchant ships heading singly to Taiwan. Players assign missions, manage resources, and stipulate tactics. Based on those instructions, the model adjudicates interactions between individual aircraft, ships, submarines, and merchant vessels belonging to China, Taiwan, the United States, and Japan. Detection mechanisms differ by platform and mission type, with complex probabilistic models used for air-to-air, air-to-surface, and antisubmarine engagements between individual platforms. The world map is layered with zones, landmasses, weather conditions, and receptor grids to simulate interactions.

37 Some of the sources used for this model include clementM, "Les satellites chinois et la surveillance maritime," *East Pendulum* (blog), September 11, 2016, https://www.eastpendulum.com/les-satellites-chinois-et-la-surveillance-maritime; and Henk H.F. Smid, "The Space Review: An Analysis of Chinese Remote Sensing Satellites," Space Review, 2022, https://www.thespacereview.com/article/4453/1.

3. **Missile Defense (Ship and Land Based):** When defended maritime or land targets are attacked, intercepts and terminal defenses (where applicable) are modeled. The expenditure of attacking missiles and interceptors is tracked, and intercept probabilities vary according to both interceptor and attacking missile. For example, each interceptor fired by U.S. and Chinese destroyers defends against legacy cruise missiles with a single shot probability of 70 percent. With two interceptors, the probability that the attacking missile penetrates is 0.09 (or 9 percent). Warships are assumed to have terminal defenses which further reduce the probability. When in convoy, merchant ships are defended by the convoy's long-range interceptors but not by their terminal defenses.
4. **Survivability of Warships and Merchants:** Modeling damage to ships is more important in wargaming a sustained blockade than in a shorter invasion scenario. Some number of damaged ships can be returned to action in blockade. In considering the munitions necessary to incapacitate or sink warships, historical data suggests that, on average, it may take six to seven 1,000-pound bombs to sink a destroyer, four to sink a frigate, and two to sink a corvette. In each case, significantly fewer weapons are required to achieve a mission kill. And against all targets, there is significant variation around the mean.

   To estimate the likelihood of sinking merchant ships, the project examined historical cases. The Tanker War of 1980–1988 provides especially useful data, derived from a large number (269) of hits by a single type of weapon (Exocet). Hits by Exocet sank, on average, 8.2 percent of targets struck, while they caused the write-off (constructive total loss, or CTL) of 27.9 percent of ships hit. The rate of sinking varied significantly by the size of the ship that was hit (see Table 4.2 below). While the lethality of weapons has improved since then (see below), so too has the survivability of ships (for example, with the double-hulling of tankers). Within the game, damage to both warships and merchants is handled probabilistically and incorporates significant deviation around the expected mean for the attacking weapon and target platform.

Table 4.2: Merchant Damage to Exocet Missile Strike, Tanker War (1980–1988)

Ship size (Gross Register Tons)	Number of strikes	Sunk	CTL
Average	**269**	**8.2%**	**27.9%**
1–10,000	46	19.6%	26.1%
10,001–90,000	100	11.0%	34.0%
90,001+	123	1.6%	14.5%

Source: Data on attacks and sinkings is from Martin S. Navias and E. R. Hooton, *Tanker Wars: Assault on Merchant Shipping During the Iran-Iraq Crisis, 1980-88* (London: Bloomsbury Publishing, 1996). Data on tonnage of individual ships comes from various sources.

5. **Lethality of Weapons:** The probability of sinking or damaging warships and merchants also considers the size and type of weapon being employed. The total energy of different

weapons is calculated by summing the explosive energy of the warhead to the kinetic energy released by the impact of the missile, which is itself a function of weight and speed (see Table 4.3). Because torpedoes strike below the waterline and historical data suggests that, pound for pound, they are far more likely to sink ships, their probability of sinking or damaging ships is estimated at twice that of a comparably sized missile.

Table 4.3: Impact of Selected Weapons

Weapon	Country	Total Energy (gigajoules)
Exocet	France	0.9
LRASM	U.S.	2.5
NSM / JSM	U.S.	0.7
JSOW	U.S.	1.0
Bomb (500 lbs)	All	1.1
YJ-83	China	1.1
YJ-18	China	1.8
YJ-100	China	3.9

Source: CSIS Defense and Security Department.

6. **Air-to-Air Combat:** Modeling of air-to-air combat includes combat between aircraft assigned to the air superiority mission in overlapping areas, fighter sweeps, and escorted strike missions. Air superiority combat calculates aircraft on-station time and yields attrition results and the degree of air control gained. On-station times are a function of flight time to mission areas, crew availability and rest requirements, and tanker support. Attrition rates per encounter (averaging roughly 5 percent) are from data on some of the most intense historical air battles (e.g., August 1940 during the Battle of Britain). Exchange rates are based probabilistically on the "generation" of aircraft involved, with exchange rates of roughly 2:1 for combat between, for example, fourth-generation and 4.5-generation aircraft.
7. **Attacks on Air Bases:** In some scenarios, attacks on adversary air bases are allowed. When attacks are undertaken, missile defenses located in the area first defend according to the probabilities discussed earlier. The model then attacks missile defenses if located at the target and if their location is detected. It then allocates attacking missiles to attacking hardened shelters, the entrances (or taxiways) to underground shelters, or areas in the open that might be used for aircraft parking. Losses to aircraft parked in each type of area are then calculated. In the case of aircraft parked in the open, the total footprint of the attacking missiles that survive missile defense is compared to the total area on which aircraft might be parked to create a proportion of aircraft physically at the base that would be destroyed. The total number of aircraft present at any one time is assumed to be two-thirds of the aircraft

based at the air base; the other third are assumed to be airborne or otherwise not present at parking areas.

8. **Submarine and Antisubmarine Warfare:** China's ability to target ships inbound to Taiwan has been the focus of previous quantitative analyses by Glosny and O'Hanlon, who use historic data to model barrier attrition against submarines.[38] This study uses a similar barrier attrition model in some scenarios, when antisubmarine warfare is one part of a broader campaign. For scenarios where submarine attacks are the main focus, this study uses an agent-based model that incorporates maintenance time, travel time to the area, movement to intercept points (assuming that Chinese ISR provides the submarines with the locations of merchant ships with minimal delay), and the likelihood of successful attacks.
9. **Infrastructure Attacks:** China has a large inventory of missiles, drones, and aircraft with which it could bombard Taiwan.[39] Besides targeting Taiwanese leadership and military targets, it could attack ports, offloading ships, or the power grid. This study estimated total Chinese inventories for these systems based on analogies to similar launcher-to-munition ratios (for example, analogizing the BRE-6 missile with the U.S. GMLRS). This study then modeled the effectiveness of attacks with these munitions based on historic cases. Most importantly, the ability of China to destroy Taiwan's energy infrastructure was based on analogies to Russia's attacks on Ukrainian energy infrastructure and U.S. attacks on Iraqi power plants during Desert Storm.

APPLYING MODELS IN SPECIFIC SCENARIOS

As described previously, the games associated with this project address different scenarios which are themselves primarily (though not solely) defined by the level of escalation assumed for each side. Importantly, the authors do not necessarily expect conflict to remain in one cell (or one scenario) throughout its course; indeed, escalation or de-escalation is likely. But tracking events in a conflict that plays out entirely within one cell allows for a cleaner assessment of the dynamics that might characterize that level of conflict, of likely advantage (e.g., China or the coalition), and of the pressures for either escalation or de-escalation from that point.

To model different scenarios, the games used three systems. The systems used depended on China's escalation level.

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38 O'Hanlon's ("Can China take Taiwan?") models rely on a 5–15 percent attrition rate of submarines by ASW barriers extracted from Congressional Budget Office, *The U.S. Sea Control Mission: Forces, Capabilities, and Requirements* (Washington, DC: Congressional Budget Office, 1977), https://apps.dtic.mil/sti/pdfs/ADA574362.pdf. Glosny ("Strangulation from the Sea?") uses similar figures from Barry Posen, *Inadvertent Escalation* (Ithaca, NY: Cornell University Press, 1991), 174, 260; Christopher Cramer Wright, "Developing Maritime Force Structure Options for the U.S. Defense Program," (master's thesis, Massachusetts Institute of Technology, Department of Political Science, 1976), 158; Paul H. Nitze and Leonard Sullivan, *Securing the Seas* (London: Routledge, 2020), 350–375; and Alain C. Enthoven and K. Wayne Smith, *How Much Is Enough? Shaping the Defense Program, 1961-1969* (New York: Harper and Row, 1971), 225–234.

39 For excellent research on the most numerous of the close-range ballistic missiles, see Joshua Arostegui, "The PCH191 Modular Long-Range Rocket Launcher: Reshaping the PLA Army's Role in a Cross-Strait Campaign," U.S. Naval War College, *CMSI China Maritime Reports* 32, November 3, 2023, https://digital-commons.usnwc.edu/cmsi-maritime-reports/32.

Table 4.4: Modeling Systems Used in Each Dyad

	Taiwan Constrained	Taiwan Assertive	U.S. Constrained	Wider War
Boarding	ISR and Intercept	ISR and Intercept		
Submarines and Mines	ISR and Intercept	ISR and Intercept	ISR and Intercept	
Offshore Kinetic		Convoy Battle	Convoy Battle	Convoy Battle
Wider War		Convoy Battle	Convoy Battle + Taiwan Operational Wargame	Convoy Battle + Taiwan Operational Wargame

Source: CSIS Defense and Security Department.

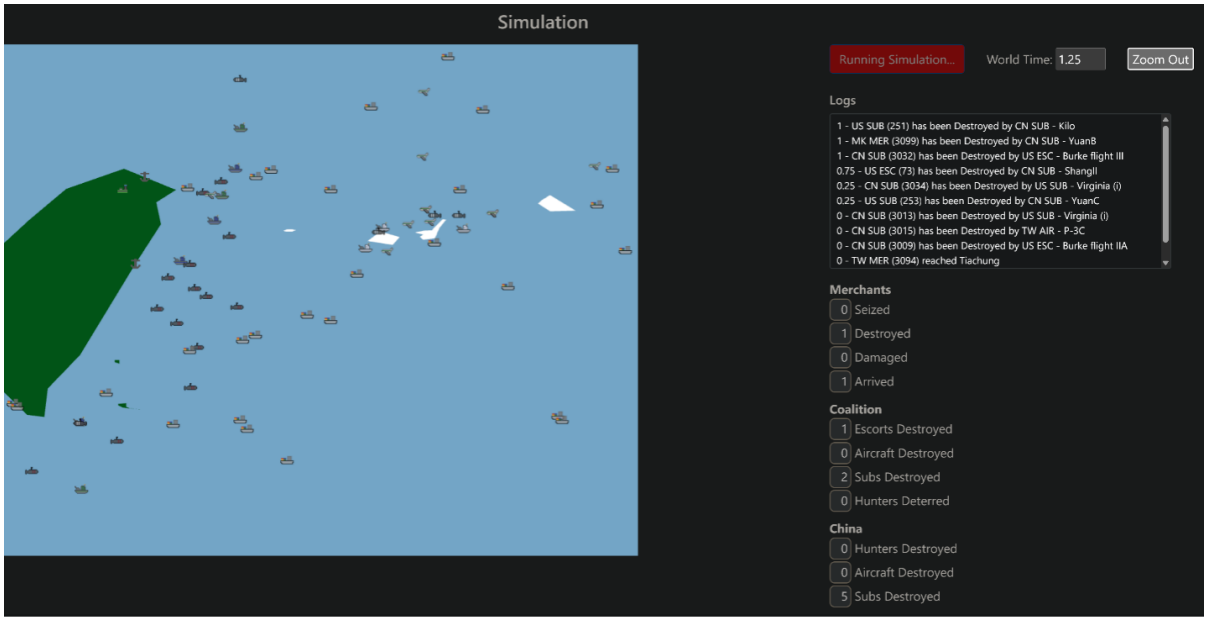
ISR and Intercept

"ISR and Intercept" is a simulation designed to explore the implications of a military conflict around Taiwan, with particular focus on China's efforts to disrupt the flow of merchants to the island at lower levels of escalation. The simulation models interactions between multiple agents—aircraft, ships, submarines, and merchant vessels—belonging to China, the United States, Taiwan, and Japan. The world map is layered with zones, landmasses, weather conditions, and receptor grids to simulate interactions. Players can influence the simulation by assigning missions, managing resources, and adapting strategies. Key agent behaviors include detecting, tracking, attacking, and defending, with detailed rules for engagement based on escalation levels and mission types.

Agents have well-defined roles and characteristics such as visibility, detection capabilities, speed, endurance, and combat proficiency. Their missions include patrolling, tracking, holding, attacking, and conducting antisubmarine operations. Combat effectiveness is probabilistically modeled based on attacker/defender skills and weapon availability. Detection mechanisms differ by platform and mission type, with complex probabilistic models used for air-to-air, air-to-surface, and antisubmarine engagements. Agent availability for missions is calculated based on maintenance requirements and endurance limits. Search patterns are determined by a "Chaotic Ant Colony" model, where each agent searching in a zone leaves pheromones that repel other agents, leading to a distributed search pattern.

Agents can pursue a variety of missions, including observing, tracking, holding, attacking, patrolling, and escorting. The simulation incorporates a mission structure for "hunter" units like unmanned aerial vehicles and submarines as well as "escort" units that defend merchants. Managers coordinate agent behavior within each country, factoring in communication delays and tactical decisionmaking. Each mission type is linked to specific triggers and outcomes, ensuring dynamic interactions between agents. Chinese and coalition forces (the United States, Japan, and Taiwan) have distinct restrictions and permissions based on the scenario's escalation level. Within each escalation level, players can make changes to ROE and force allocation during the simulation. Overall, the system offers a robust framework for analyzing potential military scenarios, with realism grounded in tactical detail and operational flexibility.

Figure 4.2: Screenshot from ISR and Intercept



Source: CSIS Defense and Security Department.

Convoy Battle

In a scenario with a Chinese escalation level of Offshore Kinetic or Wider War, the contending parties employ lethal military forces within international waters and airspace but not within the sovereign air, land, or maritime territories of the adversaries. "Convoy Battle" explores what would occur when protected convoys are attacked at sea. The model focuses on the attack and defense of convoys escorted by Taiwanese and U.S. warships operating between Japanese and Taiwanese ports but was adapted for other convoy routes.

The action revolves around convoys run between Japan's Yonaguni Island and the east side of Taiwan in the vicinity of Hualian (see Figure 4.2), a distance of 54 nm (100 km). Military engagements can be conducted over a wider area, though only in international waters, and occur before and during each convoy transit. The modeling for these scenarios is broken into two different components, both of which are run for each convoy that makes the transit. (The frequency of convoys is determined by the U.S.-Taiwan team and is based largely on the number of merchant ships available for transit.) The two elements of the modeling are (1) shaping operations and (2) the convoy crossing.

1. **Shaping Operations:** Both sides may deploy forces to gain an advantageous position in preparation for each convoy battle. The duration is defined by expected transit times for Chinese diesel submarines moving roughly 210 nm from China to the area around the convoy route. At five to six knots, two-way transit would be roughly three days. The United States may deploy SSNs into this area to intercept submarines. Both sides may attempt to deploy antisubmarine warfare maritime patrol aircraft (MPAs) in areas off their own territory and may deploy combat aircraft to contest air control, destroy adversary MPAs, and protect

friendly assets. The most important modeling components are air-to-air combat and submarine and antisubmarine warfare (with support elements).

2. **Convoy Attack and Defense:** Both sides may allocate assets to the attack and defense of convoys. Chinese submarines that have made the transit attempt to penetrate convoy defenses and attack merchants (or escorts). Chinese forces may fire air-, sea-, or ground-launched missiles from within China's own sovereign territory. Alternatively, China may sortie aircraft and warships into closer areas to attack with shorter-range weapons. If Chinese assets do sortie, then they may be engaged by U.S. aircraft and warships, which may, depending on their location, be fired upon in turn. The most important modeling components are air-to-air combat, missile attacks on ships, air and missile defense, and submarine and antisubmarine warfare.

In keeping with the spatial and temporal limits of the action within this scenario, as well as the lengthy expected duration of a blockade, limits are placed on the number of systems and assets that can be placed into each part of each convoy battles, and those limits have an important impact on outcomes. (Variations explore alternative possibilities.) For the shaping battle, the modeling assumes that eight submarines (roughly 20 percent of the submarine fleet), 12 MPAs, and 144 tactical aircraft can be employed by the two sides. Convoy sizes are limited to 100 merchant ships, based on World War II practice. The convoy escort is limited to two surface action groups (SAGs) (eight ships total if they are U.S. ships or more ships if the ships are Taiwanese). Both sides can call on up to four SAGs to provide antiship fires. China can allocate up to 200 antiship missiles against the convoy from its various platforms during the roughly five-hour transit through international waters (and 100 more if additional U.S. SAGs sortie).

Even with the capability to bring additional forces to the fight, Chinese commanders may look to ensure that operations are sustainable over weeks and months.

It is, of course, possible to imagine battles of varying sizes and intensities; both sides would have considerably more forces during an extended conflict. But there are likely limits to how much force can productively be brought to bear within a limited period and in a limited area. And even with the capability to bring additional forces to the fight, Chinese commanders may look to ensure that operations are sustainable over weeks and months.

A variant scenario explored the possibility that China could and would allocate more resources to attacking each convoy, that its command and control would prove flexible and adaptive, and that U.S. countermeasures might prove ineffective in neutralizing some of China's advanced technologies. In this sensitivity analysis, China is assumed to be able to coordinate a larger number of more diverse assets to conduct attacks with twice as many missiles (400) over the five-hour period. Unlike the Base case, where both sides declare their offensive and defensive choices and

both execute, China can execute parts of its attack and then adjust subsequent means of attack depending on results. Finally, Chinese missile seekers are assumed to be more effective in the Base case in finding warships among the convoys in the face of U.S. countermeasures. Elements of this variant might also be considered as a stand-in for cases in which China does not strike at targets within Japanese air and maritime space but is willing to execute attacks on Taiwanese and U.S. assets within Taiwan's territorial waters.

Taiwan Operational Wargame

To explore cases where both sides escalate to the level of a general or wider war, the project employs the Taiwan Operational Wargame (TOW). The *First Battle* report contains a detailed description of the wargame; important elements of it are summarized in the section on modeling above.[40] TOW provides rules and adjudication tables and probabilities for different kinds of attacks on air bases; missile, air, and submarine attacks on warships; antisubmarine warfare by surface ships, MPAs, and other submarines; and counterspace and ISR activities. Forces are free to conduct a range of missions. The modeling of convoy attack and defense was added to the TOW system to enable the wargaming of a contested convoy in the context of a wider war.

Module 3: What Is the Material Effect of the Cargo Arriving on Taiwan?

Module 3 has three elements—imports, economic outputs, and effects on Taiwanese society—and does calculations for each week of the blockade.

INPUTS

Ship Arrivals: The first element of this module translates ship arrivals by type into cargo measures. Consistent with the ship types in Module 1, deliveries are tankers with oil and petroleum products (measured in barrels), LNG carriers with natural gas (in cubic meters), and bulk and container ships (general cargo, including food and coal, in tons). General cargo is measured by weight because weight matters for import calculations and the constraint in a blockade is cargo capacity.[41]

Cross-Strait Trade: Taiwan's cross-strait trade with China constitutes 37 percent of its non-energy imports, yet this could end with a single decision by the Chinese leadership.[42] Cessation would have a severe effect on Taiwan's economy because of the trade's magnitude and how tightly logistics chains are designed. Although the modeling assumes substitution from other sources, some elements are custom designed for specific products and processes on the mainland and might be difficult to replace. Without cross-strait trade, Taiwanese manufacturing would decline approximately 20 percent. About 75 percent of Taiwan's imported consumer goods come from

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40 Cancian, Cancian, and Heginbotham, "Chapter 3: Building the Taiwan Operational Wargame," in *The First Battle of the Next War*.

41 Categorization by weight is different from categorization by value, the usual measure, because some imports are high value but low weight (consumer finished goods) while others have low value and high weight (mineral ores).

42 Cross strait trade statistics from Taiwan International Ports Corporation, *Annual Statistical Report* (Kaohsiung City: Taiwan International Ports Corporation, 2022), 2, 97, https://www.twport.com.tw/en/media/Articles?a=452.Cross strait trade is 17 percent of total trade, energy and non-energy.

cross-strait trade. The model gives consumer goods lower priority so that imports can focus on critical energy and manufacturing. The project's initial inclination was to assume that China would stop all cross-strait trade in any kind of a blockade since it counteracts the blockade's intended effects. However, several trade experts pointed out that any cessation of cross-strait trade would also damage China's economy. For every batch of microchips that Taiwan sends to China, Taiwan gets their value in return. China can use these chips to manufacture end products of much greater value like cars and appliances. Thus, Module 3 allows different levels of cross-strait trade should China decide on something between full trade and none.

There are many examples of countries allowing trade through their blockade when it was in their interest to do so. For example, the Union government in the U.S. Civil War allowed the South to ship cotton north because northern textile mills needed it.[43] Particularly in the low-end scenarios, China might exempt cross-strait trade from a blockade since these ships would be in compliance with any blockade restrictions in the normal course of operations, and continuing China's own trade while trade with other countries declined would increase China's economic leverage over Taiwan.

The module treats cross-strait traffic not on a ship-by-ship basis, as with other traffic, but as a group, which is adjusted by percentages: No change (100 percent), half (50 percent), proportional (which aligns cross-strait trade with the levels of other trade), and none (0 percent). (Appendix E, "Details on Escalation Levels," specifies cross-strait traffic for each escalation level.)

OUTPUTS

Electricity Generation and Usage: Electricity production and usage are critical economic activities because they underpin both industrial production and the population's well-being. Energy is also a major driver of imports, as the raw materials for electricity production constitute 22 percent of total imports by weight (energy imports overall for electricity, transportation, industry, and other uses total 50 percent of imports).[44] There are five component fuels in the electricity production system: natural gas, coal, oil, renewables, and nuclear. Natural gas, oil, and coal come almost entirely from external sources. Renewables and nuclear power do not.

This element of the module calculates electricity generated per week based on the following factors.

- **Deliveries:** These come from the ship arrivals described above.
- **Initial Inventories of Natural Gas, Coal, and Oil:** The default is the current level as publicly reported: oil–146 days, 118,000,000 barrels; natural gas–12 days, 1,000 million

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43 Jack Becker and Matthew K. Hamilton, "King Cotton Diplomacy: The Impact of Cotton Trade on the Civil War," Texas State Historical Association, July 10, 2012, https://www.tshaonline.org/handbook/entries/wartime-cotton-trade; and David G. Surdam, "Traders or Traitors: Northern Cotton Trading During the Civil War," *Business and Economic History* 28, no. 2 (1999), https://thebhc.org/sites/default/files/beh/BEHprint/v028n2/p0301-p0312.pdf.

44 "Table 8. Inbound Cargo by Merchandise," "Table 12. Inbound Bulk Cargo by Commodity," and "Table 27. Volume of Unloading Cargo Handled By Commodity," in Taiwan International Ports Corporation, *Annual Statistical Report*, 27-29, 41-43, 87-89.

cubic meters (mcm); coal—45 days, 7,000,000 tons.[45] Inventories are drawn down to make up any import shortfalls, thus allowing electricity production to continue at pre-blockade levels if imports decline below the required amounts. When inventories run out, production occurs at whatever level imports will sustain. If imports exceed pre-blockade usage, the excess goes into inventory.

- **Allocation of Energy Inputs:** Pre-blockade, some energy inputs go to industry, commercial activities, and residences (23 percent of coal, 17 percent of natural gas) and the rest to electricity production. Only 1 percent of oil and petroleum products are used for electricity production. (The module lumps together crude oil and petroleum products like gasoline, diesel, and petroleum gas since they are somewhat fungible with refining and the choice of tankers.) To maintain electricity generation in an emergency, some of these energy inputs shift from other sectors to electricity production. In effect, it sacrifices economic activity for the health, safety, and comfort of the population.
- **Electricity Production:** The module calculates electricity production from raw material inputs based on historical relationships between inputs and outputs. For example, in the past, 397 million cubic meters of natural gas produced 2,077,000 kilowatt-hours (kWh) weekly, or 5,231,738 kWh per million cubic meters of natural gas. The module used this factor for any changes in imports of energy raw material.
- **Nuclear Power:** The module assumes that Taiwan continued operations of its last nuclear power plant. However, Taiwan stopped operations of this plant in May 2025 as this study was being completed. Loss of nuclear power will reduce Taiwan's electricity production capacity by 6 percent until other sources can expand.
- **Voluntary Reductions:** Under this policy, the government requests users to reduce their electrical usage; for example, this may include no outside lighting (signs, streetlights), minimum daytime lighting for buildings, no lighting in unoccupied buildings, and temperatures in occupied buildings set to 80 degrees Fahrenheit in the summer and 65 degrees Fahrenheit in the winter.[46] This reduces electrical demand by 4 percent.
- **Mandatory Reductions:** The government requires ending all nonessential electrical usage, such as areas described for voluntary reductions. This produces an additional 5 percent reduction.
- **Private Generators:** If authorized, private generators allow more oil to be used for electrical generation. Although private generation is not as efficient as large power stations, it leverages oil inventories that are relatively much larger than inventories of coal or natural gas. Natural

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45 Rice, *The Resilience of Taiwan's Energy and Food Systems*; Taiwan Energy Administration, *Energy Statistics Handbook 2023* (Taipei City: Ministry of Economic Affairs, 2023), 138, 151, https://www.moeaea.gov.tw/ECW_WEBPAGE/FlipBook/2023EnergyStaHandBook/index.html#p=. Pre-blockade petroleum import data from U.S. EIA: "Taiwan: Petroleum and other liquids consumption 2023," U.S. Energy Information Administration, https://www.eia.gov/international/rankings/country/TWN?pid=5&aid=2&f=A&y=01%2F01%2F2023&u=0&v=none&pa=34.

46 Temperature recommendation from "Programmable Thermostats," U.S. Department of Energy, 2025, *https://www.energy.gov/energysaver/programmable-thermostats*.

gas supplies expire early, before coal and oil, because of storage difficulties and the scarcity of Taiwanese-controlled LNG tankers.

- **Chinese Interdiction:** In some scenarios, China might attack the production facilities or transmission systems of Taiwan's electrical system. The model provides for such attacks based on bomb tonnage dropped, as described in the section on scenario variants.
- **Blockade Running:** As described in Chapter 2, private blockade running could provide imports that do not come through official sources. Predicting the level of blockade running is difficult because it has not been seen in recent conflicts. Blockade running might not be possible at all because of decisions by the Taiwanese government, the tightness of China's blockade, or Chinese pressure on regional governments. When blockade running is possible, the wargame hypothesizes a daily level equivalent to one bulk carrier of 38,000 tons or one small container ship of 7,000 tons. Twenty-eight percent of the cargo was assumed to be coal, consistent with pre-blockade averages.

Figure 4.3 is an excerpt from Module 3 with calculations for one week of electricity production. Column A shows the element in the electrical system, Column B shows pre-blockade values, Column C shows values for the previous week, Column D shows values for the week in question, and Columns E and F show projections if imports were to stay at that week's level. The rows are as follows:

- Electricity production from natural gas, coal, oil, private generators, nuclear, and renewables (lines 19–24 respectively)
- Inventories of natural gas, coal, and oil (lines 25–27). When these run out, electricity production declines to whatever level imports will support.
- Total electricity production (line 29)
- Any decrement for Chinese attacks on ports and the electrical system (line 30)
- A comparison of total electricity production with three benchmarks: pre-blockade (line 31), demand after deducting for voluntary reductions (lines 32, 33), and demand after deducting for voluntary and mandatory reductions (lines 34, 35)

This example shows the situation at the end of week 1 of the "Zero Baseline," a scenario described in Chapter 5, "Analysis of Wargame Results." Electricity production has continued at 100 percent of pre-blockade levels by drawing down inventories. However, projecting into the future, electricity production would decline as the inventory of natural gas is exhausted. At that level, the government would impose mandatory reductions, so row 35 would be the correct metric. At week 4 (not shown), production bumps up 6 percent as private generators kick in.

ECONOMIC AND SOCIAL EFFECTS

Effects of Electricity Production Levels: This element of the module translates levels of electricity production into effects on industry and the population. The module uses pre-blockade usage as the baseline and specifies effects on each sector at the 80 percent, 60 percent, 40 percent, and 20 percent levels of electricity production. It allocates electricity to six sectors (energy

Figure 4.3: Excerpt from Module 3 Showing Calculations for Electricity Production

	Pre-Blockade	Prior Week	Current Week	Projection Week 2	Projection Week 3
Electrical Production, Coal (kWh)	*2,480,000,000*	2,480,000,000	**2,479,605,960**	2,479,605,960	2,479,605,960
Electrical Production, NG (kWh)	*2,077,000,000*	2,077,000,000	**2,078,674,156**	2,077,000,000	**841,137,914**
Electrical Production, Oil (kWh)	*102,000,000*	102,000,000	**102,000,000**	102,000,000	102,000,000
Production from private generators, Oil (kWh)	*0*	0	0	0	0
Electrical Production, Nuclear (kWh)	*341,400,000*	341,400,000	**341,400,000**	341,400,000	341,400,000
Electrical Production, Renewables (kHr)	*515,200,000*	515,200,000	**515,200,000**	515,200,000	515,200,000
Inventory, Coal (tons)	*7,000,000*	5,883,000	**4,766,000**	3,649,000	2,532,000
Inventory, NG (Mft3)	*1,000*	484	**177**	0	0
Inventory, Oil (barrels)**	*118,000,000*	112,330,000	**106,660,000**	100,990,000	95,320,000
Total weekly electrical production (MWh)	5,515,600	5,515,600	**5,516,880**	5,515,206	4,279,344
Total weekly production after Chinese interdiction	5,515,600	5,515,600	**5,516,880**	5,515,206	4,279,344
% of pre-blockade level	100%	100%	**100%**	100%	78%
Blockade requirement-voluntary		5,294,978	**5,294,978**	5,294,978	5,294,978
% of voluntarily reduced demand		100%	**100%**	**100%**	**81%**
Blockade requirement-mandatory		5,019,200	**5,019,200**	5,019,200	5,019,200
Blockade production % of demand* **		100%	**100%**	100%	85%
Voluntary/Mandatory reductions?		N	**N**	N	Y

Source: CSIS Defense and Security Department.

sector use, industrial non-electronics, industrial electronics, residential, services, and other/transportation), prioritizes them, and estimates the impact in each sector. Chip and electronics production are protected until electricity production gets so low that the health and safety of the population are threatened. Other industrial production is sacrificed as electricity production declines. Residential electrical use declines sharply at the beginning, with voluntary and then mandatory reductions, but is partly protected after that to reduce hardship on the population. Rail and agriculture are protected—rail because private transportation will decline and therefore public transportation needs to sustain a minimum level of mobility, agriculture because continued production is needed to minimize food imports.

The reduction of electricity production would affect manufacturing and society as follows, based on percentage of pre-blockade production:

- **80 percent:** Most manufacturing continues, though steel and mineral operations are cut by 27 percent (aligning with likely energy reductions). Construction and consumer goods face steep reductions. Steel production is cut sharply because of its high import tonnage, large energy needs, and relatively low value added.
- **60 percent:** Most manufacturing (except steel) runs at about 60 percent capacity.
- **40 percent:** Iron and mineral materials operations are reduced to 7 percent and 20 percent, respectively. Most other manufacturing continues but is scaled way back. Agriculture inputs are still protected. Most consumer imports are stopped.

- **20 percent:** All manufacturing ceases. No consumer goods are imported. Electricity supports only emergency services.

Effects of Non-Energy Import Levels: To better assess the effects of non-energy import reductions, Module 3 examines them separately and disaggregates them into 11 categories: mineral products (industrial), food (consumer), non-food animal/vegetable products (industrial), plastics (industrial), wood/paper (industrial), wood/paper/textiles (consumer), chemicals (industrial), base metals (industrial), miscellaneous finished goods (consumer), machinery/transportation (industrial), and miscellaneous (industrial).

Like energy production, imports prioritize the population's health and safety, with medical supplies, food, and pharmaceuticals being protected to the end. After that, imports prioritize industry because that is Taiwan's economic lifeblood. Industry operations also support employment. Consumer items have lower priority. Food is a consumer exception, receiving the highest priority. Capital goods have a lower priority because the service life of existing machinery can be extended; spare parts therefore have a higher priority. Construction is the lowest priority since its value is long term and projects can pause until the blockade ends.

Table 4.5 shows how different economic activities decline when following the prioritization described above. Effects are estimated at 80, 60, 40, and 20 percent of pre-blockade levels, including cross-strait reductions.

Chip Production: Chip production is not constrained by import levels because the raw materials, though crucial, are not heavy or bulky. Chip production could continue if (1) chips and electronics have priority for electricity and water (which the module provides), (2) air traffic is still possible for exporting the finished chips, and (3) either there are waivers for civilian aircraft to import some hazardous chemicals and gases needed in chip production or if military aircraft were used.[47] However, at the 40 percent electricity level, Module 3 cuts electricity availability for chip and electronics manufacturing by 44 percent to protect a minimum level of residential electricity usage. Chip production continues but at a reduced level. At the 20 percent level, electricity availability for electronics manufacturing would be only 8 percent of what it was pre-blockade. Nearly all production would stop.

Food: In blockades, thought turns naturally to food, since it is vital for human existence. Images of starving populations proliferate in historical examples, such as Germany at the end of World War I, Leningrad in 1941–1944, the Netherlands in 1944–1945, and Biafra (the breakaway Nigerian province) in 1968–1970.[48] However, these were exceptional circumstances driven by highly effective blockades that were maintained for years.

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47 Chris Jones and Edwards Vacuum, "Water Supply Challenges for the Semiconductor Industry," *Semiconductor Digest*, October 24, 2022, https://www.semiconductor-digest.com/water-supply-challenges-for-the-semiconductor-industry/.

48 For the Netherlands experience, see L. H. Lumey and F. W. A. Van Poppel, "The Dutch Famine of 1944–45: Mortality and Morbidity in Past and Present Generations," *Social History of Medicine* 7, no. 2 (1994): 229–46, https://doi.org/10.1093/shm/7.2.229.

Table 4.5: Blockade Effects by Economic Activity and Severity

	Imports as a Percentage of Pre-Blockade Level			
	80 Percent	*60 Percent*	*40 Percent*	*20 Percent*
Food	X	X	X	X
Emergency Health and Safety	X	X	X	X
Spare parts	X	X	/	/
Chips	X	X	/	
Farming (non-food animal, vegetable)	X	X	/	
Other Manufacturing (base metals)	X	/	/	
Capital Goods	X	/	/	
Other Mineral Production	/	/		
Construction	/	/		
Consumer Goods	/	/		
Steel	/			

Note: X = at or near pre-blockade level; / = about half of pre-blockade level.

Source: CSIS Defense and Security Department.

The project did a separate food analysis, described in detail in Appendix A, "Taiwan Food Analysis." The bottom line is that feeding a population is logistically relatively easy, and that is true in Taiwan's case. Taiwan produces about 45 percent of its food requirements by weight (30 percent by calories).[49] The remaining 55 percent requires only about 5 percent of its total import volume (10 percent if livestock feed and industrial uses are included).[50] Nevertheless, Module 3 gives food imports the highest priority because of their direct effect on the population. Although diet might get monotonous as import levels and inventories decline, the population would not go hungry unless blockade levels reached extreme levels where less than 20 percent of pre-blockade imports got through and then remained at these levels for many months. Even if China blocked all imports, including food—and accepted the global criticism for deliberately starving a population—Taiwan could feed its population for nine months using both domestic production and inventories.

49 Gustavo F. Ferreira and Jamie A. Critelli, "Taiwan's Food Resiliency—or Not—in a Conflict with China," U.S. Army War College, *Parameters* 53, no. 2 (2023), https://press.armywarcollege.edu/cgi/viewcontent.cgi?article=3222&context=parameters.

50 Oscar Lin, "Taiwan Food Security Situation Overview," U.S. Department of Agriculture, Foreign Agricultural Service, June 19, 2024, https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Taiwan%20Food%20Security%20Situation%20Overview_Taipei_Taiwan_TW2024-0030.pdf; Taiwan International Ports Corporation, *Annual Statistical Report* (Kaoshiung City: Taiwan International Ports Corporation, 2024), 27, 41, 55, https://www.twport.com.tw/en/media/Articles?a=452.

Conduct of the Wargame Iterations

The project ran 26 iterations of the game using the rules for the three modules as described above.

Twenty-one iterations looked at fixed dyads that simulated a 20-week blockade in one-week steps. These were conducted by the project staff and not outside participants for two reasons: First, making reasonable decisions quickly required players to be familiar with the issues involved; thus, these fixed-dyad games could simulate 20 weeks in one day, whereas the free-play games with outside players would simulate just three to five weeks in one day. Second, because the issues involved were less political and more operational, there was less need for outside perspectives.

To gain those outside perspectives on escalation, the project conducted five free-play iterations. These simulated only three to five weeks because of the need for multiplayer teams to discuss and decide on a move. The combination of fixed dyads and free-play games allowed the project to gain insights into both the long-term effects of different blockade scenarios and the dynamics of escalation.

Gameplay for Free-Play Iterations: These iterations began with the four teams (China, the United States, Japan, and Taiwan) being given the parameters for a scenario derived from the scenario development process described earlier. Each team had two to four participants, generally more on the U.S. and China teams and fewer on the Taiwan and Japan teams. The Japan and Taiwan teams played separately from the U.S. team to better capture the different interests of these countries and give each team agency. The U.S., Taiwan, and Japan teams could communicate freely.

The teams thought about how to operate under the game parameters and then made their move. Once all teams moved, the project staff adjudicated the results. Finally, the U.S. coalition and China teams were given the opportunity to communicate as a way to enrich the implementation of strategies and search for an off-ramp.

Players were instructed to make the most effective moves they could and not try to anticipate what those governments might do in this situation. Those actions are uncertain, and giving players discretion expands the range of strategies pursued, thus providing broader insights and reducing the possibility of future surprise.

Gameplay continued for about six hours during a single day. Based on previous experience, this is the maximum that senior players can devote to a wargame. At the end, there was a "hot wash," where participants and game staff discussed their insights about the gameplay and what it means for policy choices.

Free-Play Game Participants: Having outside participants engages a broader set of experience and elicits ideas about courses of action that the staff might not have envisioned. The project used CSIS's extensive contacts in government, think tanks, academia, and the military to attract a wide range of experts to participate in the games. These included many retired general and flag officers, several serving senior officers, former service secretaries and under/assistant secretaries of defense, and senior think tank scholars. The Taiwanese and Japanese players came from Taipei's and Tokyo's

foreign policy communities or had a background in East Asian culture and politics. Similarly, at least some players on the China team had extensive knowledge of China's military and politics. There were no players from China.

As with the previous project, participants included some junior scholars involved with research in these areas. Including junior scholars brings a different perspective and provides them with a professional development opportunity to participate in a wargame and interact directly with senior scholars and practitioners.

5

Analysis of Wargame Results

This chapter describes the results of the 26 game iterations. The chapter begins with an explanation of the victory conditions, then summarizes game results. The first result is the "Zero Baseline," which shows what an absolute blockade would do under three cases: Base, Prepared, and More Green Energy. Next, the chapter lays out results from the individual scenarios (1x1, 1x2, 2x1, 2x2, 2x3, 3x2, 3x3, 3x4, 4x2, 4x3, 4x4) and variants within them. The chapter closes by examining the results and major decisions of the free-play games.

Victory Conditions

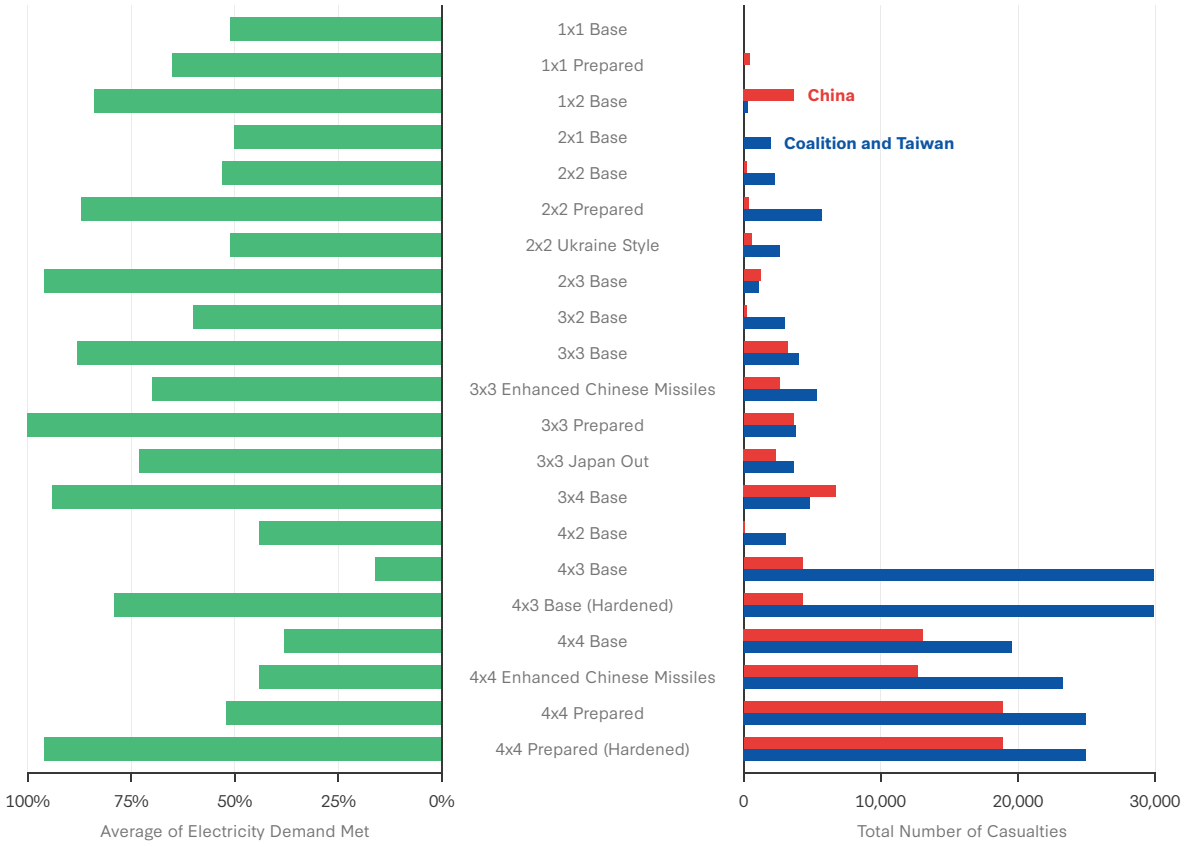
The first question asked about a wargame is generally, "Who won?" However, for this series of wargames, there were no standard victory conditions because a blockade's success or failure rests on whether the target or the blockading force gives up under hardship. This was different from the previous project's invasion scenarios, where a judgment could be made regarding whether China would have successfully occupied the island. Here, there was no way to know at what level of hardship Taiwan might opt to submit or China might decide that the effort costs too much. Arguments can be made that Taiwan would demonstrate extreme endurance, like Malta in World War II, or exhibit less robust resistance, as a result of Chinese subversion and information operations. Similarly, China might sustain a great effort to "reunify" Taiwan or back off when China's population feels squeezed. Instead, this report shows the blockade's effect on Taiwan's economy and society, leaving judgments about outcomes to the readers.

Summary of Game Outcomes

This section has three parts: the "Zero Baseline," the 21 individual iterations for each dyad, and the five free-play games.

Figure 5.1 provides a results summary for direct comparison between scenarios. "Average Percentage of Electricity Demand Met" presents the average across 20 weeks of the wargame. "Number of Casualties" refers to lives lost in each scenario. Casualty estimates were based on crew complement of the lost vessel or aircraft and does not include possible losses from land-based casualties. Free-play games are not depicted because they ran for a shorter period of time.

Figure 5.1: Summary of Game Outcomes



Note: There are some counterintuitive variations in casualties and electricity production due to different gameplay decisions. For example, in the 4x2 Base case iteration, the China team elected not to strike Taiwanese energy infrastructure, as they deemed it was not necessary to accomplish their objectives. Thus, electricity production is higher than in other 4x[n] variants.

Source: CSIS Defense and Security Department.

A blockade scenario is not a bloodless endeavor for either party at any escalation level. That said, limiting escalation to level 1 or 2 would result in significantly lower human costs for both sides. As Figure 5.1 demonstrates, the level 4 escalation scenarios have many more casualties in comparison to the lower-escalation iterations. For example, coalition casualties are 5.5 times greater in the 4x4

Base scenario than in the 3x3 Base scenario, and China's casualties are 5 times greater. Comparing the 2x2 Base scenario with the 4x4 Base, the coalition's casualties went from 2,256 to 20,529, China's casualties from 206 to 13,515.

The lowest electricity production rates were found in scenarios with asymmetric escalation levels in China's favor and the 4x3 and 4x4 scenarios where China attacked Taiwan's electrical system. Electricity production did best in Prepared scenarios or where Taiwan had an escalatory advantage.

The "Zero Baseline"

Before analyzing any of the individual scenarios, the project established the "Zero Baseline": What would happen in an absolute blockade where nothing could get through? It is an extreme case, as some resources do get through in all the scenarios examined in this study, but it does provide a baseline that is useful for comparison.

The project examines three cases of the Zero Baseline: Base, Prepared, and More Green Energy. Although electricity production and economic activity in all three iterations eventually declined to critical levels, the slower decline in some iterations could provide enough time to produce a diplomatic settlement or intervention by outside powers such as the United States. Cross-strait trade was set at zero since this simulated an absolute blockade.

The Base case assumed no change from day-to-day operations before the blockade began. Thus, there was no expansion of inventories and no plan for allocation of energy or mandatory electricity conservation. It did include voluntary electricity reductions.

"Prepared" included adding two weeks of energy inventory, mandatory conservation, fuel rationing, and allocation of electricity based on economic and social priorities. These changes reflect a scenario wherein the Republic of China has made certain policy changes that could be beneficial in a blockade scenario (see "Prepared" description under Chapter 4, Module 3). Not surprisingly, this variant does best, providing more electricity for longer.

Finally, the More Green Energy variant projected where Taiwan's energy balance would be as a result of climate and environmental concerns, including the elimination of nuclear power, a reduction in coal-fired plants with an offsetting increase in natural gas-fueled plants, and a 20 percent increase in renewable sources.[1]

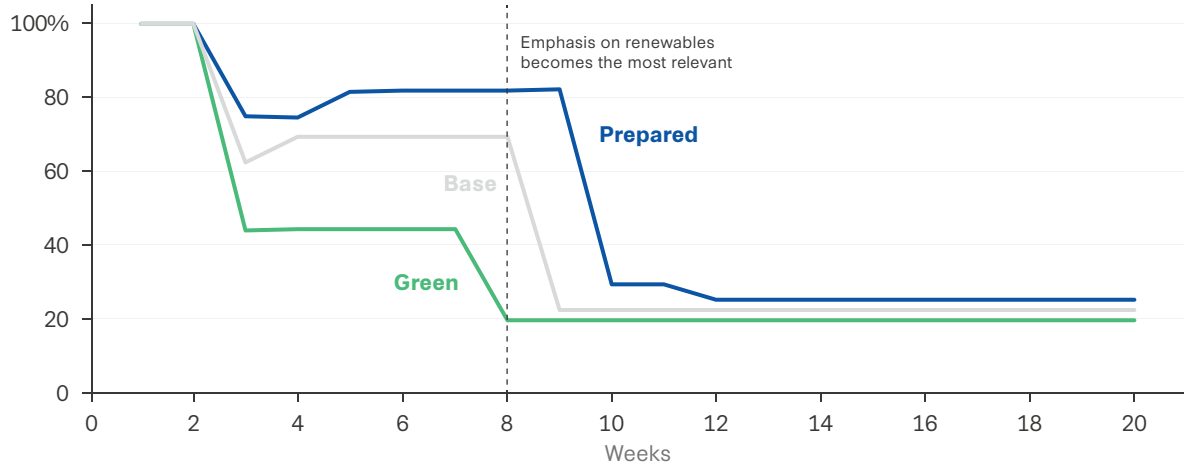
Unfortunately, Taiwan's environmental and climate concerns undermine its energy security in a conflict in the near and medium terms. The lowest line in Figure 5.2 illustrates an energy structure based on Taiwan's plans. These policies sustained far less electricity production in a crisis than other variants. The first reason is that natural gas ran out quickly because of limited inventories. The second reason is that coal, which is easier to store and therefore available in larger inventories, was less important. The third is that nuclear power was gone. Thus, by week 8 (identified in Figure

1 Taiwan Power Company, *2022 Sustainability Report* (Taipei: Taiwan Power Company, 2022), https://www.taipower.com.tw/mag/Sustainability_en/2022sustainability.pdf.

5.2 by a vertical line), electricity production under More Green Energy was down to 18 percent of needs, whereas it was at 75 percent in other variants.

Taiwan's stated policy is to have 60–70 percent renewables by 2050. This would produce a system generally more resilient to blockade because renewables do not depend on continuous imports. However, there will be decades of vulnerability until this shift can be made, even if such a large shift is possible.[2]

Figure 5.2: Electricity Production Over 20 Weeks in a Zero Baseline as a Percentage of Demand



Note: Electricity demand in the peacetime posture and sustainable energy variants included voluntary reductions. Demand in the Prepared variant included both voluntary and mandatory reductions.

Source: CSIS Defense and Security Department.

The rest of the economy's resilience would likely be weak. The module assumed that other industries had only one week of inventory because of complex logistics chains and "just-in-time" logistics policies. Preparations might increase that to two weeks. After that, most activities in the economy would stop without imports. Chip production and electronics might continue because they rely less on inventories, and some inputs could come in by air, assuming that is still viable. Cannibalization and repairs could keep some machinery and vehicles going for extended periods.

The week-by-week description below illustrates what this would mean for Taiwan's economy and society in the Base case with some elements of preparation:

- **Week 1:** Absolute blockade imposed. Taiwan immediately asks its citizens to make voluntary reductions in energy usage.
- **Week 2:** Electricity production uses inventories to remain at pre-blockade levels, adjusted for the voluntary reductions. Manufacturing continues.

2 There will still be a problem of base vs. intermittent loads, which analysis using average usage, as this project did, does not capture.

- **Week 3:** Natural gas inventories are exhausted, and electricity production drops to 73 percent of pre-blockade levels. Private generators are authorized since oil supplies are relatively large compared to natural gas and coal. The government imposes mandatory electricity reductions. Chip and electronics manufacturing continues as before, but other manufacturing is cut in half as inputs dry up. Agriculture and residential electricity use is protected—the former to maintain domestic food production, the latter to reduce hardship on the population. Consumer goods gradually disappear as inventories decline. Active markets for used items spring up. Repair and recycling businesses expand.
- **Week 9:** Coal inventories are depleted, and electricity production declines to 24 percent of pre-blockade levels. Virtually all manufacturing ceases, including electronics and chip production. Most commercial establishments shut down or operate without electricity. Residential electricity operates only 12 hours a day.
- **Week 21:** Electricity production declines to 17 percent as oil inventories are depleted. Only nuclear and renewables remain as sources of electrical power. Only emergency services receive electricity; none is available for industrial or commercial activities. Residential electricity is reduced to 10 hours a day. All private transportation ceases, though some public transportation continues. Food supplies are adequate, however.
- **Weeks 21-36:** No change in electricity. Food is adequate but becomes increasingly monotonous.
- **Week 36:** Food begins to run out as inventories become exhausted. Domestic production can only sustain about 1,000 kcal/person without imported fertilizers and livestock feed.

The Prepared variant delays these adverse events by about three weeks, not reaching the level of "severe" reductions until week 12 (involving chip production reduced to half of pre-blockade levels, the shutdown of other electronics and manufacturing, and the reduction of residential electricity to 21 hours/day) or "crisis" level until week 18 (most economic activity shut down, emergency services only). The More Green Energy variant hits the "severe" level in week 3 and "crisis" in week 7.

In a "Zero Baseline" scenario where no goods reach Taiwan, making the policy changes envisioned by the "Prepared" variant delays "severe" reductions from week 9 until week 12 and "crisis" levels from week 16 to week 18. The "More Green Energy" variant hits the "severe" level in week 3 and "crisis" in week 7.

Analysis of the Individual Scenarios

This section describes the results of each individual scenario and scenario variant as laid out in Chapter 3.

Dyads on the diagonal have multiple iterations, while dyads off the diagonal do not. This is because dyads on the diagonal (1x1, 2x2, 3x3, and 4x4) represent roughly equivalent levels of escalation and therefore are more sensitive to changes in assumptions. Dyads off the diagonal represent scenarios where one side had a substantial escalatory advantage, so the outcome is less likely to be sensitive to changes in assumptions. This asymmetry should be kept in mind when judging iteration outcomes.

The project analyzed the outcome of each game iteration using a set of standard metrics: losses, electricity production, and imports displayed in a summary table, as shown in Table 5.1, and economic metrics described with Figure 5.2.

Table 5.1: Illustrative Iteration Summary

Taiwan's Condition				
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game				
Worst Week				
Merchant Ship Arrivals by Country				
	U.S.	China	Taiwan	Japan
Arrivals				
Losses by Country				
Merchant Ships				
Air				
Surface Ships				
Submarines				
Casualties				

Source: CSIS Defense and Security Department.

1. **Energy Production:** Production is measured as a percentage of demand, with demand being adjusted for voluntary or mandatory reductions, depending on the scenario. One snapshot is taken at the end of the scenario, and the other at the worst week during the game iteration. Examining the worst week shows the maximum level of hardship that the population would have to endure.
2. **Import Level:** This compares the amount of non-fuel imports with the pre-blockade levels. That percentage gives a rough sense of the economic effects of the blockade. As with energy production, the import level also looks at the worst week in the scenario.

3. **Merchant Ship Arrivals by Country:** This provides the total number of merchant ships across the 20 weeks of a scenario that made it successfully to Taiwan. The total number of arrivals demonstrates the level of success of convoys compared to the number of merchant ships lost shown in the next row. Because ships could do multiple trips, this number does not equal the number of ships.
4. **Losses by Country:** The project tracks military losses, including aircraft, warships, and submarines, as well as law enforcement and coast guard vessels. Because economics are central to the success or failure of a blockade, the project also tracks merchant ship losses, both private and government owned. Finally, personnel casualties are estimated based on historical experiences with equipment losses and military operations.

DYAD: CHINA BOARDING VS. TAIWAN CONSTRAINED (1X1)

In this first dyad, China used only the China Coast Guard (CCG), Maritime Safety Administration (MSA), and the People's Armed Force Maritime Militia (PAFMM), while Taiwan's military forces were limited to operations in their own waters. The United States and Japan were uninvolved. Cross-strait trade continued as normal.

Because there were no coalition combat vessels, there were no convoys. Thus, this was not a combat scenario but more like a game of "cat and mouse." Taiwan-bound ships tried to evade the screen of Chinese nonmilitary vessels.

Any iteration in this dyad would create strong escalatory pressures on Taiwan. China's maritime intelligence, surveillance, and reconnaissance (ISR) could effectively locate merchants as they approached the exclusion zone and vector forces to intercept positions within the exclusion zone. Even with the constraints of periodic maintenance, resupply, and travel times, China always had many ships on station. These were enough to drive Taiwan's electricity production and imports to low levels. Taiwan would have to either make concessions to China sufficient to get China to cease its boarding campaign, escalate by using military force against Chinese forces in the exclusion zone, or get the United States to intervene on its behalf.

Iteration 1: China Boarding vs. Taiwan Constrained (1x1) Base

Taiwan's merchant ship losses were due to boarding and seizure, not gunfire and missiles, so there were no Taiwanese personnel casualties. As there was no resistance to this effort, there were similarly no Chinese casualties.[3]

As Figure 5.3 shows, few merchants got through (13 percent overall). Merchants got through more frequently when weather conditions prevented Chinese VBSS operations. This suggests that traveling during rough seas could be an effective response to some forms of Chinese coercion, although the amount of cargo that could get in during these time windows would fall far short of Taiwan's requirements.

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3 In reality, there would likely be minor skirmishes as some Taiwanese crews attempted to resist Chinese boarding efforts. However, these are outside the scope of the project's models and would be relatively minor (compared to later iterations with a wider war).

Table 5.2: Results Summary (1x1) Base

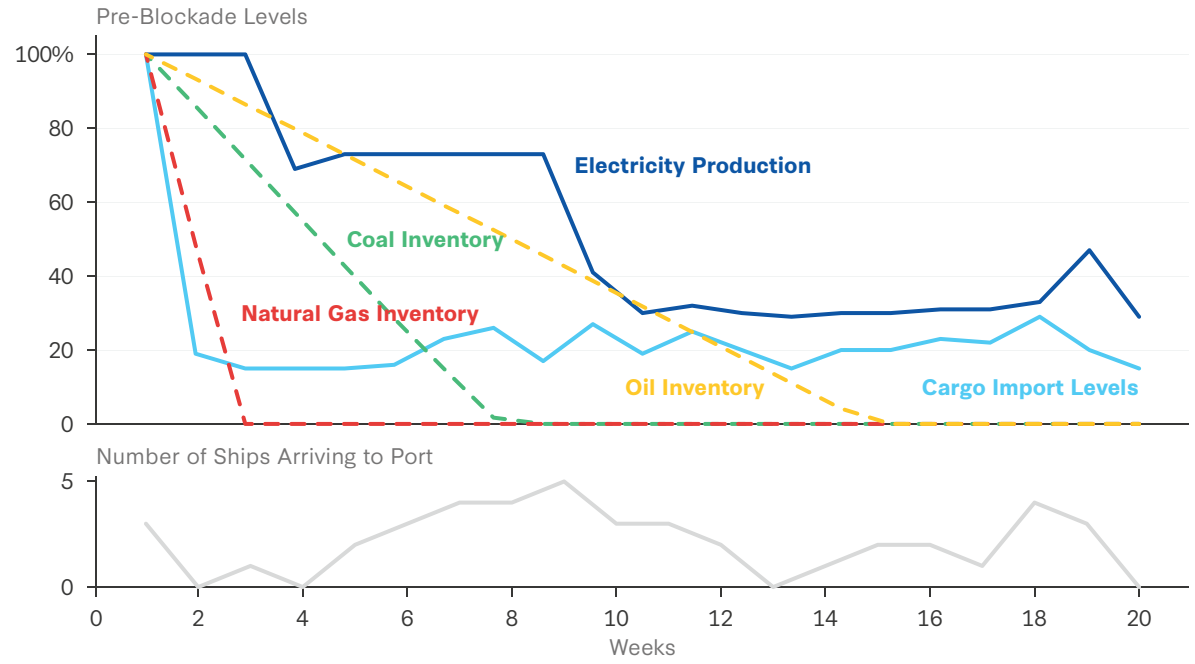
Taiwan's Condition				
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	29%		15%	
Worst Week	29%		15%	
Merchant Ship Arrivals by Country				
	U.S.	China	Taiwan	Japan
Arrivals	–	–	43	–
Losses by Country				
Merchant Ships	–	–	448	–
Air	–	–	–	–
Surface Ships	–	0	–	–
Submarines	–	–	–	–
Casualties	–	0	0	–

Source: CSIS Defense and Security Department.

Energy inventories declined steadily since so few imports arrived. Electricity production declined in steps as inventories were exhausted. In this and all other scenarios, any electricity production after the exhaustion of inventories came from weekly deliveries, nuclear power, and renewables, with some variation based on the behavior of private generators using non-government oil reserves. The spike in electricity production in week 19 occurred because the Taiwan team elected to husband their purchased LNG tankers for a concerted blockade run; five of the seven LNG tankers were seized by China in that run, but two made it. They were subsequently captured when leaving Taiwanese waters. The meager returns on this effort underscore the strength of China's nonmilitary options against a constrained Taiwan.

As this is the first of many similar figures showing economic impacts of a blockade on Taiwan, some explanation is important. On the top graphic, the horizontal scale shows weeks, up to 20. The vertical scale is the percentage of the pre-blockade level. There are five lines. One solid line is the level of electricity production. The other solid line is the level of imports, excluding energy. As Chinese cross-strait trade continues at various levels depending on the Chinese escalation level, it is possible for non-energy imports to remain above zero even if no merchants arrive. Cargo imports are capped at 100 percent of peacetime levels given the following justifications: (1) Peacetime cargo reaching the transshipment point would be limited to 100 percent, (2) more cargo would not be needed, (3) if there was excess cargo capacity, some ships would not be filled to capacity in order to

Figure 5.3: Economic Impacts (1x1) Base



Source: CSIS Defense and Security Department.

spread out the risk, or (4) excess merchants would be sent empty in order to improve the survival chances of laden merchants.

The three dotted lines all show inventory levels. Inventories are important because they provide a buffer against interrupted imports. Note that these dotted lines represent inventories, not arrivals. It often happens that energy raw materials arrive but are used in the week of arrival to produce electricity and thus do not change the level of inventories. Inventories are capped at the prepared level (two weeks of additional inventory) since their expansion hits limits on storage capacity.

The bottom graphic shows the number of ship arrivals by week, with the scale varying according to the data. Cross-strait trade is included separately as an activity, not by ship, since the level is set by policy and not by Chinese interdiction. Thus, cross-strait trade does not show up in ship arrivals.

Iteration 2: China Boarding vs. Taiwan Constrained (1x1) Prepared with CGA Variant

Even a Prepared Taiwan that used the Coast Guard Administration (CGA) to attack Chinese boarding ships was unable to deal with a Chinese campaign at this scale, although adequate electricity production could be maintained longer. Some of Taiwan's CGA ships (the Taichung, Anping, and Shun Hu 10 classes) were armed with antiship cruise missiles (ASCMs) and powerful deck guns that

Table 5.3: Results Summary (1x1) Prepared

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	33%		22%	
Worst Week	33%		22%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	–	–	304	–
	Losses by Country			
Merchant Ships	–	–	1,110	–
Air	–	–	–	–
Surface Ships	–			–
Coast Guard		12	0	
MSA		1	–	
PAFMM		22	–	
Submarines	–	–	–	–
Casualties	–	415	0	–

Source: CSIS Defense and Security Department.

allowed them to outmatch even the demilitarized ex-PLAN ships in the CCG. However, over time they were simply outnumbered, and by week 20, Taiwan was in the same place as the Base case.

Unlike in the Base case, there were Chinese casualties in the Prepared case due to Taiwan's CGA attacking Chinese boarding ships in the exclusion zone. However, Taiwan's ability to destroy Chinese ships paled in comparison to the number of Chinese ships available.

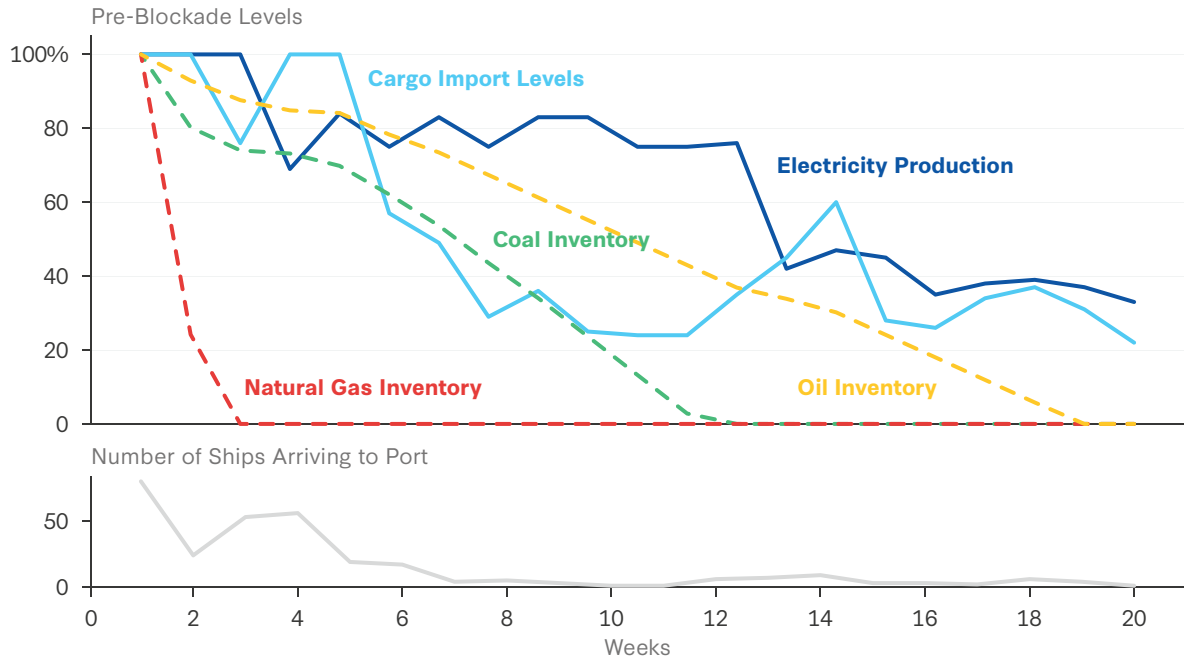
In the Prepared variant, inventories of coal, oil, and gas declined more slowly than in the Base case. As a result, electricity production did not go below 50 percent until week 13 versus week 9 in the Base case. Imports stayed above 20 percent until week 20, whereas the Base case hit that level in week 1. However, even the greater numbers of Taiwanese merchants posited by the Prepared variant were eventually attrited down and unable to resupply Taiwan. By week 20, imports were only 3 percent higher than in the Base case, and electricity production was 4 percent higher.

Even if the CGA only fired at Chinese ships that were attempting to board and Chinese ships did not fire back, they only reduced the rate of seizures in the first four weeks from 89 percent in the Base case to 73 percent. The problem was Chinese numbers.

DYAD: CHINA BOARDING VS. TAIWAN ASSERTIVE (1X2)

This dyad pitted Chinese nonmilitary forces against Taiwanese military forces. The Republic of China Air Force (ROCAF) and Republic of China Navy (ROCN) engaged in direct combat against

Figure 5.4: Economic Impacts (1x1) Prepared



Source: CSIS Defense and Security Department.

Chinese CCG, MSA, and PAFMM vessels operating in the exclusion zone. Chinese ships only returned fire if they were attacked and if they were armed. Taiwanese merchants continued to operate individually as shuttles coming from Japan.

This scenario created strong escalatory pressures on China. If Taiwan is willing to use military force against Chinese boarding, then its military is more than capable of rapidly destroying most of the CCG, MSA, and PAFMM ships sent. As an "off-diagonal" scenario, the correlation of escalation between China and Taiwan is imbalanced: Taiwan is using military forces against nonmilitary (though militarized) Chinese forces. China would quickly lose many ships. It would have to decide between abandoning its effort or escalating to direct kinetic action.

Although this iteration allowed Taiwanese forces to destroy as many Chinese ships as physically possible if they attempted boarding, in reality Taiwan might be better off demonstrating its willingness to use military force by attacking a few select Chinese ships and then offering China a face-saving off-ramp. Otherwise, the sunk costs of so many destroyed Chinese ships might drive China to escalation that would be difficult for Taiwan to match on its own.

Iteration 3: China Boarding vs. Taiwan Assertive (1x2) Base

The ROCAF and ROCN were able to destroy hundreds of Chinese CCG, MSA, and PAFMM vessels in a few weeks, almost entirely destroying those forces. A few Taiwanese merchants were boarded or damaged early in the campaign, but the number declined to zero by week 3. By this point, the main constraint on trade was acquiring and crewing enough merchants to make the Japan-Taiwan run. As with all off-diagonal dyads, the imbalance of capabilities meant that only one iteration was needed.

Table 5.4: Results Summary (1x2) Base

Taiwan's Condition				
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	100%		100%	
Worst Week	61%		16%	
Merchant Ship Arrivals by Country				
	U.S.	China	Taiwan	Japan
Arrivals	-	-	1,736	-
Losses by Country				
Merchant Ships	-	-	7	-
Air	-	-	-	-
Surface Ships				
Coast Guard		125	4	
MSA	-	11	-	-
PAFMM		189	-	
ROCN		-	16	
Submarines	-	-	-	-
Casualties	-	3,663	272	-

Source: CSIS Defense and Security Department.

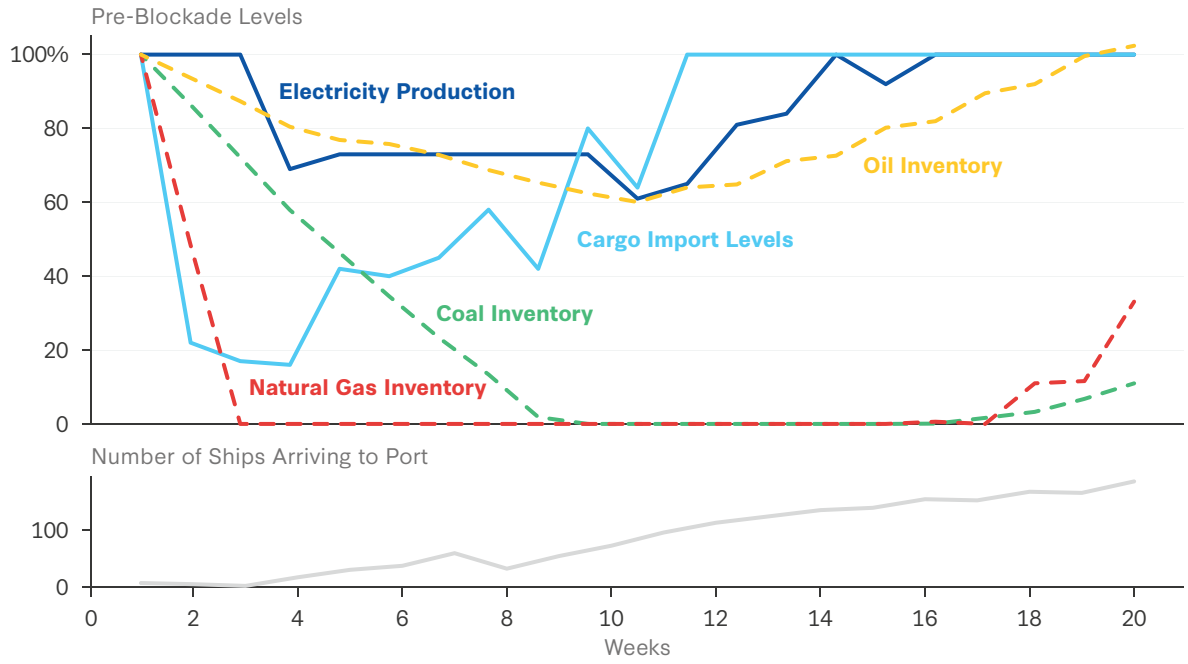
Losses show the great imbalance in capabilities. Although these Chinese ships were individually small, they were so numerous as to cause significant casualties for China. In turn, Taiwan's casualties were comparatively light, although not trivial. This is because many CCG ships have been transferred from the PLAN and retain capable armaments.

Imports plummeted initially due to Chinese boardings but rebuilt gradually as Taiwan cleared out the Chinese forces. Although LNG inventories were quickly depleted—as is the case in nearly all scenarios—followed by the depletion of coal inventories, the steady flow of oil coupled with large initial oil inventories and government-imposed mandatory reductions in usage allowed electricity production to bottom out at 61 percent. Electricity production picked up after 10 weeks, when supplies began to arrive in bulk. By week 14, conditions in Taiwan returned to normal. By week 18, imports were large enough to begin rebuilding coal and LNG inventories.

DYAD: CHINA SUBS AND MINES VS. TAIWAN CONSTRAINED (2X1)

This dyad pitted Chinese submarines and mines against a constrained Taiwan. Chinese submarines used torpedoes, but China withheld its ASCMs for potential future conflicts rather than using them on defenseless merchants. China conducted covert mining with the PAFMM (versus overt mining of

Figure 5.5: Economic Impacts (1x2) Base



Source: CSIS Defense and Security Department.

international waters with conventional forces, which would make outside intervention more likely). This allowed China to have a semi-deniable blockade.[4]

A Chinese attempt to blockade Taiwan using submarines and mines would pressure Taiwan to escalate militarily, make concessions, or get the United States to intervene militarily. As another off-diagonal scenario, the relative commitment of forces was imbalanced. Chinese submarines and mines were able to effectively interdict merchant traffic to Taiwan.

Iteration 4: China Subs and Mines vs. Taiwan Constrained (2x1) Base

Unlike previous scenarios where China was only boarding Taiwanese ships, China was now attacking merchants with the intent to sink them. This means that the loss of merchants now resulted in casualties. As with all iterations, this scenario ran for 20 weeks regardless of losses on either side; however, Taiwanese and foreign seafarers might not continue to volunteer to travel on merchant ships that are facing a 50 percent attrition rate. Taiwan—and the United States—would have to quickly decide on escalation or concession.

Even with constraints on the use of ASCMs, Chinese submarines and mines destroyed 59 percent of Taiwanese merchant vessels in the first month of conflict and cumulatively destroyed 387 merchant vessels by the end of 20 weeks. The overall attrition rate per merchant trip ran about 50 percent.

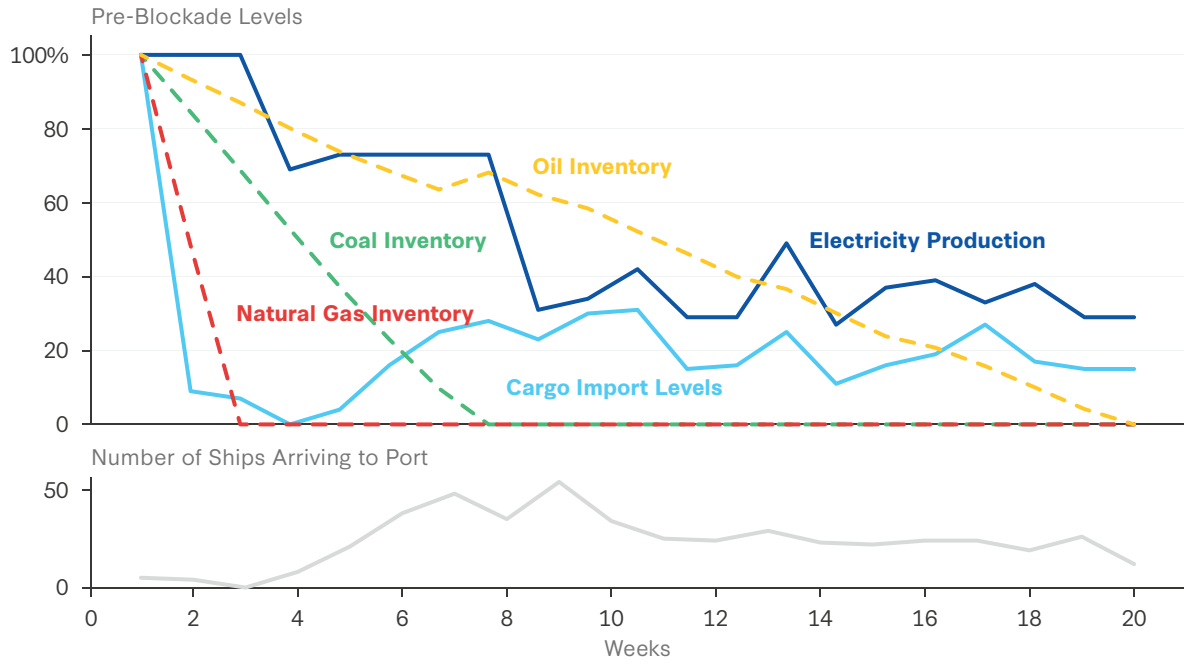
4 This would mirror the case of Russia's occupation of Crimea, in which there was no confusion about whether it was Russian forces seizing Ukrainian military facilities, but the patina of deniability was used to make retaliation by third parties less likely.

Table 5.5: Results Summary (2x1) Base

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	29%		15%	
Worst Week	27%		0%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	-	-	1,736	-
	Losses by Country			
Merchant Ships	-	-	475	-
Air	-	-	-	-
Surface Ships	-	0		-
Submarines	-	-	-	-
Casualties	-	0	1,958	-

Source: CSIS Defense and Security Department.

Figure 5.6: Economic Impacts (2x1) Base



Source: CSIS Defense and Security Department.

Electricity production declined to about 30 percent of demand by week 8 and stayed there. Cargo imports declined to 20 percent and stabilized there. Both levels were insufficient for normal

economic functioning. The loss rate of merchant shipping would likely be unsustainable. Taiwan might be able to acquire enough ships on the open market, at the cost of billions of dollars per month, but finding crews would be challenging.[5]

DYAD: CHINA SUBS AND MINES VS. TAIWAN ASSERTIVE (2X2)

This dyad pitted Chinese subs and mines against Taiwanese forces that could operate in the exclusion zone. Chinese submarines used basic ASCMs against Taiwanese ships but saved more advanced ASCMs and antiship ballistic missiles for a potential confrontation with the United States. The Taiwanese forces most relevant were the P-3C maritime patrol aircraft (MPA) and larger ROCN vessels equipped with helicopters or ASROCs. Taiwanese merchants transshipped goods from Japan.

All iterations in this dyad saw unsustainable merchant losses for Taiwan. Chinese submarines have advanced both quantitatively and qualitatively past the point where the ROCN could be expected to counter them effectively. In the Base case, merchant losses were high, and the levels of electricity production and imports declined to critical levels by week 12. In the Prepared case, levels of electricity production and imports were adequate throughout, but the merchant losses were immense—over 1,000 vessels. It is unlikely that Taiwan would be able to sustain operations with that much attrition, even with strong willpower. In the "Ukraine strategy" variant, the United States provided aid short of troops (primarily additional ASW weapons), but this made only a small improvement.

Thus, regardless of the specific iterations, there would be strong pressure on Taiwan to make concessions: Unlike in the 1x1 case, there is no further escalation that Taiwan could make on its own. This in turn means that there would be strong escalatory pressures on the United States to intervene with its own military forces, lest Taiwan make substantive concessions to China.

Iteration 5: China Subs and Mines vs. Taiwan Assertive (2x2) Base

Taiwan's ASW capabilities ran out by the second week as all munition inventories were depleted and ROCN ships with antisubmarine capability were sunk. Although Taiwan sank over a half-dozen Chinese submarines, these were mostly the older classes. Even without using their most advanced antiship missiles, Chinese submarines can destroy Taiwan's frigates and destroyers. Only one Taiwanese ship class has ASROCs. Taiwan's MPAs inflicted slow and steady attrition on Chinese submarines but ran out of torpedoes (having bought 168 from the United States, and with many torpedoes required to sink Chinese submarines in the deep waters east of Taiwan).

Of the 2x2 variants, China suffered the fewest casualties in the Base case. However, the losses for Taiwan and China were disproportionate, as there were 11 Taiwan casualties for every China casualty.

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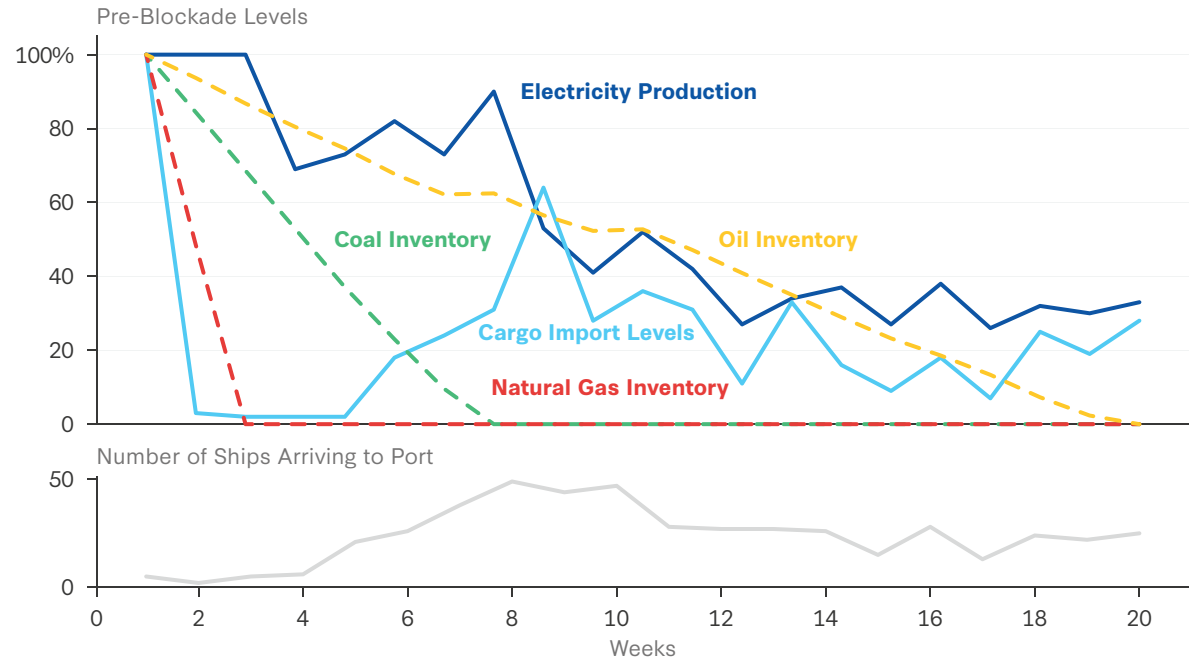
5 Monthly ship cost estimated at $1 billion by calculating ships lost per month (84, from Table 5.5) and multiplying by the average cost per used ship ($12.1 million, from Ch. 4, "Module 1/Ship Purchases"). The cost of cargoes would be in addition.

Table 5.6: Results Summary (2x2) Base

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	33%		28%	
Worst Week	26%		2%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	-	-	478	-
	Losses by Country			
Merchant Ships	-	-	354	-
Air	-	-	-	-
Surface Ships				
Major Combatants	-	-	8	-
Minor Combatants		-	14	
Submarines	-	5	-	-
Casualties	-	208	2,256	-

Source: CSIS Defense and Security Department.

Figure 5.7: Economic Impacts (2x2) Base



Source: CSIS Defense and Security Department.

Imports surged in weeks 5 to 8 as more merchants became available and Taiwanese forces suppressed Chinese submarines, but then imports declined as Taiwan's ASW effort lost effectiveness and Taiwanese forces were attrited. An assertive Taiwan in the Base case could supply about 80 percent of electricity demand for six weeks, but that fell to one-third by week 10 as Taiwan lost hundreds of merchant ships and most of its navy.

Iteration 6: China Subs and Mines vs. Taiwan Assertive (2x2) Prepared

A prepared Taiwan could sustain electricity production (75 percent) and imports (34 percent at the end of 20 weeks but 94 percent overall) at much higher levels than the Base case if Taiwan were willing to pay the cost (over 1,000 merchants).

The increased inventory of merchant ships available in the Prepared case allowed more ships to make it to Taiwan due to sheer numbers and the operational constraints on China's submarine force. The constraints arose from the long submarine cycle time. Chinese submarines that survived the initial two weeks until Taiwanese ASW munitions ran out still had to travel to their patrol station, be directed to inbound merchants, get a firing solution, engage, and repeat until they ran out of torpedoes. They then had to travel back to their base on the mainland, reload, refuel, and return to their station. With over 1,200 Taiwanese-owned ships augmented by in-crisis purchases, this gave Taiwan some breathing room.

The imbalance of Taiwan's owned merchant fleet was an obstacle to maintaining steady energy supplies. While general cargo-carrying ships remained plentiful, Taiwan still had insufficient LNG ships (even with the five additional LNG ships bought in the Prepared case and with the purchase of one more LNG ship off the open market). Taiwan's relative lack of oil-carrying ships also became a problem, although this only manifested by the end of the 20 weeks. The high level of coal and oil inventories along with arrivals sustained electricity production at nearly 100 percent for seven weeks and at about 80 percent thereafter.

Although imports in the Prepared case ended up at about the same low level as the Base case, they only did so by week 20 compared to week 12. Overall, imports were much higher: 88 percent (Prepared) versus 21 percent (Base). However, by the end of the 20 weeks, Taiwan had only 26 merchants remaining and had lost over $79 billion worth of ships and cargo. Although shipments had sustained Taiwan at a relatively high level, the remaining merchant fleet would have been unable to sustain this for the long run.

Iteration 7: China Subs and Mines vs. Taiwan Assertive (2x2) with Ukraine-Style Aid

This iteration does for Taiwan what the United States has done to support Ukraine in its war against Russia—everything short of directly involving military forces. This would include many things that are not modeled in these military wargames, such as launching diplomatic initiatives and imposing sanctions. Activities affecting the wargames include providing intelligence information from the strategic to the tactical level about the disposition of Chinese forces and transferring ASW weaponry.

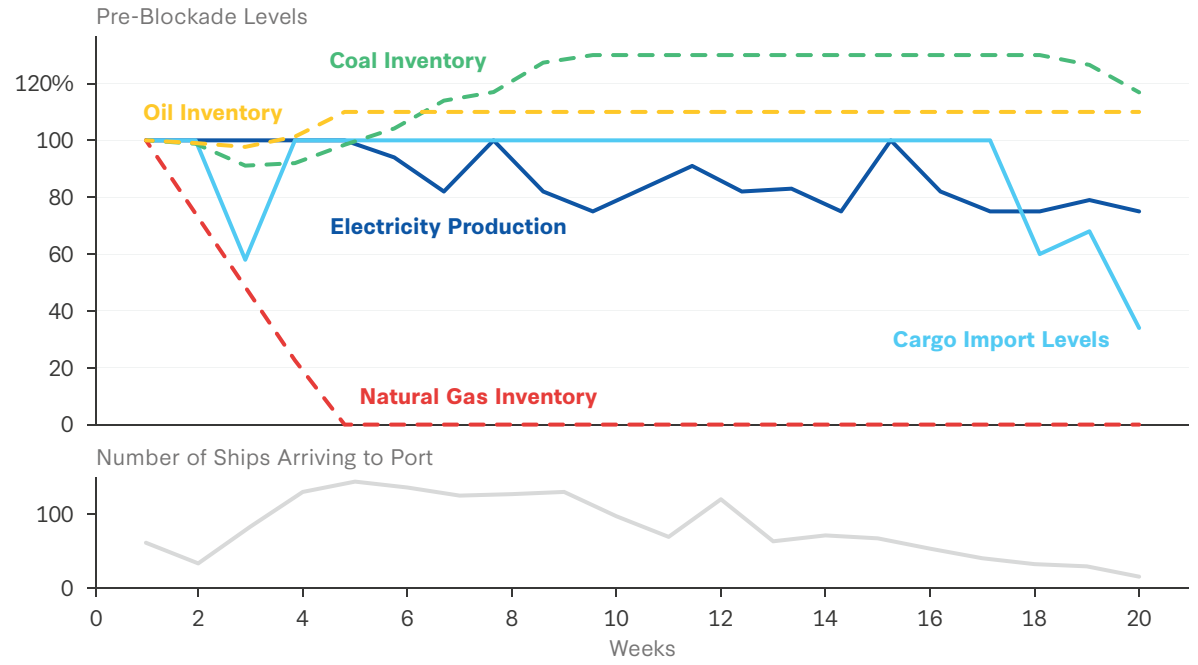
This approach had some positive effects: Chinese submarine losses increased from three in the Base case to 13 in this variant, although Taiwan's ability to fight Chinese submarines was not primarily

Table 5.7: Results Summary (2x2) Prepared

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	75%		34%	
Worst Week	75%		34%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	-	-	1,628	-
	Losses by Country			
Merchant Ships	-	-	1,016	-
Air	-	-	-	-
Surface Ships				
Major Combatants	-	-	9	-
Minor Combatants		-	15	
Submarines	-	8	-	-
Casualties	-	333	5,656	-

Source: CSIS Defense and Security Department.

Figure 5.8: Economic Impacts (2x2 Prepared)



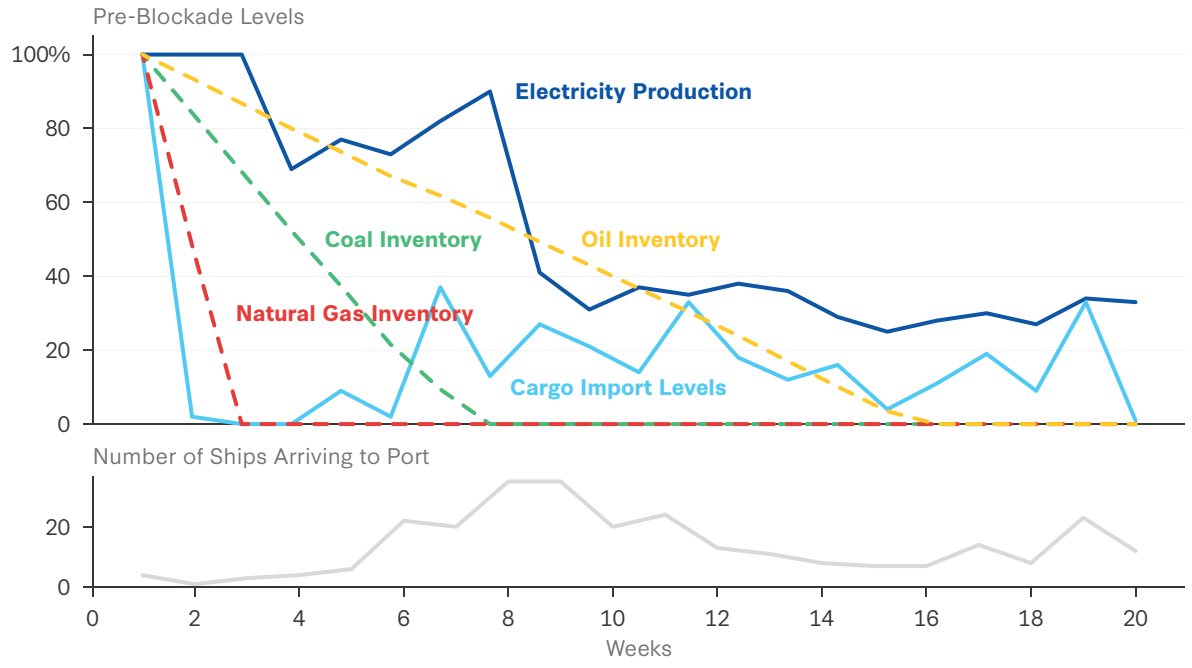
Source: CSIS Defense and Security Department.

Table 5.8: Results Summary (2x2) Ukraine

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	33%		1%	
Worst Week	25%		0%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	-	-	277	-
	Losses by Country			
Merchant Ships	-	-	1,016	-
Air	-	-	-	-
Surface Ships				
Major Combatants	-	-	8	-
Minor Combatants		-	16	
Submarines	-	13	-	-
Casualties	-	541	2,646	-

Source: CSIS Defense and Security Department.

Figure 5.9: Economic Impacts (2x2) Ukraine



Source: CSIS Defense and Security Department.

constrained by munitions but rather by platforms (destroyers, frigates, and MPAs). However, this higher attrition to Chinese submarines did not make a substantial difference in ship arrivals. In comparing these results to the Prepared variant, Taiwan would benefit much more from pre-conflict preparations (e.g., mobilizing all of its owned shipping) than from U.S. arms deliveries during the conflict.

Imports and electricity production did not change substantially from the Base case. Merchant losses were about the same as in the Base case but half what they were in the Prepared case because the players decided to buy fewer, larger ships in this game than in the Base case.

DYAD: CHINA SUBS AND MINES VS. U.S. CONSTRAINED (2X3)

This scenario pitted China's submarines and mines against an assertive Taiwan, with U.S. forces participating but constrained to operations in the exclusion zone. U.S. forces consisted of MPAs (P-8s), nuclear attack submarines, surface combatants, and the T-AGOS ships that are specialized for detecting submarines. China could use advanced antiship missiles against U.S. surface combatants.

Constrained U.S. intervention was sufficient to ensure Taiwan's continued ability to maintain peacetime electrical production in the face of Chinese submarines and mines. This is the scenario posited by Glosny and O'Hanlon.[6] Although "the sea lanes east of Taiwan" might seem large in principle, by focusing on narrow approaches from Japanese territorial waters to Taiwan, the 56,000 km^2 east of Taiwan shrinks to approximately 20,000 km^2. This is far less than the six million km^2 of the North Atlantic covered by the U-boat threat during World War II. The United States also has secure basing for aircraft in Japan, so there is no comparable "Mid-Atlantic gap" within which Chinese submarines would be relatively safe.[7]

The end of the Chinese submarine threat after a month of combat allowed the United States and Taiwan to shift their effort toward countering the PAFMM's covert mine laying, further mitigating that threat.

Here, the escalation risk lies with China, as it loses a large part of its submarine fleet. Because these losses are unseen, however, China could choose to ignore them and simply withdraw from the campaign.

Iteration 8: China Subs and Mines vs. U.S. Constrained (2x3) Base

Merchant ship losses were very low because the United States neutralized the Chinese submarines. The price was paid by the coalition antisubmarine forces, whose losses were essentially equal to those of the submarines.

Taiwan's inventories covered the shortfalls in energy imports until China's submarine threat was neutralized. Once that threat was neutralized, Taiwan achieved 100 percent electricity production from week 7 onwards. Coal and oil inventories never ran out and began rebuilding in week 10.

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6 Glosny "Strangulation from the Sea?"; and O'Hanlon, "Can China take Taiwan?"

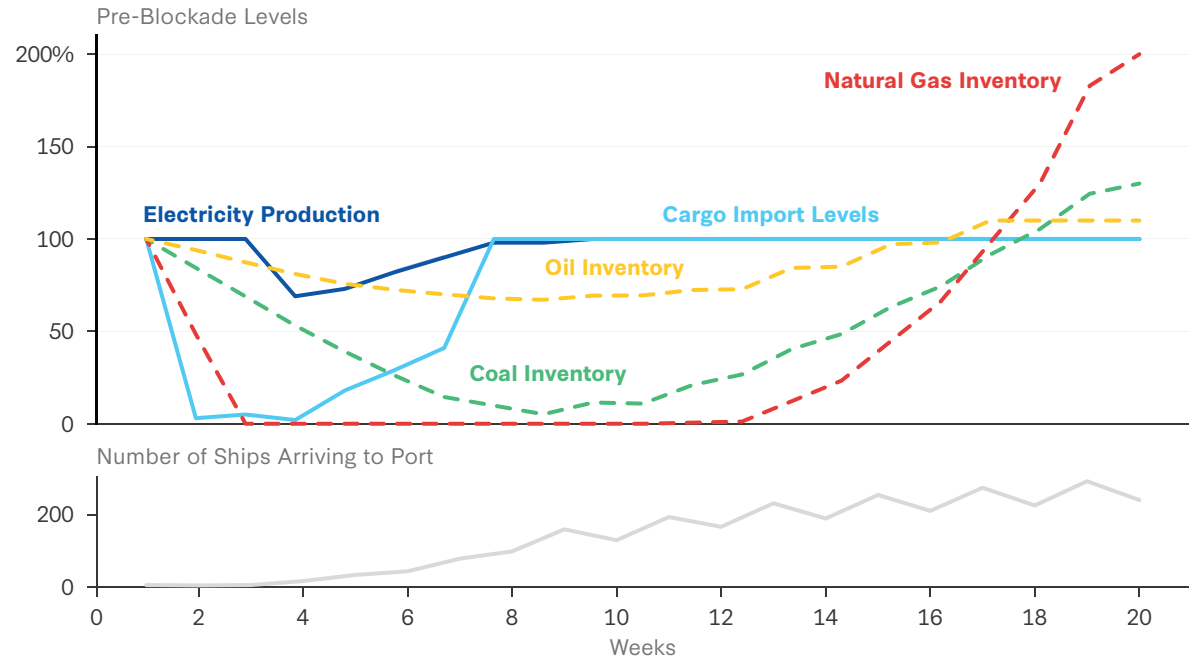
7 In World War II, the mid-Atlantic Gap was an area unreachable by patrol aircraft. This allowed U-boats to move more freely. The gap was closed in 1943 when escort carriers and very long-range patrol aircraft became available.

Table 5.9: Results Summary (2x3) Base

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	100%		100%	
Worst Week	69%		2%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	-	-	763	-
	Losses by Country			
Merchant Ships	-	-	7	-
Air	-	-	-	-
Surface Ships				
Major Combatants	9	-	0	-
Minor Combatants	0		11	
Submarines	2	13	-	-
Casualties	815	1,206	255	-

Source: CSIS Defense and Security Department.

Figure 5.10: Economic Impacts (2x3) Base



Source: CSIS Defense and Security Department.

DYAD: CHINA OFFSHORE KINETIC VS. TAIWAN ASSERTIVE (3X2)

This scenario pitted China conducting operations in the exclusion zone with all its military and nonmilitary assets against Taiwan alone using all its assets. Neither U.S. military assets nor its merchant ships participated.

Faced with this situation, Taiwan was unable to protect merchant shipping. Taiwan's warships had very limited capability. Even after organizing the most capable ships into two large mega-surface action groups (SAGs) of 16 ships, each SAG had only 75 medium- and long-range surface-to-air missiles. Many of these were outdated SM-1s. By contrast, a U.S. SAG of three ships has roughly 288 Vertical Launch Systems cells, a majority of which would normally be filled with the most advanced defensive missiles, such as SM-2s, SM-3s, and SM-6s. None of Taiwan's ships had ballistic missile defense capability.

The bottom line is that Taiwan would be hopelessly outclassed in this blockade scenario without direct, large-scale intervention by the United States.

Iteration 9: China Offshore Kinetic vs. Taiwan Assertive (3x2) Base

In this iteration, the last of Taiwan's navy was annihilated while attempting to provide defense for the second convoy (run during week 5). China shot down the last of Taiwan's MPAs during the fourth convoy run (week 10) and the last of Taiwan's fighter aircraft during the sixth convoy (week 13). In keeping with the gaming protocol, the game continued for 20 weeks, and a total of nine convoys were run, three of which were entirely unprotected. Taiwanese decisionmakers might be unwilling to do this even if China refrains from escalating to more aggressive tactics.[8]

Despite the high level of Chinese activity, some merchants leaked through the rain of missiles and bombs. Spikes in cargo and electricity production reflect the weeks in which convoys were attempted: The players in this iteration husbanded ships for larger, more infrequent convoys, in contrast with the Chinese escalation 2 scenarios, where convoys were attempted every week. When these large, undefended convoys ran, China was only limited by their ability to destroy merchant ships during their five-hour transit in international waters between Yonaguni and Taiwan. For example, of the 100 merchants that traveled on week 13, 26 ships arrived undamaged off Taiwan. The point is less about the precise numbers of the scenario results and more to underline that, should China want to respect Taiwanese and Japanese territorial waters, it would put itself at serious disadvantage.[9]

Spikes on the chart for electricity production and imports (weeks 5, 8, 10, 13, 17, and 19) reflect convoy arrivals. Overall performance is better than the final snapshot would imply. Convoys kept import and electricity production at about 50 percent on average after week 10, although at immense cost to Taiwan's military forces and merchant fleet.

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8 In addition to these caveats, it should be added that China would be able to fire larger salvos at each convoy if it did not have to withhold missiles for a possible conflict with the United States.

9 For an excellent discussion of PLA self-appraisal, see: Dennis J. Blasko, "PLA Weaknesses and Xi's Concerns about PLA Capabilities." Presented at the Panel on "Backlash from Abroad: The Limits of Beijing's Power to Shape its External Environment," U.S.-China Economic and Security Review Commission, February 7, 2019.

Table 5.10: Results Summary (3x2) Base

	Taiwan's Condition	
	Electricity Production (% of Demand)	Import Level (% of Demand)
End of Game	100%	100%
Worst Week	69%	2%

	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	–	–	294	–

	Losses by Country			
Merchant Ships	–	–	7	–
Air	–			–
Fighters		60	180	
Bombers		–	–	
MPA		12	12	
Surface Ships	–			–
Major Combatants		0	8	
Minor Combatants		0	30	
Submarines	–	1	2	–
Casualties	–	217	4,411	–

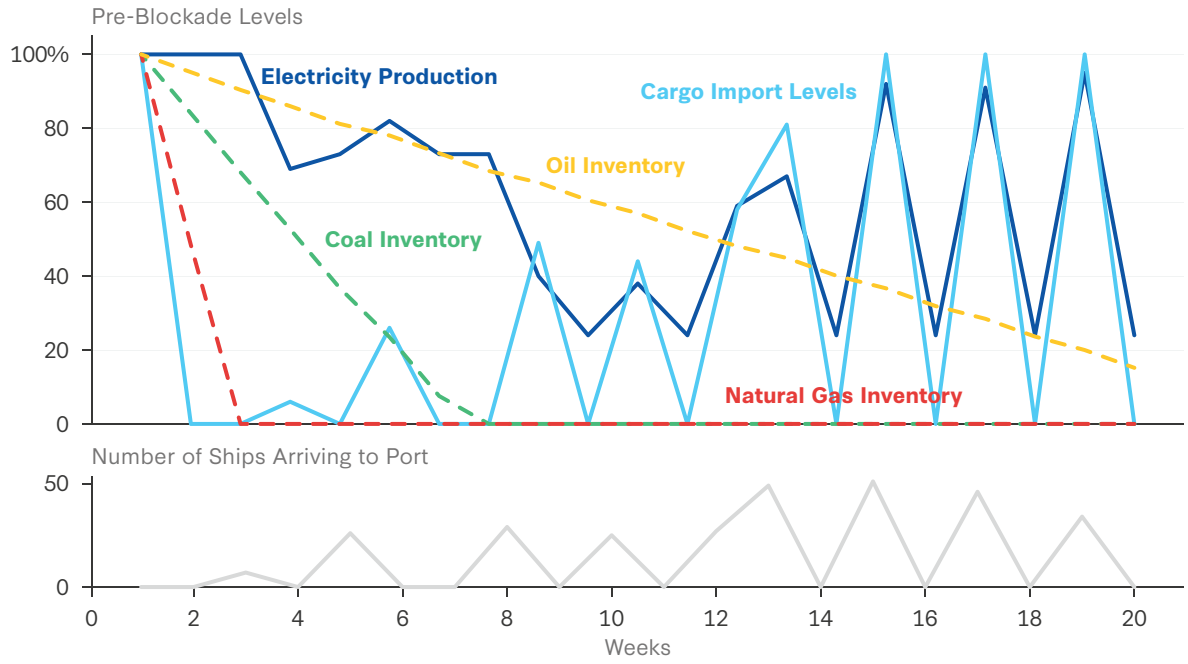
Source: CSIS Defense and Security Department.

DYAD: CHINA OFFSHORE KINETIC VS. U.S. CONSTRAINED (3X3)

This dyad pitted China's military forces against U.S. and Taiwanese military forces, with all sides limited to operations in the international waters of the exclusion zone. This "cage fight" produced intense convoy battles. In these convoy battles, the United States and Taiwan kept the island supplied using an increasing number of merchant ships, which became available from the fourth week of conflict. The United States and Taiwan suffered heavy losses in warships and merchants, while China, unable to attack U.S. aircraft at their bases, lost much of its air force in air-to-air combat.

In this dyad, overt fighting between the United States and China would create great escalatory pressures on both sides. On the U.S. side, high casualties would incentivize attacks on Chinese assets outside of the exclusion zone, especially command and control and assets capable of launching missiles, including via aircraft, ships, and transporter erector launchers. For China, U.S. aircraft in Japan would present a lucrative target that, if attacked, would make the blockade much more feasible, albeit at the risk of widening the war. Overall, escalation pressures might weigh more heavily on the United States, as remaining within this dyad enables China to control the pace of

Figure 5.11: Economic Impacts (3x2) Base



Source: CSIS Defense and Security Department.

fighting. This would be particularly true during the first month of conflict, when China's long-range missile magazines are deepest and Chinese missile launchers could operate entirely from sanctuary.

Iteration 10: China Offshore Kinetic vs. U.S. Constrained (3x3) Base

In the 3x3 Base case, the United States' situational disadvantage at sea was somewhat offset by advantages in the air.

As a result of operating in sanctuary for most of the game, the PLA lost only 6 major ships and 18 corvettes. U.S. warships were forced to run the gauntlet to protect convoys, and China put 25 U.S. warships out of action, either sunk or a constructive total loss (CTL).

With the United States enjoying an advantage in advanced fighter aircraft and not subject to attack on its bases, U.S. air forces destroyed 684 PLA fighter aircraft over the course of the conflict while losing 206 of its own. The Chinese submarine force inflicted substantial damage on merchants and escorting warships. But to get to operational areas, Chinese submarines had to transit 400 km from China's coast and were subject to interception and attack by U.S. submarines, convoy escorts, and, in areas close to Taiwan and Japan, MPAs. By the end of 20 weeks, all of China's 40 operational submarines were destroyed, while only 4 U.S. submarines were sunk. Both sides lost a portion of their MPAs.

China inflicted significant losses on convoys, particularly during the early stages of conflict. Overall, 11 percent of the 1,884 merchant ships that departed for Taiwan over the course of 20 weeks were destroyed (sunk or CTL). Losses were particularly heavy at the outset, with the first convoy losing all of its 5 ships and the second losing 8 of its 31 ships (26 percent).

Table 5.11: Results Summary (3x3) Base

	Taiwan's Condition	
	Electricity Production (% of Demand)	Import Level (% of Demand)
End of Game	100%	100%
Worst Week	35%	0%

	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	862	–	780	–

	Losses by Country			
Merchant Ships	106	–	96	–
Air				
Fighters	206	684	72	–
Bombers	0	0	–	
MPA	36	12	–	
Surface Ships				
Major Combatants	25	6	6	–
Minor Combatants	0	18	13	
Submarines	4	40	0	–
Casualties	3,090	3,147	1,039	–

Source: CSIS Defense and Security Department.

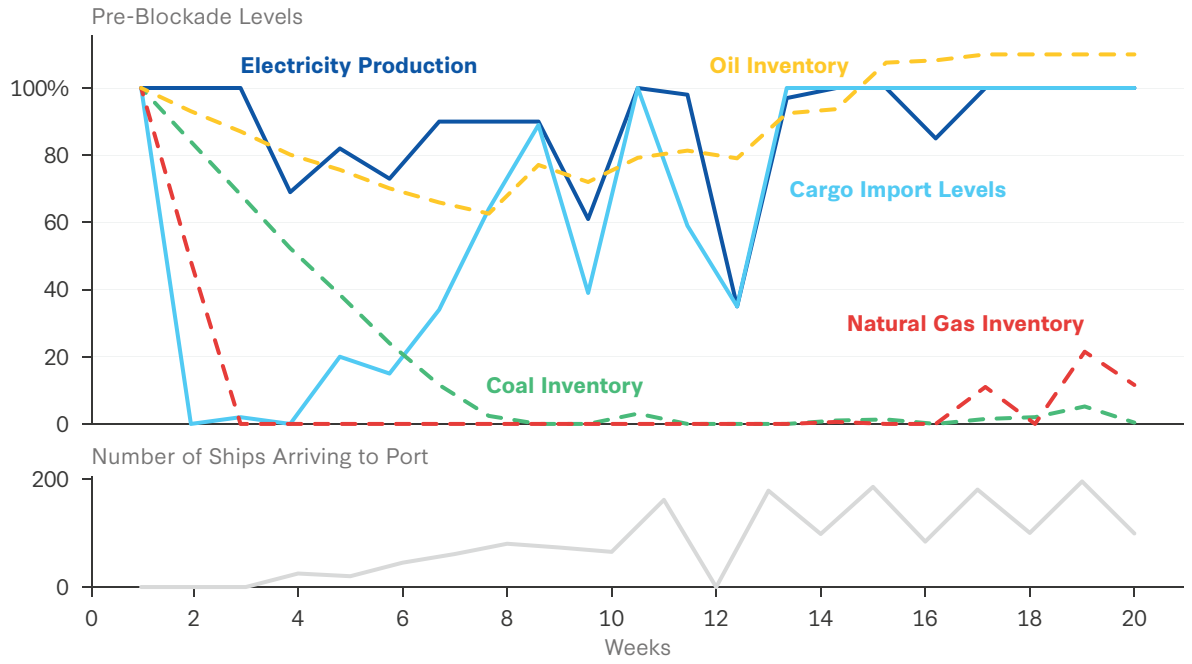
U.S.-escorted convoys delivered sufficient supplies to sustain electrical production at 100 percent of demand for more than half of the 20-week game. Although shipments were relatively inconsistent, the operation of private generators, nuclear power, and renewable sources offset limited inventories during the weeks when convoys were not sent. By week 13, Taiwan's economy was operating at pre-blockade levels.

Iteration 11: China Offshore Kinetic vs. U.S. Constrained (3x3) Prepared

The 3x3 Prepared variant showed the value of whole-of-government preparation. The increased number of cargo ships—which are relatively resilient to attack compared to warships—created a major challenge for China. The greater number of ships in convoys, despite suffering heavy losses, was enough to overwhelm the capabilities of a Chinese military that sought to husband its forces in an effort to sustain attacks over a period of months.

With more ships available early in the conflict, significantly more convoys were run in this case than in the 3x3 Base (38 convoys compared to 19 convoys over 20 weeks). The number of successful merchant transits was 61 percent higher. Military losses were broadly comparable. China lost 900 fighter aircraft in this scenario (32 percent more than in the 3x3 Base), as well as 48 bombers, in

Figure 5.12: Economic Impacts (3x3) Base



Source: CSIS Defense and Security Department.

opposing roughly two convoys a week. The United States lost three more ships in this scenario than in the 3x3 Base, in part because it did not elect to employ Taiwanese escorts (a game decision).

The blockade barely affects the major metrics of Taiwan's economy and society. Inventories cover the first three weeks when shipping is disrupted. After that, arrivals keep electricity production and imports at 100 percent. Energy inventories are healthy.

Iteration 12: China Offshore Kinetic vs. U.S. Constrained (3x3) Japan Out

In the 3x3 Japan Out scenario, Japanese political decisions precluded the use of Japanese bases for combat operations and ports for transshipment, though it continued to allow the use of bases for support operations. In this scenario, transshipment occurred in Guam and Australia, which are much farther from Taiwan than the Japanese home islands. Because transshipment would also be slower, given both the greater distances and the more limited port capacity of those alternative ports, each transit took twice as long as those in the other 3x3 cases.

Militarily, the United States was forced to rely on carrier-based aircraft for tactical airpower, since Air Force tactical aircraft flown from Guam or other locations had almost no loiter time around Taiwan, even if they were provided with copious aerial refueling. The ability to fly support missions from Japan was critical, though the scenario would place significant additional strain on many aspects of the force. Only a subset of U.S. Air Force tanker aircraft can be fitted with the centerline or wing-mounted drogue systems necessary to refuel naval aircraft, and those that can do so offload fuel at a rate that is roughly half of their normal rate. MPA aircraft, flying armed combat missions against Chinese submarines, had to transit from Guam.

Table 5.12: Results Summary (3x3) Prepared

	Taiwan's Condition	
	Electricity Production (% of Demand)	Import Level (% of Demand)
End of Game	100%	100%
Worst Week	94%	83%

	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	458	–	2,337	–

	Losses by Country			
Merchant Ships	36	–	181	–
Air				
Fighters	312	900	96	–
Bombers	0	48	–	
MPA	6	18	–	
Surface Ships				
Major Combatants	28	5	8	–
Minor Combatants	0	14	20	
Submarines	5	45	–	–
Casualties	2,479	3,638	1,657	–

Source: CSIS Defense and Security Department.

The incentives for Chinese escalation were arguably higher in this scenario than in the 3x3 Base scenario, since Japan's absence forced the United States to rely on a much smaller set of critical nodes that represented tempting targets.

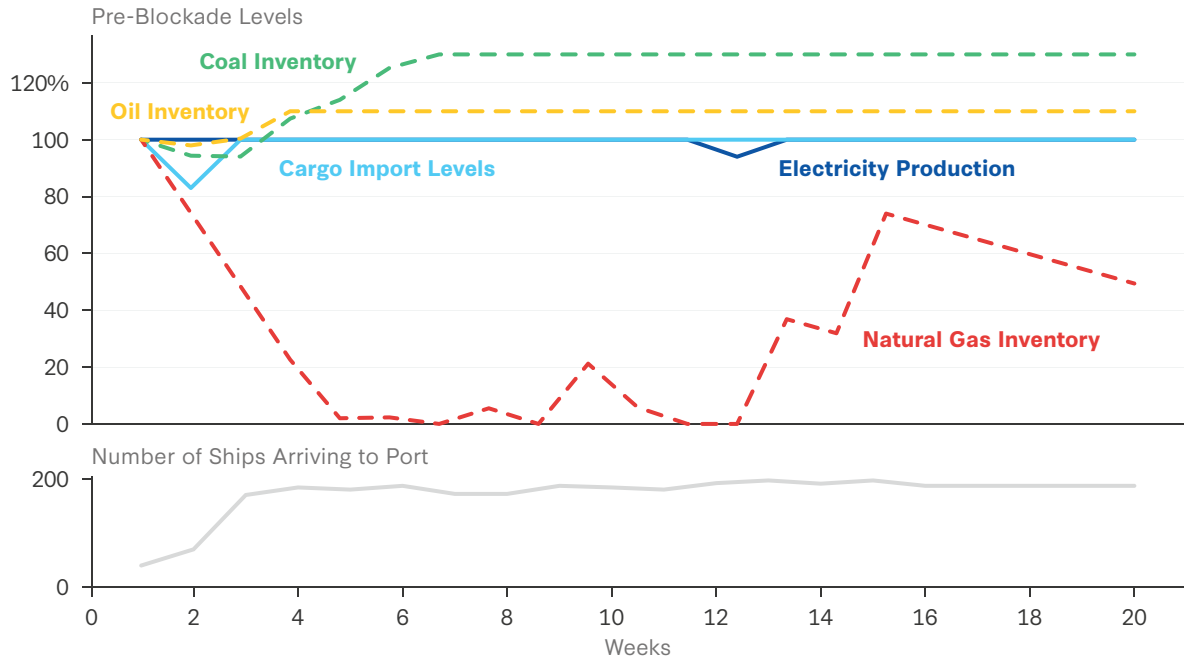
Overall, losses to all the combatants were comparable to the Base case. The number of merchant ships lost was slightly higher than in the 3x3 Base scenario, while the number of successful merchant transits was 32 percent lower.

Compared with the base case, imports were roughly the same level, reflecting the coalition's ability to gather many ships. However, electricity production was much lower, reflecting the difficulty in finding enough LNG tankers to fill the longer pipeline. Natural gas and coal declined as in the Base case. Oil inventories declined in this variant, whereas they increased in the Base case. However, oil inventories never reached zero, so Taiwan's economy still operated.

Iteration 13: China Offshore Kinetic vs. U.S. Constrained (3x3) Enhanced Chinese Missiles

More effective Chinese missiles increased attrition to inbound merchants while reducing Chinese casualties. This variant assumed that Chinese missiles are highly effective in finding and targeting escorting warships within the larger convoy, that China is better able to coordinate its missile

Figure 5.13: Economic Impacts (3x3) Prepared



Source: CSIS Defense and Security Department.

brigades and other forces to launch larger salvos, and that its ISR and command and control is effective and flexible enough to tailor weapons employments to changing circumstances in near-real time. After the first such attack, the U.S. team assigned larger escort formations to convoys.

Compared with the Base case, this variant saw increased U.S. and Taiwanese military losses and reduced the flow of merchants to Taiwan. Overall, the number of Taiwan-bound ships destroyed (sunk and CTL) increased by 51 percent, from 202 ships in the Base case to 306 in this variant. Of the 1,361 ships that set out for Taiwan in this variant, 80 percent made it to port, of which 4 percent were CTL. These increased Chinese capabilities also reduced Chinese military losses to about half as much as in the Base case.

The effects on imports are similar to those in the Base case. Imports plummeted initially but began to recover as the coalition's larger merchant fleet came online and China ran low on missiles and submarines. By about week 12, Taiwan had regained pre-blockade import levels.

Electricity production was much worse than in the Base case. Base case electricity production averaged about 80 percent for the first 13 weeks and then returned to 100 percent. In this iteration, electricity production sank to 70 percent from week 3 to week 5 and then sank further to 60 percent in week 7 when coal inventories ran out. It stayed at that level or a little above through the 20-week period.

Table 5.13: Results Summary (3x3) Japan Out

	Taiwan's Condition	
	Electricity Production (% of Demand)	Import Level (% of Demand)
End of Game	98%	100%
Worst Week	39%	0%

	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	623	–	563	–

	Losses by Country			
Merchant Ships	113	–	563	–
Air				
Fighters	206	432	140	–
Bombers	0	0	–	
MPA	18	24	–	
Surface Ships				
Major Combatants	27	20	6	–
Minor Combatants	0	27	16	
Submarines	3	45	–	–
Casualties	2,813	3,423	1,207	–

Source: CSIS Defense and Security Department.

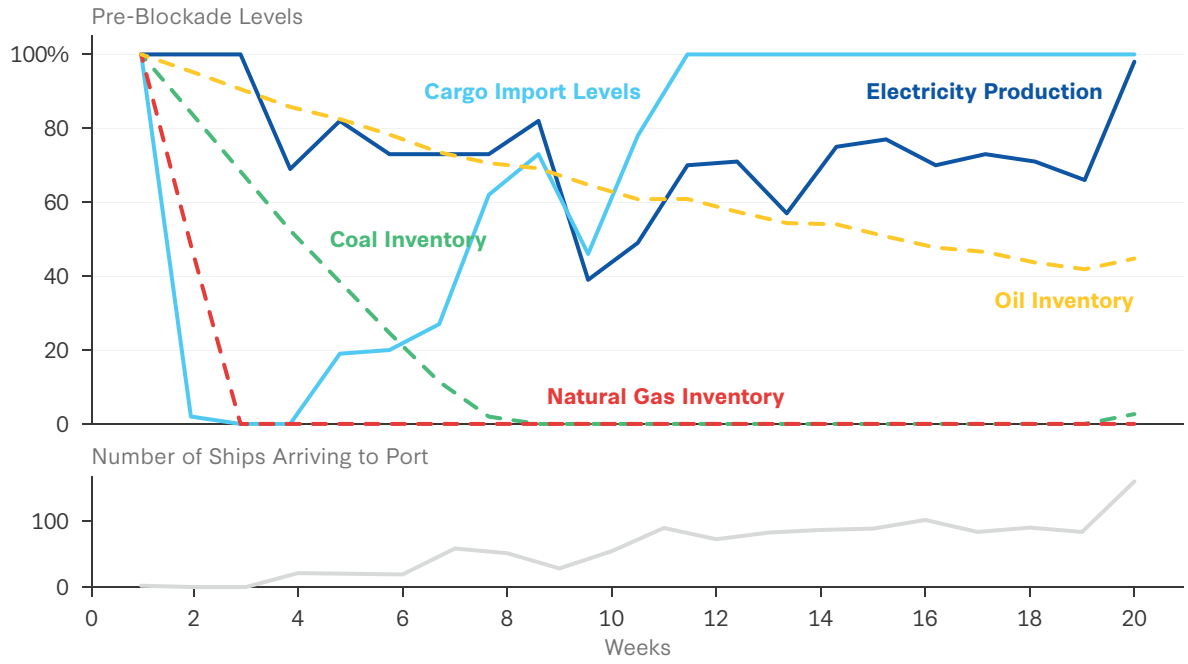
DYAD: CHINA OFFSHORE KINETIC VS. U.S. WIDER WAR (3X4)

This dyad featured Chinese forces confined to the exclusion zone against unconstrained U.S. forces. China was limited to offshore attacks in the exclusion zone, while the United States was less constrained and fought according to a "Wider War" escalation level that allowed attacks on ports and airports in China's coastal regions. An important corollary of China's lower escalation level was that Japan's Self Defense Forces did not themselves participate in combat operations even though Japan allowed use of U.S. bases and transshipment points for military and merchant operations.

The results of this scenario show that it would be difficult if not impossible for China to operate successfully without striking bases in Japan in the event that the United States did not show similar restraint against bases in China. From the outset, U.S. bombers could operate from within the region, greatly increasing their sortie rate. With coastal air bases under threat from JASSM-ER salvos, China was forced to keep its aircraft relatively dispersed, with only a modest screen along the coast. U.S. tactical aircraft were then able to achieve air superiority progressively closer to China's coast (and, ultimately, over coastal areas).

U.S. air and submarine forces focused initially on attacking Chinese warships, which remained at sea continuously (apart from reprovisioning). Despite the efforts of the PLA Air Force and

Figure 5.14: Economic Impacts (3x3) Japan Out



Source: CSIS Defense and Security Department.

submarine force to protect those ships, the PLAN was effectively destroyed within the first five weeks of war.

With relatively few LRASMs in the inventory, U.S. aircraft were forced to employ shorter-range weapons against ships at sea, and Chinese aircraft and shipboard surface-to-air missiles claimed about 150 U.S. aircraft, including 12 bombers, during this phase of the conflict. Having destroyed China's navy, U.S. surface ships, submarines, and aircraft systematically attacked Chinese air bases along the coast using the more numerous land-attack missiles, reattacking whenever additional aircraft were flown into coastal bases.

This scenario would create high escalatory pressures for China. China would have to either acknowledge failure (which would be more palatable if offered a face-saving off-ramp), or escalate, perhaps striking Guam or U.S. bases in Japan.

Iteration 14: China Offshore Kinetic vs. U.S. Wider War (3x4) Base

With Chinese military forces under siege and U.S. forces able to operate in larger numbers, Chinese attacks on merchant convoys were less successful than in most other scenarios. The worst convoy losses occurred early. Of the 17 merchant ships in the first convoy, 13 were destroyed (sunk or CTL). From the fourth to the tenth convoys (weeks 7 to 13), none suffered more than 7 percent losses. No losses occurred after week 13, when all Chinese threats to shipping were effectively neutralized. Of the 2,603 merchant ship sorties that set out for Taiwan during the entire 20-week period, a total of 89 were destroyed (sunk or CTL)—a 3.4 percent loss rate.

Table 5.14: Results Summary (3x3) Enhanced Chinese Missiles

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	65%		100%	
Worst Week	57%		0%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	544	–	492	–
	Losses by Country			
Merchant Ships	161	–	145	–
Air				
Fighters	98	540	132	–
Bombers	–	–	–	
MPA	6	12	–	
Surface Ships				
Major Combatants	45	24	5	–
Minor Combatants	–	36	14	
Submarines	8	20	2	–
Casualties	4,324	2,673	1,363	–

Source: CSIS Defense and Security Department.

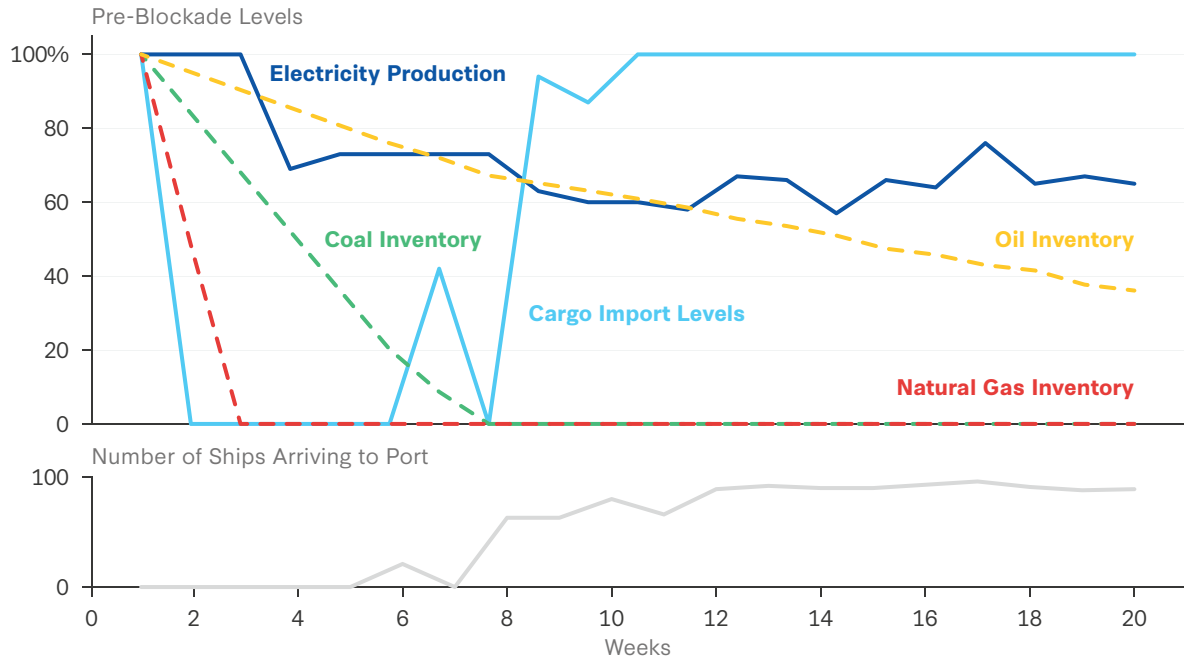
Not surprisingly given the coalition's stronger position, this iteration was better for Taiwan than the 3x3 Base. Imports regained 100 percent in week 7 during this variant (compared to week 13 in 3x3 Base). Electricity production regained 100 percent and stayed there in week 9 (compared to week 13). Taiwan was able to rebuild its energy inventories to about 80 percent by week 20. This put Taiwan in a strong position if the blockade were to continue.

DYAD: CHINA WIDER WAR VS. TAIWAN ASSERTIVE (4X2)

This dyad pitted unconstrained Chinese forces against Taiwanese forces that could operate in the exclusion zone and escort convoys, but without assistance from the United States. China had the option of bombarding Taiwan itself.

This is not a viable scenario for Taiwan. China did not even have to resort to direct attacks against Taiwan's civilian infrastructure, judging that the imbalance of forces allowed it to achieve its objectives without such a step. The obvious imbalance and detrimental effects of U.S. inactivity would put much pressure on the United States to either intervene or accept Taiwan's acquiescence to Chinese demands.

Figure 5.15: Economic Impacts (3x3) Enhanced Chinese Missiles



Source: CSIS Defense and Security Department.

Iteration 15: China Wider War vs. Taiwan Assertive (4x2) Base

The results of this iteration were devastating for Taiwan. More than half of its aircraft and warships were destroyed at their bases in the first days of conflict, while the rest were mopped up in the ensuing two weeks. Merchant shipping was then at the mercy of Chinese warships and submarines that pushed well to the east of Taiwan. The United States would face a decision whether to allow this international "bully" to devastate its coalition partner or step in to stabilize the situation.

Convoys were sent in week 2 and week 4. Both were unsuccessful in getting a single ship to Taiwan, after which the effort was abandoned. Due to the unbalanced escalation levels, Taiwan suffered disproportionate losses as the PRC destroyed many Taiwanese ships and aircrafts.

Since the convoys were unsuccessful in reaching Taiwan, natural gas inventories fell to zero quickly and Taiwan's coal inventories ran out at week 6. Nevertheless, Taiwan was able to continue producing some electricity because China opted not to attack Taiwan's electrical system (despite having the option to do so). Therefore, at week 8, Taiwan's energy production stabilized at 24 percent of the demand–a level barely able to sustain emergency services–and remained at this level of output for the remainder of the iteration.

DYAD: CHINA WIDER WAR VS. U.S. CONSTRAINED (4X3)

This dyad pitted unconstrained Chinese forces against U.S. forces constrained to operations inside the exclusion zone. China had the option of bombarding Taiwan itself.

Table 5.15: Results Summary (3x4) Base

	Taiwan's Condition	
	Electricity Production (% of Demand)	Import Level (% of Demand)
End of Game	100%	100%
Worst Week	69%	0%

	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	1,282	–	1,159	–

	Losses by Country			
Merchant Ships	47	–	42	–
Air				
Fighters	372	1,056	96	–
Bombers	12	60	–	
MPA	6	24	–	
Surface Ships				
Major Combatants	12 + 1 Carrier	92	8	–
Minor Combatants	–	58	19	
Submarines	9	40	1	–
Casualties	4,295	7,091	1,060	–

Source: CSIS Defense and Security Department.

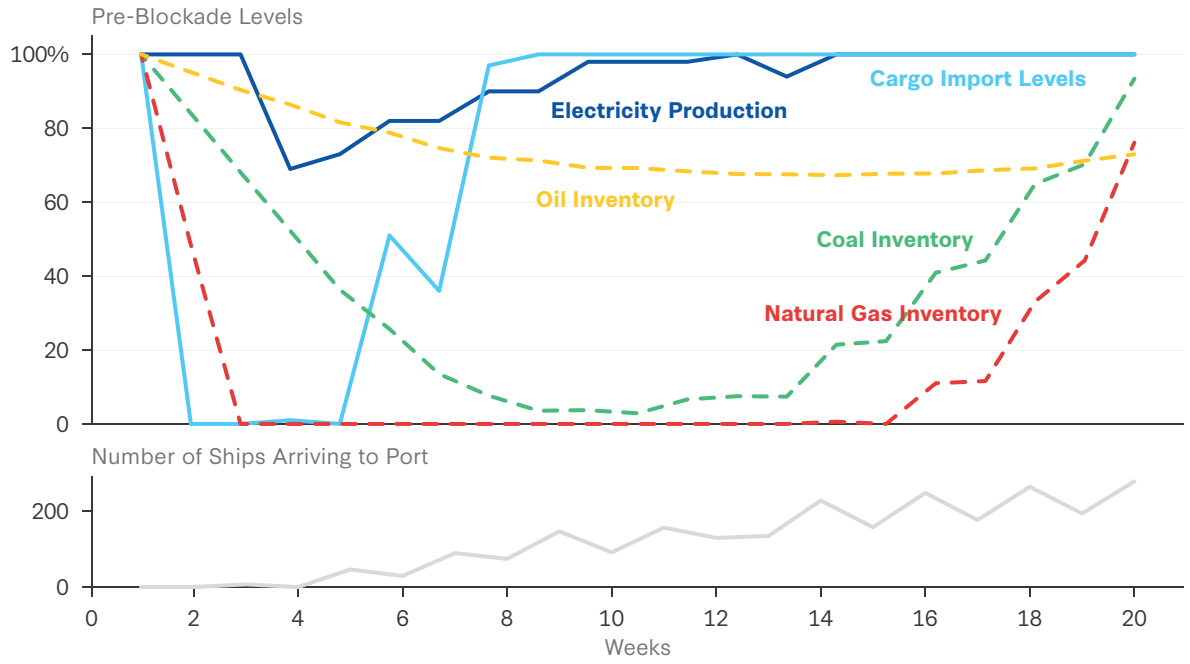
Chinese strikes on Taiwan's electrical system were devastating, driving electricity production levels below what was experienced in other iterations. The United States suffered heavy losses, including two aircraft carriers.

This scenario would be a shock to the U.S. public and likely engender demands for escalation. This would especially be the case since the United States could not strike many of its Chinese attackers because it was limited to operations in the exclusion zone.

Iteration 16: China Wider War vs. U.S. Constrained (4x3) Base

From a military perspective, the escalation level neutralized U.S. land-attack capabilities, which are useful in other scenarios for attacking air bases, ports, ISR, and other assets on the mainland. Two consequences followed. First, Chinese air forces were able to crowd into forward coastal air bases without risk of being hit by air strikes. This increased the concentration and range of Chinese airpower. Second, the escalation level greatly improved the survivability of Chinese warships and submarines, which took shelter as needed in ports or other areas immediately offshore.

Figure 5.16: Economic Impacts (3x4) Base



Source: CSIS Defense and Security Department.

To compensate, the United States delayed the first convoy from week 3 to week 4, thereby allowing more forces to arrive in theater before risking the passage. More importantly, it relied on carrier-based airpower far more than in other scenarios.

As in all games in which the Chinese escalation level allowed it to hit air bases in Japan, Guam, and Taiwan, such attacks destroyed large numbers of U.S. aircraft on the ground. Moreover, China's own air force was able to inflict punishment on convoys and maintain or contest air superiority in the areas around Taiwan for the first seven weeks of conflict. Ultimately, the U.S. strategy of spreading risk and employing carriers paid dividends, and the United States was able to equalize and, finally, win the air-to-air fight.

But unlike the course of other high-end conflict scenarios, China was able to conduct attacks against every convoy through to week 20, though for several weeks at the end, its attacks were entirely conducted by submarines.

Apart from suffering heavy military casualties, including 33 surface combatants and two U.S. aircraft carriers destroyed, the United States and Taiwan had more difficulty moving materiel to Taiwan in this scenario. The total number of merchant ship sorties that reached Taiwan in this iteration, 1,584, was 9 percent smaller than the total that reached Taiwan in the 4x4 Base. The 153 merchant ships that were destroyed (sunk or CTL) were some 56 percent greater than the 4x4 Base scenario. These numbers do not include more lightly damaged ships.

Table 5.16: Results Summary (4x2) Base

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	24%		0%	
Worst Week	24%		0%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	–	–	0	–
	Losses by Country			
Merchant Ships	47	–	42	–
Air				
Fighters	–	36	120	–
Bombers		42	–	
MPA		–	12	
Surface Ships				
Major Combatants	–	–	8	–
Minor Combatants			18	
Submarines	–	1	3	–
Casualties	–	255	2,913	–

Source: CSIS Defense and Security Department.

Cargo imports returned to pre-blockade levels at week 11 and stayed there until the end of the iteration. Conversely, because of China's continuing attacks on the electrical system, electricity levels fell to zero in week 5 and did not rise above 10 percent of pre-blockade levels for the remainder of the game. This low level of electricity production–a result of China's attacks on Taiwan's energy infrastructure–meant not just economic collapse but also the failure to meet even minimal health and safety activities for the population.

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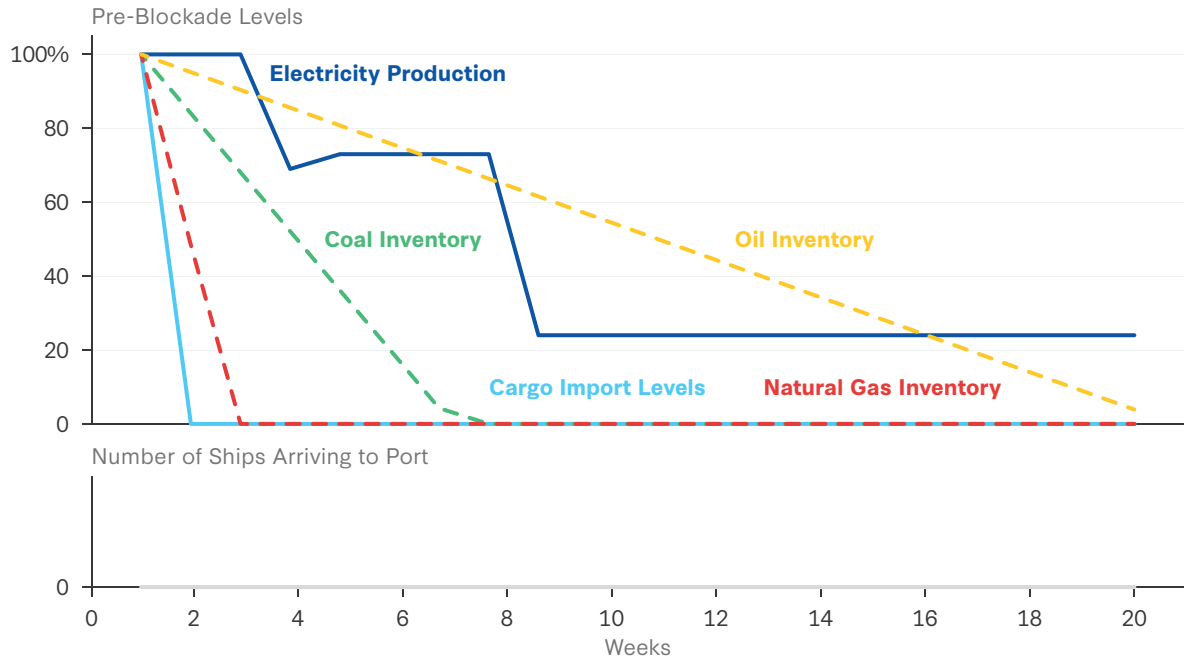
Figure 5.17: Economic Impacts (4x2) Base



Source: CSIS Defense and Security Department.

Iteration 17: China Wider War vs. U.S. Constrained (4x3) Hardened

In this iteration, China again attacked Taiwan's electrical system. When that happened in the Base case, the effects were devastating. This iteration, therefore, explored the value of hardening the electrical system. The Hardened case assumed that each ton of Chinese munitions did half as much damage as in the Base case and that Taiwan could repair damage at twice the rate of the Base case. As a result, electricity production was far higher. In the Base case, electricity production was zero in both the worst week and week 20. In this Hardened case, the worst week was 47 percent and week 20 was 100 percent.[10]

Outside of this bombardment and its effect on electricity production, the Hardened case was identical to the Base case, with the same ship losses, aircraft losses, personnel casualties, ship arrivals, and imports because nothing changed in terms of warfighting parameters. Thus, this iteration does not have a separate results summary table.

Instead, this iteration has Figure 5.19, which contrasts electricity production in the Hardened versus unhardened (Base) cases. In the Hardened case, electricity production dipped initially, as in the unhardened Base case, but recovered over time. The unhardened case did not have enough

10 These factors came from historical air attacks as described in Appendix H, "Calculating the Effects of Chinese attacks on Taiwan's Energy System." However, similar effects might be achieved by cyber and special forces attacks. The profile of those attacks would likely be different, heavy in the early few weeks but tapering off as the capabilities were used up. For analysis of a possible cyber attack on Taiwan's electrical system, see son Vogt and Nina Poznansky, *Taiwan Digital Blockade Wargame Report*, Cyber and Innovation Policy Institute, Naval War College, October 10, 2024.

Table 5.17: Results Summary (4x3) Base

	Taiwan's Condition	
	Electricity Production (% of Demand)	Import Level (% of Demand)
End of Game	0%	100%
Worst Week	0%	0%

	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	832	–	753	–
	Losses by Country			
Merchant Ships	80	–	73	–
Air				
Fighters	900	1,068	216	216
Bombers	0	276	–	0
MPA	168	24	–	24
Surface Ships				
Major Combatants	27 + 2 Carriers	13	10	–
Minor Combatants	1	36	17	
Submarines	4	38	3	2
Casualties	18,785	4,284	7,666	4,138

Source: CSIS Defense and Security Department.

recovery capability to get ahead of China's continuing attacks. Whereas the average level in the Base case was about 10 percent, it was about 75 percent in the Hardened case.

The bottom line is that hardening the electrical system makes a huge difference. Even if the assumptions of this analysis are overly optimistic about what hardening can accomplish, the effort is worthwhile.

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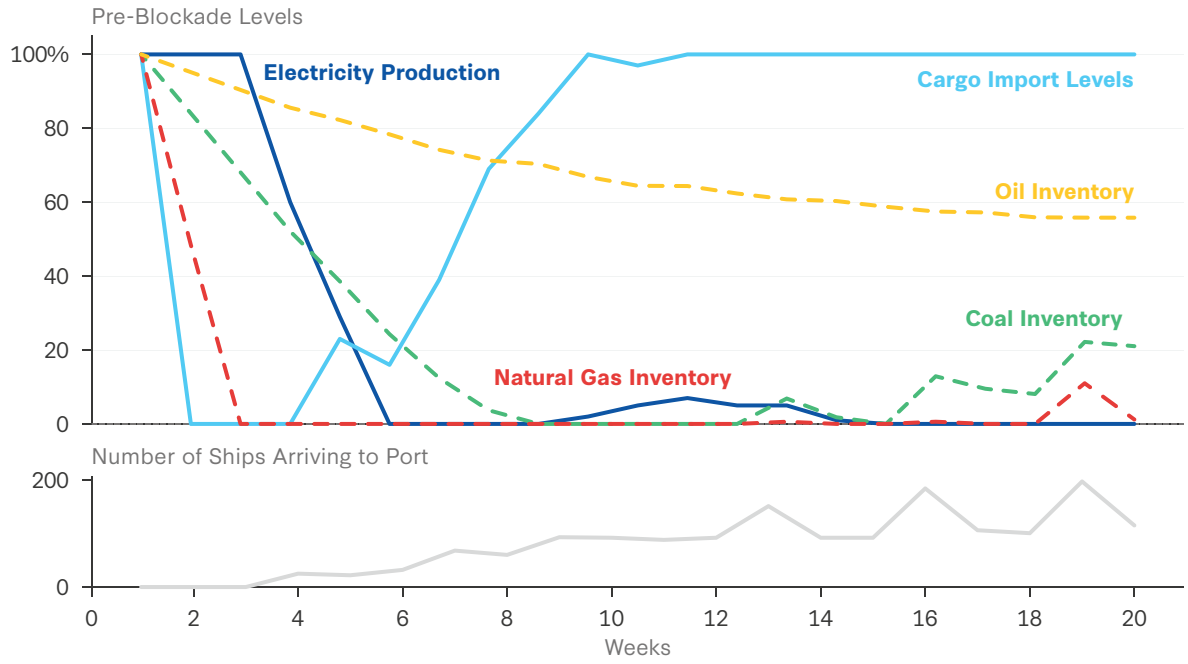
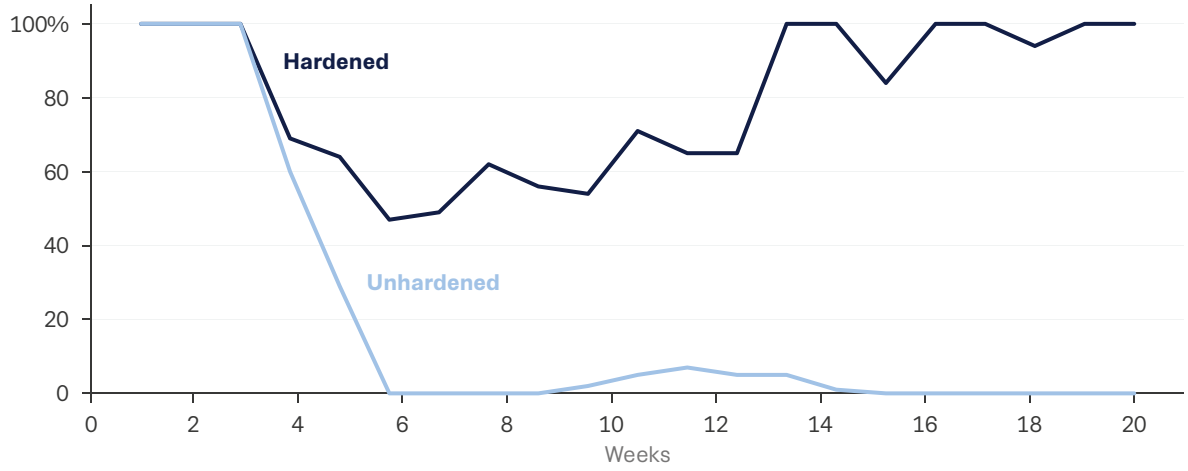
Figure 5.18: Economic Impacts (4x3) Base



Source: CSIS Defense and Security Department.

Figure 5.19: Electricity Production Impacts (4x3) Hardened vs. Unhardened



Source: CSIS Defense and Security Department.

DYAD: CHINA WIDER WAR VS. U.S. WIDER WAR (4X4)

In this dyad, both sides used all their conventional forces without constraints on geography or targets.

There were two elements to this campaign: (1) a series of convoy battles that resembled those of previous scenarios, and (2) a larger conflict in which both sides sought to destroy the relevant military assets of the other. The convoy battle inevitably put U.S. ships at risk long before the

antiship threat was neutralized, but it also divided Chinese attention and resources. Sinking merchant ships required large salvos of missiles that might, in a high-level conflict like this, be allocated instead against U.S. warships. In this dyad, both sides' ability to attack air bases proved important in forcing the other side to maintain a modicum of dispersion in depth, thereby limiting the potential of tactical airpower.

Since this represented the top of the conventional escalation ladder, there were few further steps to take. One side might implement a strategy that looked like regime change, for example, by attacking the adversary's leadership. Otherwise, the next escalation step would be to the nuclear realm, which involves an entirely different set of considerations. For this project's purposes, the scenario was run for 20 weeks at high intensity, though one or both combatants would likely move to a *guerre de course* (by, for example, rationing attacks to continue operations beyond 20 weeks) or exit the conflict prior to that time.

As the lower-level scenarios illustrate, there are strong military and political incentives for either conflict resolution or escalation toward wider war. Thus, the full-war scenario is highly likely if off-ramps are not found sooner in the escalation process. From an operational perspective, the U.S. military might prefer this scenario to a limited convoy battle, as it would give U.S. planners more control over events and an ability to strike back freely instead of simply sending ships through a shooting gallery. This Wider War scenario demonstrated a plausible path to U.S. success (defined as keeping Taiwan supplied at a relatively high level) and the destruction of China's air and naval capability. However, Taiwan's position was often precarious for the first 5 to 10 weeks, and success came with high losses that U.S. political leaders would need to accept as they continued operations to the point of final success.

Iteration 18: China Wider War vs. U.S. Wider War (4x4) Base

Overall, China was less effective in sinking merchant ships when it was forced to engage in a broader war. The first convoy, sent in week 3, suffered losses of 53 percent (sunk and CTL). The following six convoys, sent between weeks 5 and 10, suffered 24 percent losses on average, while subsequent convoys were effectively unmolested. Overall, merchant ships suffered losses of 5 percent (sunk and CTL) of the 1,808 ships that departed for Taiwan, a loss rate that was half that suffered in the 3x3 Base case (limited war convoy battle).

The improvement in merchant fortunes came at the cost of a much wider and more destructive war in which military losses on both sides were high. For the first weeks of the conflict, China's land-attack missiles deterred the U.S. command from bringing large numbers of aircraft to Japan. China subsequently launched periodic attacks on those bases until its inventory of long-range munitions was exhausted. Following China's use of long-range antiship missiles (particularly the DF-26B) to sink a U.S. carrier early in the conflict, the U.S. Navy decided against bringing additional full-sized carriers into striking distance for the remainder of the game. Instead, the U.S. team restricted sea-based airpower to two "lightning carriers" (America-class amphibious assault ships loaded with aircraft instead of infantry), which the United States may regard as more expendable.

Table 5.18: Results Summary (4x4) Base

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	68%		100%	
Worst Week	14%		13%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	858	–	777	–
	Losses by Country			
Merchant Ships	49	–	45	–
Air				
Fighters	558	936	192	126
Bombers	12	78	0	0
MPA	90	24	0	36
Surface Ships				
Major Combatants	27 + 1 Carrier	85	10	14
Minor Combatants	0	45	17	0
Submarines	3	40	3	–
Casualties	13,306	13,675	7,666	2,717

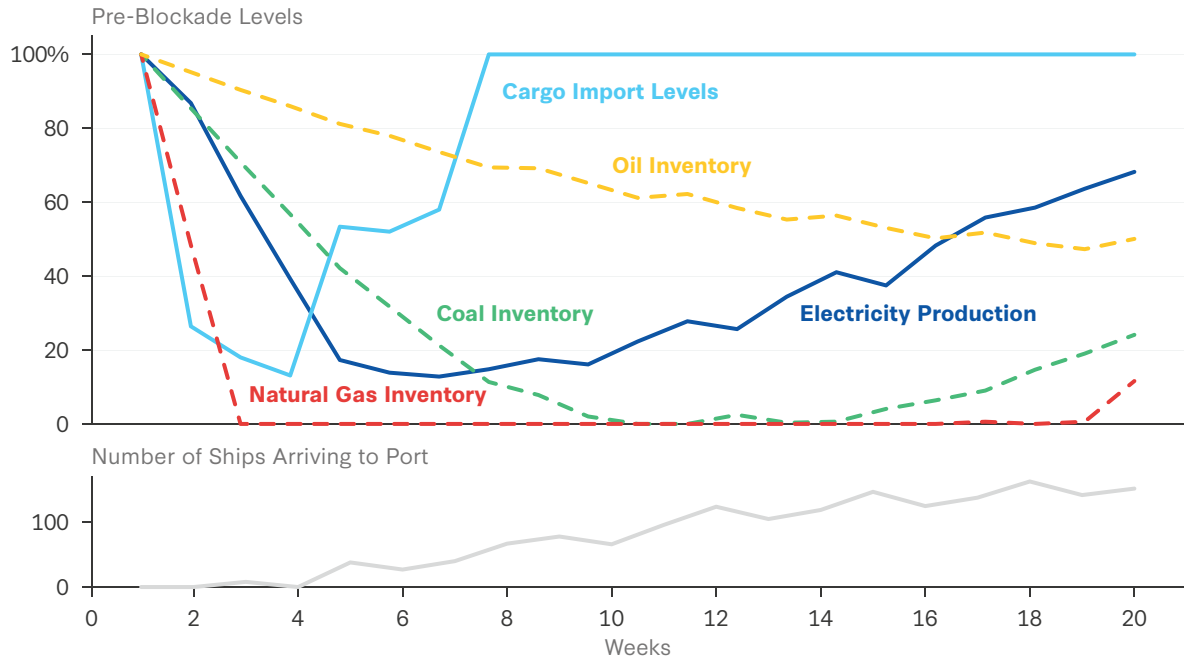
Source: CSIS Defense and Security Department.

U.S. submarines and ASCM-equipped aircraft kept Chinese surface ships largely bottled up in port, where they served as floating missile batteries but were vulnerable to U.S. land-attack fires. The rate of attrition against the Chinese surface fleet in port was steady but slower than it would have been had they remained at sea and vulnerable to submarines and coalition ASCMs. U.S. submarines were themselves at risk until China's nascent fleet of MPAs was destroyed by missile attack on their bases.

Throughout the course of the conflict, U.S. bombers launched large salvos of long-range missiles (e.g., JASSM-ERs and JASSMs), and warships and submarines fired salvos of Tomahawks to gradually attrit Chinese ISR, airpower, air defenses, and ships in port. China responded with antiship missiles against the SAGs. Like the Chinese threat to U.S. air bases, however, this was an uneven battle. With Chinese ships pinned in port, the number of Chinese antiship missiles that could range U.S. SAGs beyond 1,000 km was far smaller than the number of land-attack missiles that the U.S. Navy and Air Force could employ against ports and air bases. Both sides conducted strikes with tactical airpower, with China more active during the early stages and the United States becoming dominant later in the conflict.

As in other higher-end scenarios, a United States that was willing to sustain heavy losses translated into relatively stable deliveries to Taiwan. After the opening month of fighting, and especially

Figure 5.20: Economic Impacts (4x4) Base



Source: CSIS Defense and Security Department.

once China began to exhaust its long-range munitions, deliveries of cargo and key energy supplies returned to pre-blockade levels.

However, the problem now was that Chinese bombardment of Taiwanese energy infrastructure limited Taiwanese recovery. Despite sufficient energy inventories, Taiwan's energy production had not recovered even by the end of the 20 weeks.

Iteration 19: China Wider War vs. U.S. Wider War (4x4) Prepared

The 4x4 Wider War Prepared variant explored the potential impact of U.S. and Taiwanese peacetime preparations, including the ability to quickly assemble a large group of merchant ships for convoy operations in the event of conflict. Not surprisingly, this produced a major improvement in the amount of shipping that arrived safely in Taiwan. Although the impact was seen throughout the duration of the conflict, the most important gains were at the outset of conflict—during the initial weeks when very little shipping succeeded in reaching Taiwan in the 4x4 Base scenario. Whereas only one convoy ran during the first four weeks of the Base case (with 8 merchant ships reaching Taiwan), in the Prepared scenario, six convoys were run during the same period (with 389 merchant ships reaching Taiwan).

Of the 5,752 merchant ship sorties over the entire 20-week period, 171 were destroyed (sunk or CTL)—a loss rate of about 3 percent. The highest loss rate in any given week was 21 percent. While overall merchant losses were higher in absolute terms than in the Base case, the percentage lost was lower—and 2.6 times as many ships succeeded in making the passage.

Military losses for both sides were roughly comparable to those suffered under the 4x4 Base case. A generally more aggressive China team in this iteration led to slightly higher casualties on both sides.[11] As in the Base case, China's ability to strike U.S. air bases in Japan largely offset U.S. advantages in other areas, especially early in the conflict. The United States employed a wide variety of platforms and missiles to force China to disperse its aircraft in depth. As in the invasion scenario covered by the *First Battle* report, the U.S. shortage of long-range antiship missiles limited the attrition rate against China's fleet, but U.S. submarines and, eventually, airpower succeeded in blunting the PLAN's considerable ship-launched missile forces. The relatively large loss of U.S. submarines reflects their campaign against both Chinese surface ships and Chinese submarines. The additional supplies, particularly early in the war, would give authorities on Taiwan and in Washington far more leeway in decisionmaking.

Table 5.19: Results Summary (4x4) Prepared

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	77%		100%	
Worst Week	21%		100%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	755	–	3,847	–
	Losses by Country			
Merchant Ships	28	–	143	–
Air				
Fighters	552	1,092	228	240
Bombers	0	72	–	–
MPA	150	30	12	–
Surface Ships				
Major Combatants	19 + 1 Carrier	95	8	4
Minor Combatants	–	81	16	–
Submarines	7	42	2	–
Casualties	14,123	19,207	8,118	4,662

Note: The large number of arrivals provided large energy and import amounts. It also allowed spread loading of cargoes and some ships to act as decoys.

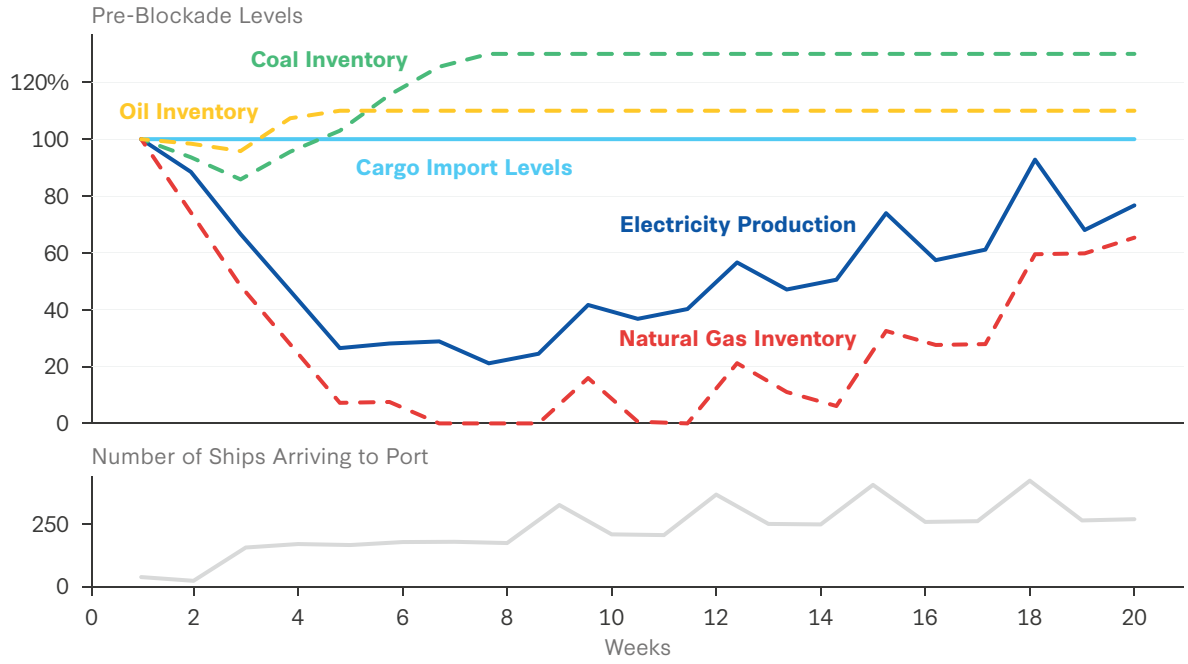
Source: CSIS Defense and Security Department.

11 Underscoring again the need to take these results—and all those wargames—not as predictive.

Throughout the iteration, U.S.-escorted convoys suffered losses week to week while traveling to Taiwan's ports; however, cargo levels dropped below pre-blockade demand only during week 2 and 3. Oil and coal inventories stayed above pre-blockade levels for most of the iteration. Natural gas inventories, alternatively, dropped to zero in the early weeks of the game and then rose to 200 percent of pre-blockade levels for the remainder of the game.

Again, the limiting factor for Taiwanese energy production was the status of energy infrastructure. Increasing energy deliveries resulted in healthy stockpiles that could not be used in an electrical grid degraded by bombing.

Figure 5.21: Economic Impacts (4x4) Prepared



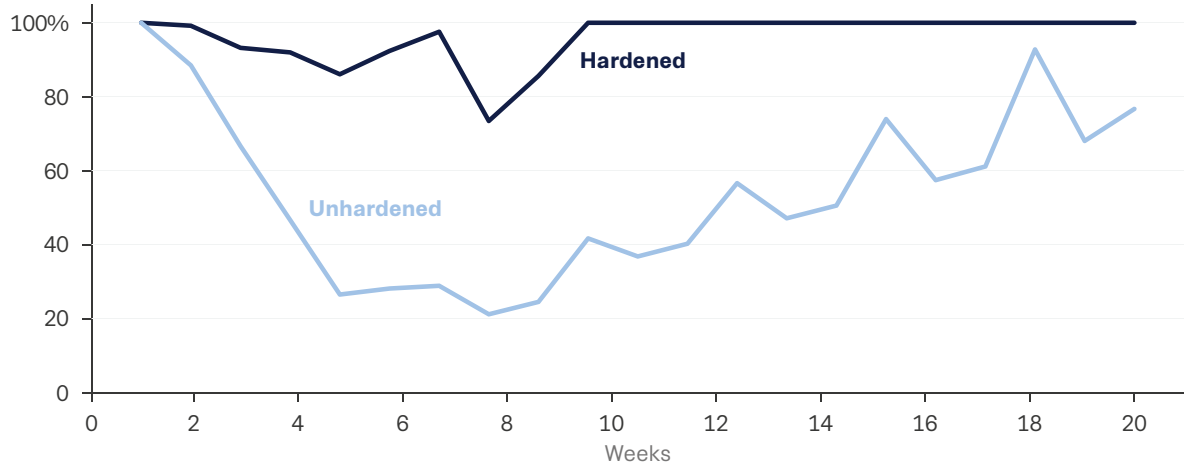
Source: CSIS Defense and Security Department.

Iteration 20: China Wider War vs. U.S. Wider War (4x4) Prepared + Hardened

The hardened electrical system produced a higher level of electricity production (worst week: 73 percent) than both the Base (worst week: 13 percent) and Prepared cases (worst week: 21 percent). Indeed, the electricity production level returned to pre-blockade levels, unlike any other iteration where China bombarded Taiwan's electrical system.

Figure 5.22 shows electricity production in a hardened (iteration 20) and unhardened (iteration 19) system. In this iteration, China's attacks on the electrical system were not as severe as in the 4x3 scenarios (iterations 16 and 17) So both hardened and unhardened could recover. However, the hardened system had returned to 100 percent by week 9. The unhardened system had only reached 78 percent by week 20.

Figure 5.22: Electricity Production Impacts (4x4) Prepared–Hardened vs. Unhardened



Source: CSIS Defense and Security Department.

Iteration 21: China Wider War vs. U.S. Wider War (4x4) Enhanced Chinese Missiles

A variant of the Wider War scenario is one in which Chinese antiship missile capabilities are better than in the Base case. Specifically, this variant assumed that Chinese missiles are highly effective in finding and targeting escorting warships within the larger convoy, that China is better able to coordinate its missile brigades and other forces to launch larger salvos, and that its ISR and command and control is sufficiently adept to target warships first and then attack cargo ships. In this case (as in the 3x3 Enhanced Chinese Missiles variant), the results did change somewhat. The U.S. team held the second convoy back but prosecuted a more aggressive strategy to attrit Chinese forces faster. Compared with the Base case, merchant arrivals were about the same, but merchant ship losses were up about 50 percent (94 versus 145). Chinese losses were the same, and Taiwanese and Japanese losses were down about 10 percent. The big change was the increase in U.S. losses, up nearly 400 aircraft (45 percent). During the conflict, the United States lost a total of 14 squadrons of tankers and 43 squadrons of fighters.

Energy inventories fared relatively well. Although natural gas and coal declined to zero, both started to rebuild as a result of robust deliveries from U.S. escorted convoys, coal in week 11 and natural gas in week 16. The problem was that China's attacks on electricity production prevented energy arrivals and inventories from being fully used. Electricity production levels, though gradually recovering after week 10, did not get above 50 percent until week 17 and ended week 20 at 80 percent. Without the attacks, electricity production would have been at about 100 percent in week 10.

Cargo import levels, which were not affected by Chinese attacks, returned to pre-blockade levels at week 12.

Table 5.20: Results Summary (4x4) Enhanced Chinese Missiles

	Taiwan's Condition			
	Electricity Production (% of Demand)		Import Level (% of Demand)	
End of Game	82%		100%	
Worst Week	14%		0%	
	Merchant Ship Arrivals by Country			
	U.S.	China	Taiwan	Japan
Arrivals	893	–	808	–
	Losses by Country			
Merchant Ships	76	–	69	–
Air				
Fighters	936	840	144	192
Bombers	12	144	0	0
MPA	192	24	12	24
Surface Ships				
Major Combatants	45 + 1 Carrier	94	7	14
Minor Combatants	0	72	18	0
Submarines	2	42	0	0
Casualties	21,080	13,165	3,034	4,662

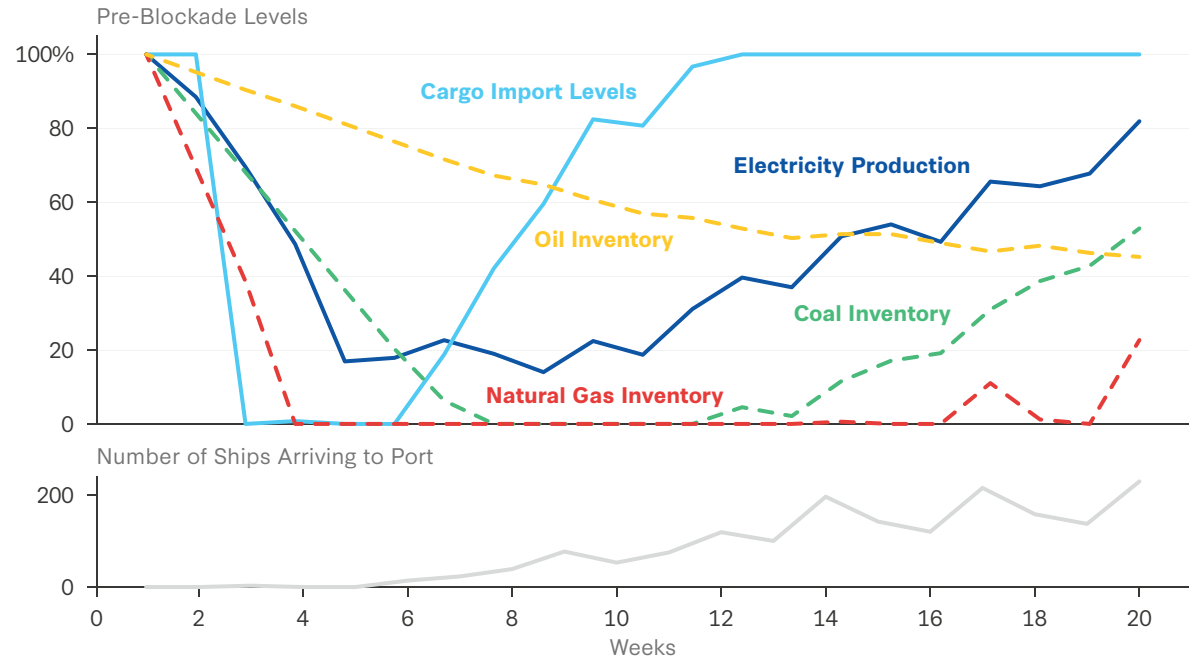
Source: CSIS Defense and Security Department.

Free-Play Games

As noted earlier, free-play games did not lock the players into particular escalation levels; instead, players could increase escalation, decrease escalation, or explore an off-ramp. Although the 50 participants in these games were experienced professionals, many with expertise related to their country team, it cannot be known whether their decisions would reflect those of real-world decisionmakers. Nevertheless, the results give useful insights into escalation dynamics. The games also show how variable results can be when different groups face the same problem and why multiple game iterations are needed to illuminate the range of possible decisions and outcomes.

- In two of five free-play iterations, the teams escalated to the highest level of violence. This resulted in heavy casualties to both sides.
- In two other games, the teams found or discussed off-ramps. The form of coalition concessions ranged from symbolic (agreeing to hold bilateral talks) to substantive (ceding offshore islands). Of note, when Taiwanese citizens played on the Taiwan team, they were unwilling to discuss concessions to China.

Figure 5.23: Economic Impacts (4x4) Enhanced Chinese Missiles



Source: CSIS Defense and Security Department.

- In all games but one, there was a reluctance to escalate. (In the exception, China struck Taiwan early and hard.) Instead, teams tried to maintain their current escalation level. Often, they made small escalations to respond to a perceived escalation and send a signal. However, these escalations sometimes produced counter-escalations all the way up the escalation ladder.
- Signaling with actions was often misunderstood. To be effective, signals had to be accompanied by direct or indirect communication.
- In all the iterations, naval forces exchanged fire and inflicted casualties.
- Attacks on homelands were highly variable, as Table 5.21 shows. In one iteration, Taiwan, China, Japan, and Guam were all struck. In another, Taiwan, China, and Guam were struck but not Japan. In two others, Taiwan or its islands were struck but no other countries were. In one iteration, no homeland was struck.

When Taiwanese citizens played on the Taiwan team, they were unwilling to discuss concessions to China.

The tables below summarize the five game iterations. Appendix I contains turn-by-turn descriptions.

Table 5.21: Attacks on Homelands During Free-Play Iterations

Game #	Taiwan *(including islands)*	China	Japan *(including Okinawa)*	United States/Guam	United States/Other
1	X	X	X	X	
2	X	X		X	
3					
4	X				
5	X				

Source: CSIS Defense and Security Department.

FREE-PLAY GAME 1

This game featured rapid escalation between China and the United States, ending with strikes on each other's territory and major losses on both sides. Coalition personnel casualties (20,634) were much heavier than China's (3,620) because of the need to push convoys through to Taiwan while under attack

Table 5.22: Free-Play Game 1 Results Summary

	Losses by Country			
Merchant Ships	0	–	10	–
Air				
Fighters	420	79	61	72
Bombers	42	–	–	–
MPA/Tankers	60	–	–	–
Surface Ships				
Major Combatants	34 + 2 Carriers	29 + 1 Carrier	9	1
Minor Combatants	0	56	20	–
Submarines	2	6	–	–
Casualties	16,943	3,820	2,399	4,662

Note: These free play games typically ran four weeks, much shorter than the 20 weeks of the dyad games. Thus, statistics on Taiwan's status are not included. Any comparison of casualties between the two groups of games should be made with caution.

Source: CSIS Defense and Security Department.

In this game, China began with a fire strike that destroyed a major part of the ROCAF and ROCN. China expanded these strikes to Taiwan's energy system. The United States responded by escorting convoys from Japan to Taiwan. U.S. antiship missile forces landed on Taiwan, but then the United States halted convoys for a week due to high losses. The United States also attacked Chinese airfields with missiles from ships and bombers. In response, China attacked bases on Guam and Japan. When China attacked U.S. bases in Japan, Japan entered the conflict and provided additional convoy escorts. Most U.S. aircraft losses occurred on the ground in these strikes.

FREE-PLAY GAME 2

This game also featured rapid escalation between the United States and China, resulting in an unrestricted conventional level of escalation on both sides. Unlike in the first game, Japan remained largely uninvolved beyond providing light convoy assistance.

Table 5.23: Free-Play Game 2 Results Summary

	Losses by Country			
Merchant Ships	0	–	26	–
Air				
Fighters	270	144	165	75
Bombers	6	–	–	–
MPA/Tankers	3	–	–	–
Surface Ships				
Major Combatants	8	13	10	–
Minor Combatants	0	8	11	
Submarines	–	3	–	–
Casualties	6,612	1,122	4,674	1,688

Source: CSIS Defense and Security Department.

The game began with the United States and Taiwan escorting a convoy that skirmished with Chinese forces. The skirmish escalated into a full-scale convoy battle. China launched a mass missile attack on Taiwan, destroying large parts of the ROCAF, ROCN, and ground-based ASCMs. China also attacked Guam. In week 4, China launched a missile attack on U.S. and Japan Self-Defense Forces aircraft on Japan. Japan took defensive actions only, and convoy battles continued throughout. China landed forces on Penghu Island.

U.S./coalition personnel losses greatly exceeded those of China because of China's airfield attacks. However, Taiwan's energy and import levels remained high.

FREE-PLAY GAME 3

In this game, the United States and Japan focused on economic attacks on China rather than military attacks. The game still featured combat, but direct conflict remained solely between China and Taiwan.

Taiwan formed convoys, and China intercepted them with the CCG. Fighting escalated to a full convoy battle but was limited to the CCG and Taiwan's military forces. The United States refused to provide forces for convoy escort. Instead, it imposed a distant blockade on Chinese shipping, implementing a board and seizure operation at key straits such as Malacca and Sunda. The United States also airlifted military supplies into Taiwan. During week 4, three U.S. transport aircraft were destroyed on the tarmac in Taiwan. Meanwhile, the United States prepared to escalate horizontally by striking Chinese infrastructure near the Suez Canal, Panama Canal, and Singapore. Japan stayed

Table 5.24: Free-Play Game 3 Results Summary

	Losses by Country			
Merchant Ships	–	–	6	–
Air				
Fighters	–	12	112	–
Bombers	–	0	0	–
MPA/Transport	3	0	0	–
Surface Ships				
Major Combatants	–	3	12	–
Minor Combatants	–	32	14	–
Submarines	–	–	–	–
Casualties	68	500	3,429	–

Source: CSIS Defense and Security Department.

neutral throughout, not allowing military operations from its territory or transshipment from its ports, but it did participate in sanctions and freezing Chinese assets.

U.S./coalition casualties were much lower than in games 1 and 2, but electricity production and import levels were also much lower. This would be a contest of endurance between Taiwan and China.

FREE-PLAY GAME 4

This game featured escalation directly followed by de-escalation and ceasefire negotiations between China and Taiwan.

Table 5.25: Free-Play Game 4 Results Summary

	Losses by Country			
Merchant Ships	–	–	1	1
Air				
Fighters	–	12	–	72
Bombers	–	–	–	–
MPA	–	–	–	–
Surface Ships				
Major Combatants	3	7	–	–
Minor Combatants	–	–	3	2
Submarines	1	5	–	–
Casualties	281	503	65	92

Source: CSIS Defense and Security Department.

This game began with Japan sending ships with humanitarian supplies to Taiwan, escorted by the Taiwanese navy; China interdicted them. The United States sent a Patriot battery and advisers to Taiwan, attacked Chinese ships with aircraft, and hunted Chinese submarines. Fighting escalated to full-scale convoy battles involving U.S., Taiwanese, and Chinese forces. China reached out to Taiwan to propose a deal, demanding that the Taiwanese president step down and U.S. forces leave Taiwan in exchange for the end of the blockade. Gameplay ended before a final settlement was reached.

The de-escalation resulted in fewer casualties than in games 1, 2, and 3.

FREE-PLAY GAME 5

The last free-play game also featured escalation, which was resolved by an arrangement in which Japan and China would jointly escort Taiwanese merchant ships into Taiwan.

Table 5.26: Free-Play Game 5 Results Summary

	Losses by Country			
Merchant Ships	–	–	3	5
Air				
Fighters	36	50	12	–
Bombers	–	–	–	–
MPA	–	–	–	–
Surface Ships				
Major Combatants	–	–	–	1
Minor Combatants	–	3	4	–
Submarines	–	–	–	–
Casualties	48	116	121	95

Source: CSIS Defense and Security Department.

In this game, China began by occupying Taiwan's outlying islands of Quemoy/Kinmen and Matsu and deploying mines. The United States and Taiwan responded with convoys, which China attacked. The United States, Japan, and Taiwan arranged for additional merchant shipping, both mobilized and purchased. Japan organized Japanese-flagged ships for convoys with humanitarian aid. China attacked a humanitarian convoy. The United States and Japan reinforced Okinawa and Kyushu. Convoy battles took place between China on one side and the United States, Japan, and Taiwan on the other. The battles led to negotiations between China, Taiwan, and Japan, and ultimately an agreement for convoys to Taiwan to be escorted jointly by China and Japan.

Because of the ceasefire agreement, this game produced the least casualties overall, about 500; at the other extreme, free-play game 1 produced 13,000 casualties.

6

Policy Recommendations and Conclusion

This chapter lays out recommendations arising from analysis of the wargame results described in the previous chapter. The recommendations are divided into four groups: (1) preparing the merchant fleets, (2) preparing Taiwan's energy infrastructure, (3) preparing the United States to assist Taiwan during a blockade, and (4) actions for countering and ending a blockade, were one to occur.

These recommendations have three goals. The first is to enhance deterrence by showing China that Taiwan and the United States are prepared and cannot be intimidated. The recommended actions would do this by raising the potential cost to China, as well as increasing the likelihood that a conflict would be long, hard, and unsuccessful.[1] The second is to prepare for faster and more effective action in an emergency. Although plans can be developed on the fly, that takes time, which may not be available in a crisis. The third is to discourage other countries from pressuring Taiwan to submit because they hope that a quick resolution would restart the flow of semiconductors. The United States and Taiwan want to be clear that any encouragement of China would be worse for the global economy, in both the near and long term, than supporting Taiwan in its autonomy.

In the event a blockade does occur, these actions may not necessarily thwart the blockade outright, but they would buy time. Time is critical because it allows Taiwan's supporters, like the United States, to build diplomatic coalitions and put pressure on China to cease coercive action. It also

1 Equally important is reassuring China that as long as it does seek to unilaterally change the status quo, the United States will abide by its agreements with Beijing.

allows the United States to prepare its forces in case military action is needed. Prior planning and preparation—the main theme of these recommendations—would therefore decrease escalatory pressures and strengthen deterrence.

Prepare the Merchant Fleets

Because countering a blockade would primarily involve a maritime fight with outcomes determined largely by the number and type of merchant ships that arrive on Taiwan, the most important area for pre-conflict preparations involves measures to increase the availability of merchant ships.

- **Arrange for mobilization of Taiwanese-owned shipping.**

  In Prepared variants where Taiwan was able to mobilize its owned ships (in addition to ships flagged to Taiwan), the increased number of available merchants greatly eased escalatory pressures. Additional merchants also make China's task more difficult; China is more likely to run out of antiship munitions if it has to attack more targets.

  Taiwan should ensure that all ships whose beneficial owners are Taiwanese are legally subject to requisition with appropriate compensation when ordered by the government. The Legislative Yuan should be prepared to implement requisitioning immediately after blockade begins—before owners might sell or otherwise dispose of ships. Taiwan should also require the contracts of Taiwanese seafarers to stipulate that they would be required to serve at the government's behest during times of national emergency and establish incentives for non-Taiwanese seafarers to similarly continue their service.

- **Contract LNG tankers into the Tanker Security Program (TSP) and a Taiwanese equivalent.**

  Taiwan's energy supply depends heavily on imported LNG, and in all of the scenarios, natural gas inventories invariably run out long before coal and oil. However, as the data in Module 1 show, there are few LNG tankers that Taiwan or the United States could acquire quickly.

  Both the United States (through the U.S. Maritime Administration, or MARAD) and Taiwan should buy or contract for LNG tankers. Today's depressed market for LNG tankers creates an opportunity.[2] This would provide a low-cost but highly visible demonstration of both countries' commitment to resist coercion. As far back as 2022, Taiwan's Maritime and Port Bureau suggested the country needs to build a national fleet of up to 16 LNG tankers, so this is not a new proposal.[3]

  For the United States, securing LNG tankers would be relatively straightforward since MARAD already maintains two mechanisms for doing this. One is the ready reserve fleet.

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2 "LNG Freight Rates Remain Depressed Amid Vessel Oversupply and Market Dynamics," ShipUniverse, January 22, 2025, https://www.shipuniverse.com/news/lng-freight-rates-remain-depressed-amid-vessel-oversupply-and-market-dynamics/.

3 "Taiwan Plans to Build up to 16 LNG Carriers," LNG Prime, January 13, 2022, https://lngprime.com/vessels/taiwan-plans-to-build-up-to-16-lng-carriers/38951/.

Although that fleet is intended to support military operations, adding a few LNG tankers to hedge against a blockade would be a modest expansion of the program. The number required would be small, and a contested blockade would meet the statutory requirements that the ships be used for "national defense or military purposes in time of war or national emergency."[4] The other is the TSP, which currently contracts tankers to support military operations but could be expanded to include LNG tankers.[5] The statutory language seems to allow such an expansion under "national defense and other security requirements."[6]

Taiwan would need to establish a similar, small program with perhaps only five LNG carriers, enough to provide one week of Taiwan's LNG requirements. These tankers would bridge the gap as Taiwan's LNG inventory runs out and before Taiwan is able to acquire LNG tankers from other sources, such as reflagged vessels and purchases on the open market after conflict begins.

- **Make plans for managing war risk in the commercial sector.**

  As discussed in Chapter 2, commercial shipping companies are risk averse and will avoid sending ships into combat zones without compensation. Insurance rates will rise, perhaps to astronomical levels, in any sort of blockade. Moreover, virtually all maritime insurance includes a "five powers clause" that excludes losses resulting from war between the United Kingdom, United States, France, Russia, and China. Special financial structures will thus be needed to allow the operation of shuttle merchants. Crews will also need incentives.

  In an emergency, both Taiwan and the United States will need to replace or supplement commercial insurance with guarantees, subsidies, or reinsurance to keep maritime and air traffic flowing. There are precedents for this in both world wars. The legal and administrative requirements of such preparation should not be underestimated, and the foundations must be established during peacetime so they are ready in an emergency. Although Taiwan would be expected to take the initial steps in these areas, the United States should be prepared to step in with its larger financial resources.

- **Plan for transshipment via Japan, Guam, and Australia.**

  The most important factor to the throughput of Taiwan's merchant fleet during a blockade is the ability to use Japanese harbors to transship goods. The ships involved in global trade are not the same ones that would make an opposed run into Taiwan. Japan is preferable as a transshipment point because it is closer to Taiwan and has excellent port facilities. Guam is a potential fallback, but it is farther away than Japan and has limited port capacity that would already be in high demand during a conflict. Australia has significantly more capacity than

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4 46 USC § 57100

5 "Tanker Security Program," Maritime Administration, last updated April 7, 2025, https://www.maritime.dot.gov/national-security/strategic-sealift/tanker-security-program.

6 For statutory language for TSP, see https://www.federalregister.gov/d/2022-26358/p-20; for NDRF, see https://www.law.cornell.edu/uscode/text/46/57100.

Guam but is farther still from both Taiwan and other trade partners and routes. However, it could provide coal, gas, food, and assorted other supplies from its own resources.

Coordination between Taiwan, the United States, Japan, and Australia on transshipping is critical. Infrastructure in Japan should be surveyed for its amenability for use in transshipment. For a transshipment point to be operational in an operationally relevant timeframe, Japan would have to authorize such use in the first hours or days of a conflict. Pre-conflict planning for transshipment via Japan would be provocative to China and thus politically sensitive in Japan, so it should be done quietly. Transshipping might be introduced in Japan as one element of contribution to alliance security in the Western Pacific. Similar discussions should be held with Australia.

Prepare Taiwan's Energy Infrastructure

Energy is the weakest element in Taiwan's resilience against coercion. The overwhelming preponderance of energy must be imported and would thus be vulnerable to a blockade. This is not a new observation; every analysis of Taiwan blockade scenarios highlights this vulnerability.[7] Although Taiwan has already taken measures to mitigate the problem, more remains to be done.

- **Increase Taiwanese energy reserves.**

  As a result of laws mandating large inventories, Taiwan's energy reserves are substantial for a country without any significant domestic energy resources.[8] Taiwan's oil reserves, at 146 days of consumption, far surpass that of the United States and the European Union, which have 21 days and 69 days, respectively.[9] Its natural gas (11–12 days) and coal reserves (40–42 days) are lower than those of the United States and the European Union, which both have substantial production, which engenders large "in process" inventories.[10] The United States

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7 For just a few examples, Marek Jestrab, *A Maritime Blockade of Taiwan by the People's Republic of China: A Strategy to Defeat Fear and Coercion* (Washington, DC: Atlantic Council, December 2023), https://www.atlanticcouncil.org/content-series/atlantic-council-strategy-paper-series/a-maritime-blockade-of-taiwan-by-the-peoples-republic-of-china-a-strategy-to-defeat-fear-and-coercion/; Jeff Kucharski, "Taiwan's Greatest Vulnerability Is Its Energy Supply," *The Diplomat*, September 12, 2022, https://thediplomat.com/2022/09/taiwans-greatest-vulnerability-is-its-energy-supply/; Walker Robinson, "Energy Is the Achilles' Heel of Taiwan's National Security," American Foreign Policy Council, June 11, 2024, https://www.afpc.org/publications/articles/energy-is-the-achilles-heel-of-taiwans-national-security; and Adrien Simorre, "Taiwan's Energy Supply: The Achilles Heel of National Security," Institut Francais des Relations Internationales, October 22, 2024, https://www.ifri.org/en/papers/taiwans-energy-supply-achilles-heel-national-security.

8 Jordan McGillis and Patrick Yu, "Assessing Taiwan's Strategic Energy Stockpiles," Global Taiwan Institute, *Global Taiwan Brief* 7, no. 9 (2022), https://globaltaiwan.org/2022/05/assessing-taiwans-strategic-energy-stockpiles/; and "Petroleum Administration Act (amended 2023-06-28)," Ministry of Economic Affairs, Republic of China (Taiwan), accessed June 13, 2025, https://law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=J0020019, Article 24.

9 Rice, *The Resilience of Taiwan's Energy and Food Systems*.

10 Ibid.

has 29 days of natural gas reserves and 83 days of coal reserves, while the European Union has 63 days and 6 days, respectively.[11]

Nevertheless, these inventories are inadequate for meeting Taiwan's electricity demands in most of the scenarios studied.

One obvious approach is to expand inventories. The Prepared scenarios hypothesized such an expansion before a conflict. This could come from building additional storage facilities or filling the existing logistics chains on the island.

Building additional storage facilities requires new tanks for natural gas and oil and specialized storage yards for coal.[12] The advantage of building and filling new storage is that the inventories are always available. The disadvantage is cost. Not only do these facilities need to be constructed, but there is also the carrying cost of maintaining additional inventory. For oil and natural gas, there is the additional risk of attack on these storage facilities if a blockade becomes kinetic. Natural gas poses unique problems, as it requires refrigeration to -260 degrees Fahrenheit (-162 degrees Celsius) or very high-pressure containers. Natural gas also experiences continuous evaporation as some liquified gas turns into vapor. This requires active management and may not be viable.[13]

For oil, building tanks underground is attractive for survivability, but these have the potential to become an environmental nightmare due to the risk of leakage in the near term or long term. After the 1941 attack on Pearl Harbor, the United States built extensive underground fuel tanks there. These are now leaking. The Navy is spending nearly $2 billion to drain and

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11 For oil, see Samantha Fields, "U.S. oil reserve tumbles to lowest level in 4 decades," Marketplace, September 22, 2022, https://www.marketplace.org/story/2022/09/22/u-s-oil-reserve-tumbles-to-lowest-level-in-4-decades; "Statistics Explained: Emergency oil stocks statistics," Eurostat, October 18, 2023, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Emergency_oil_stocks_statistics#Emergency_oil_stocks_in_days_equivalent; and "European Union Oil Consumption (I:EUOC)," YCharts, 2023, https://ycharts.com/indicators/europe_oil_consumption/. For natural gas, see Office of Energy Policy and Innovation's Division of Energy Market Assessments, *2022 State of the Markets: A Staff Report to the Commission* (Washington, DC: Federal Energy Regulatory Commission, March 2023), 7, 11, https://www.ferc.gov/sites/default/files/2023-03/2022_State-of-the-market.pdf; and "AGSI Storage Inventory: 2022-06-30," Gas Infrastructure Europe: Aggregated Gas Storage Inventory, 2025, https://agsi.gie.eu/#/. For coal, see "Electricity Monthly Update," U.S. Energy Information Agency, May 22, 2025, https://www.eia.gov/electricity/monthly/update/coal-stocks.php; "PT Adaro Energy Indonesia Tbk Quarterly Activities Report: Second Quarter of 2022," Adaro, https://www.alamtri.com/files/news/berkas_eng/2139/2Q22%20QAR%20Final.pdf; and "Coal 2022 - Analysis," International Energy Agency, 2022, https://www.iea.org/reports/coal-2022/executive-summary.

12 Large amounts of coal cannot be stored in unprepared areas, as there is a high risk of fire from spontaneous combustion deep inside a coal pile. Thus, coal storage facilities have mechanisms for directing water onto coal piles. Coal storage facilities also need mechanisms for rapid loading and unloading so that coal can move smoothly from the port to the storage facility to the power plant: Una Nowling, "'Who Moved My Btus?' The Pitfalls of Extended Coal Storage," *Power Magazine*, December 1, 2016, https://www.powermag.com/who-moved-my-btus-the-pitfalls-of-extended-coal-storage/.

13 S. Z. Naji et al., "Tracking boil off gas generation into liquefied natural gas supply chain using HYSYS simulator," *IOP Conference Series: Materials Science and Engineering* 579 (2019), doi:10.1088/1757-899X/579/1/012019.

clean the old tanks and faces lawsuits about environmental damage and health effects from seepage.[14] Underground tanks would therefore need to meet high environmental standards.

Alternatively, Taiwan could take advantage of the fact that international crises often develop over weeks or even months. Taiwan's energy system could top off centralized storage facilities and those of distributors and customers, thus using all available storage to the maximum extent. This would require a government directive early in a crisis to start the process while there is still time.

The advantage is that peacetime costs would be relatively low. The chief disadvantage is timing. Filling all the storage facilities would require additional ship deliveries and take some time. A blockade could occur while the plan was still being put into action. A second disadvantage is persuading the supply chain to accept additional deliveries. The government might have to provide incentives for energy users and suppliers to do this.

- **Maintain and expand resilient energy sources.**

  Over time, Taiwan has shifted its sources of energy from coal and nuclear to natural gas and renewables for environmental reasons. However, this has greatly increased Taiwan's energy vulnerability. As noted above, natural gas poses several storage problems, and continuous resupply is needed. Solar and wind power do not depend on imports but are intermittent. Hydro sources are excellent, but Taiwan is running out of locations to install additional capacity at economical rates. In contrast, nuclear power provides the ultimate energy resilience because it can run continuously and without significant imports through any blockade. Coal has the advantage that it can be stored indefinitely and in large quantities, though it poses environmental hazards.

  Building energy resilience is difficult both politically and environmentally.[15] Nevertheless, Taiwan cannot ignore the connection between energy sources and national security. Nuclear power could provide an immediate gain. Taiwan should consider reopening its last nuclear plant rather than continuing its closure as currently planned.[16] It should certainly investigate new forms of nuclear power plants, which might not only provide resilience but also save Taiwan from having to pay other countries $60 billion per year for energy imports.[17] The siting flexibility and fast build-speed of small modular reactors make that option particularly appealing for Taiwan.

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14 Daryl Huff, "State and county propose 30-year, $750M plan to clean up Red Hill fuel pollution," HawaiiNewsNow, November 29, 2023, https://www.hawaiinewsnow.com/2023/11/29/state-county-propose-30-year-750m-plan-clean-up-red-hill-fuel-pollution/.

15 For example, Taiwanese billionaire Jensen Huang was bitterly criticized for suggesting that Taiwan invest in nuclear power: "Editorial: Energy debate heats up," *Taipei Times*, June 1, 2025, https://www.taipeitimes.com/News/editorials/archives/2025/06/01/2003837834.

16 "Nuclear Power in Taiwan," World Nuclear Association, last modified May 22, 2025, https://world-nuclear.org/information-library/country-profiles/others/nuclear-power-in-taiwan.

17 "Chinese Taipei," Observatory of Economic Complexity, 2025, https://oec.world/en/profile/country/twn.

Instead of converting from coal to natural gas and then, in the future, to renewable sources, Taiwan might skip the first conversion and wait for more renewables to come online. This would ensure that more plants could continue to operate in case of a temporary cessation of maritime traffic to Taiwan.

- **Harden energy infrastructure.**

  Direct attacks on an adversary's electrical system have occurred in every conflict of the last century. China might take this escalation step later in a campaign if other blockade actions were not producing the desired result, or it might pursue such an action immediately to produce a "shock and awe" effect. Wargaming showed that such attacks would be devastating if conducted in volume and sustained over weeks. Conversely, a hardened and resilient system could continue to operate at acceptable levels.

  Taiwan has done a lot to make its electrical system more resilient in the face of extreme weather conditions. More hardening is needed for national security reasons. The additional resilience would not only reduce hardship on the population in the event of Chinese missile attacks but would also strengthen deterrence by reducing pre-attack estimates of the effectiveness of those attacks. Making China's task more difficult adds to deterrence. These actions have the added benefit of engendering more reliable utilities in peacetime.

  Taiwan should also build additional dual-fuel plants or adapt an existing plant for dual-use in an emergency. Taiwan has recognized LNG as a security vulnerability; allowing LNG plants to use more easily stockpiled diesel would mitigate this.[18] This also provides flexibility in both peacetime and conflict, allowing electricity generation to continue with a wider variety of fuel deliveries. Replacement turbines, transformers, and other critical spare parts should be stockpiled in peacetime, as these might be targeted during a Chinese bombardment and replacements might not otherwise be available.

- **Expand plans for allocating resources on Taiwan.**

  Even under the best of circumstances, shipping would be in short supply during a blockade, and space onboard those ships would be scarce. There will inevitably be competition for that space. Normally, space would go to the highest bidder. However, the highest bidder might not prioritize the goods necessary for national survival. As described in the discussion about Module 3, energy, health and emergency supplies, and chip production should be the top priorities. Consumer goods and construction materials should be lowest.

  To ensure the most effective response during an emergency, the government will need to control imports to ensure they prioritize the most critical items and distribute these for greatest effect. Without an allocation process, import priorities will become a free-for-all, with the most powerful and well connected getting what they need and others being left out. This will undermine the legitimacy of resistance as well as be inefficient, with

18 Cindy Wang and Dan Murtaugh, "Taiwan Military Warns on LNG Vulnerability After PLA Drills," Energy Connects, October 23, 2024, https://www.energyconnects.com/news/gas-lng/2024/october/taiwan-military-warns-on-lng-vulnerability-after-pla-drills/.

resources going to lower-priority activities. Taiwan should build on its existing plans for allocating imports during a blockade and develop decision criteria for how to use inventories. Additional steps might include planning for rationing food, fuel, and certain consumer products.

Countries at war have always had some government allocation and rationing process. In World War II, the United States had the Office of Production Management, which was replaced by the more powerful War Production Board in January 1942.[19] The United Kingdom had the Ministry of Production, and Nazi Germany had the Ministry of Armaments.[20] A Taiwan equivalent would need sunset provisions, lest it hang on after the conflict and undermine Taiwan's free enterprise system.

The government has many ways to prepare the population and send the message to China that "we can overcome any attack." For example, the government could have educational materials ready to help the population. For energy, this would cover the voluntary and mandatory reductions discussed earlier as well as establishing a standby rationing system, should supplies fall substantially.[21] For food, it could include instructions on how to build a "victory garden." The United States encouraged these in World War II, and unlike with some symbolic actions like scrap metal drives, home food production had a significant economic impact by replacing half of vegetable and fruit production.[22] Taiwan already has a volunteer training system to build on.[23]

Prepare Contingency Plans for the United States to Assist Taiwan During a Blockade

In most scenarios, Taiwan cannot face China alone. While Taiwan can prevail in a scenario that pits the Taiwanese military against Chinese nonmilitary boarding parties, China will prevail in all other Taiwan versus China scenarios. In those scenarios, Taiwan needs U.S. assistance, likely in direct combat operations, if it is to remain autonomous and democratic. If the United States wants to retain the option of continuing an autonomous and democratic Taiwan in the face of a Chinese

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19 Martin Hart-Landsberg, "U.S. Economic Planning in the Second World War and the Planetary Crisis," *Monthly Review*, February 1, 2023, https://monthlyreview.org/2023/02/01/u-s-economic-planning-in-the-second-world-war-and-the-planetary-crisis/.

20 Mark Harrison, "Resource mobilization for World War II: the U.S.A., U.K., U.S.S.R., and Germany, 1938-1945," *Economic History Review* 41, no. 2 (1998): 171-192, https://warwick.ac.uk/fac/soc/economics/staff/mharrison/public/ehr88post-print.pdf.

21 The United States had a standby gas-rationing system in the 1970s after the two oil shocks and even printed rationing tickets. See Richard D. Lyons, "Standby Gas Ration Plan Offered: 1½ Gallons a Day For Each Private Vehicle Is Basis," *New York Times*, December 8, 1979, https://www.nytimes.com/1979/12/08/archives/standby-gas-ration-plan-offered-1-gallons-a-day-for-each-private.html.

22 Gustavo F. Ferreira and Jamie A. Critelli, "Taiwan's Food Resiliency—or Not—in a Conflict with China," U.S. Army War College, *Parameters* 53, no. 2 (2023): 53, https://press.armywarcollege.edu/cgi/viewcontent.cgi?article=3222&context=parameters.

23 Julia Bergstrom, "Bolstering Taiwan's Civil Defense," Taiwan Business, March 21, 2024, https://topics.amcham.com.tw/2024/03/bolstering-taiwans-civil-defense/.

blockade, then it needs to have plans ready to support Taiwan at a variety of blockade levels. These preparations would aid deterrence against China by making the prospects of a successful blockade seem less likely, and as contingency plans, they are entirely consistent with the policy of strategic ambiguity.

- **Rebuild skills and prepare contingency plans to conduct convoys during a blockade.**

  Conducting convoys is a basic naval task, but the U.S. Navy is out of practice because convoys have not been a priority mission since the end of the Cold War.[24] Deprioritizing was appropriate for the immediate post-Cold War era, when prospective adversaries had weak naval fleets. It is not appropriate for the current great power era, where prospective adversaries like China can threaten shipping far out into the global commons. With the exception of LNG tankers (as discussed earlier), the United States has enough merchant ships in the National Defense Reserve Fleet (NDRF), accessible through the Voluntary Intermodal Sealift Agreement (VISA), and from other programs; however, it lacks the wartime tools to recruit crews.

  The United States cannot wait weeks or months for the U.S. Navy to develop convoy procedures while a blockade is squeezing the economic life out of Taiwan. It must act swiftly once the president directs action. The experience in World War II is a warning. The Navy was slow to adopt convoys, generating heavy costs. U-boats sank 240 cargo ships on the eastern seaboard from January to June 1942 before the United States established a convoy system.[25] Japan never developed an effective convoy system and paid a terrible price.

  The United States therefore needs to develop plans for conducting convoys:

  - The Navy has recently focused attention on contested logistics, and convoys should be part of that larger effort. For example, it would be worthwhile to conduct some convoy exercises in the western Pacific to renew these skills and signal U.S. resolve. These should be done with allies and partners and characterized as ensuring freedom of navigation and the open use of international waters, so they are not perceived internationally as provocative.
  - U.S. Transportation Command (TRANSCOM) and Indo-Pacific Command (INDOPACOM) should have a plan for where mobilized merchant ships will go and a plan for the operation of convoys to Taiwan.

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24 Even during the Cold War, the Navy's convoy skills had atrophied, as seen in the initially poor performance during the Tanker War in 1982-1988. See Quentin Zimmer, "The Tanker War," *Naval History*, June 2025, 30-35, https://www.usni.org/magazines/naval-history/2025/june/tanker-war.

25 Virtually every history of U.S. naval operations in World War II criticizes the U.S. Navy's slowness in establishing a convoy system on the East Coast. Losses cited come from Ed Offley, "Undefended Shore," *Military History Quarterly* 30, no. 2 (Winter 2018), https://www.historynet.com/undefended-shore/.

- MARAD, in conjunction with TRANSCOM, needs a plan for recruiting crews to operate mobilized shipping in a war zone. One possibility is to revive the U.S. Maritime Service of World War II, but there are many other possible approaches.[26]

- **Make joint plans with allies and partners, especially Japan.**

  Access to the U.S. bases in the region, particularly in Japan, is critical at all levels of escalation in wargame scenarios. At the lower levels, the bases provide home ports for U.S. reconnaissance assets and minesweepers when the United States decides to intervene. In convoy battles, the ports provide secure staging areas for convoy formation. At high levels of escalation, Japan provides airfields close enough to Taiwan and conflict areas that U.S. fighter aircraft could enter the fight; additionally, the Japan Self-Defense Forces are a valuable ally.

  Because there is no alliance structure in Asia comparable to NATO, arrangements must be mostly bilateral. For the same reason, the United States cannot turn leadership over to another organization or country. Other countries will help Taiwan only if the United States does. (See Appendix F, for a country-by-country analysis of what allies and partners might provide to counter a Chinese blockade of Taiwan.)

  If the United States regards competition with China and the defense of Taiwan as its top military priorities, then it needs to align its other policies, such as trade and demands for host-nation support, with that priority. Otherwise, it may find that allies and partners hang back in the hour of crisis, having been alienated by their prewar treatment and having developed doubts about U.S. reliability.

- **Make contingency plans for an airlift and military resupply of Taiwan while recognizing their severe limitations.**

  Some experts think of the Berlin Airlift and the Ukrainian aid mission when faced with the problem of supporting an isolated ally or partner without engaging in direct combat. Both efforts arguably succeeded. However, when applied to Taiwan, neither provides more than an emergency stopgap. They are not viable strategies for dealing with a Taiwan being blockaded by China.

  Nevertheless, in some circumstances, an airlift could have a powerful moral effect and provide some breathing room. In all the project's free-play and unrestricted warfare games, the U.S. team either considered or implemented an airlift. In free-play games, this sometimes created dilemmas for the China teams at lower levels of escalation.

  TRANSCOM and INDOPACOM need to develop an operational plan for an airlift into Taiwan. TRANSCOM has a history of being able to respond rapidly in crises, so this is just an extension of its long-standing expertise. However, the scale of such an airlift would be unprecedented in recent history. Airlift planning will need to examine all the

26 Suggested by Mark Buzdy and Doug Burnett, "A Modern Maritime Service Can Deliver What The Nation Needs," U.S. Naval Institute, *Proceedings* 151, no. 7 (July 2025), 57-61, https://www.usni.org/magazines/proceedings/2025/july/modern-maritime-service-can-deliver-what-nation-needs.

relevant airfields and estimate what would be needed for the high level of operations in forward locations.

Prepare to Counter and End a Blockade

Although deterrence is the first goal for Taiwan and the United States, China may nevertheless launch a blockade. This section describes actions that the United States and Taiwan might take during a blockade to thwart its intentions and mitigate damage to Taiwan.

- **Do not treat a blockade like an invasion.**

  A blockade is a different challenge than an invasion. In invasion scenarios, China must be committed to use all of its conventional military forces and escalate to high levels from day one. The U.S. response therefore has to be similarly forward leaning, requiring U.S. forces to engage in direct combat against Chinese forces almost immediately, lest China rapidly occupy Taiwan and end the conflict before the United States can bring its military power to bear.

  In contrast, the success or failure of a blockade depends on whether Taiwan accedes to Chinese demands. There are many scenarios where China could hold some or even most of its military forces in reserve, escalating only if its political goals were not met. A blockade therefore has more in common with the coercive dialogue typical of nuclear scenarios than with an invasion. In these scenarios, both sides have unused military force that they would prefer not to use if they could get a satisfactory diplomatic resolution: Therefore, finding off-ramps that secure key coalition goals yet provide China with a face-saving exit are critical. Total military victory is unachievable.

  U.S. authorities should not react to a Chinese blockade in the same way that they would react to an invasion attempt. Separate plans are required for these scenarios because plans for countering a blockade would diverge in important ways from war plans to counter an invasion.

  While some immediate actions would be required due to their long lead times (e.g., activating VISA, implementing plans for transshipping in Japan, and alerting forces for possible deployment), direct military action against Chinese forces could wait for a week or two if that allows diplomatic and military coalitions to be built. This is particularly true because an extended blockade is a poor prelude to invasion. This operational patience by the United States would ensure China's diplomatic isolation, set up negotiations for a ceasefire, and, if necessary, prepare a coalition military response.

- **Provide Beijing with off-ramps.**

  A blockade would be a risky strategy for China. While political circumstances might make it appear an attractive and flexible option, it could easily produce a political and diplomatic disaster. The Berlin blockade was catastrophic for the Soviet Union. The Berlin Airlift's success showed what concerted military action could do. As a direct result of the blockade's

challenge and the airlift's success, both the Federal Republic of Germany and NATO came into being.

A failed Chinese blockade might have similar effects. Squeezing Taiwan into submission could take a long time; it might fail outright, especially if the United States and its coalition are willing to contest the blockade actively. As China's blockade was squeezing Taiwan, China's own economy would be suffering from foreign capital flight and the disruption of its trade.

Further, a blockade would inflict suffering on civilians, kill seafarers and service members, destroy shipping, and disrupt the global trade on which many countries depend. This could undermine China's efforts to make itself an attractive alternative to U.S. regional leadership and potentially drive regional states toward the United States. Faced with the prospect of disastrous failure, China might escalate, with all the risks involved, but it would also consider off-ramps if they were available.

Creative offers by the United States and Taiwan might allow China to declare victory and lift the blockade at an acceptable cost to the coalition (e.g., Taiwan agreeing to international observers in customs houses; reiterating the 1992 Consensus verbatim). Developing a menu of offers and responses ahead of a conflict would greatly help the process of finding a mutually agreeable off-ramp during a conflict. In two of five in-person games, teams looked for off-ramps to avoid a destructive conflict. These can be developed from pre-conflict wargames, analyses, and exercises.

This needs to be done in conjunction with allies and partners, especially Taiwan and Japan. If they are not on board, the effect will collapse.

Conclusion

This project is the third in a series that this team has done on China's threat to Taiwan. Along with one-off wargames for organizations such as the Naval War College and Business Executives for National Security, these projects have run over 70 wargame iterations covering dozens of scenarios. These provide a broad view of what might happen in a U.S.-China conflict over Taiwan.

The first project, *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan*, looked at invasion. It concluded that the United States and its coalition partners could maintain an autonomous and democratic Taiwan, but at a high cost. It recommended a variety of actions to enhance deterrence, build strength, and abet warfighting, if conflict should break out. These measures included fortifying air bases, acquiring more antiship missiles, deepening diplomatic and military ties with Japan, and recognizing the need to continue operations in the face of heavy casualties.

The second wargaming project, *Confronting Armageddon: Wargaming Nuclear Deterrence and Its Failures in a U.S.-China Conflict over Taiwan*, used the same basic methodology but added the possibility of each side using nuclear weapons. It concluded that the greatest pressure to use nuclear weapons came when China was facing conventional military defeat. There was a high risk

of escalation to general nuclear war. The project recommended against the United States acquiring more nuclear weapons beyond the planned modernization; rather, what was most important was the development of off-ramps for China to take in lieu of nuclear escalation.

There are many common elements in the recommendations across the three projects:

- Even successful campaigns exact heavy casualties. This will be a shock in the United States, which since the end of the Cold War has been accustomed to fighting wars with few personnel or weapons losses.
- Off-ramps are valuable because total victory is unachievable when both sides have secure homelands and nuclear weapons.
- Strong military forces and determined policies strengthen deterrence.
- Military operational planning needs to include all these many scenarios. Planning is a tool for better senior-level decisionmaking, not a statement of intent to fight a war.
- Above all, the unexpected can happen. Although war with China is unlikely, it is not impossible, and unlikely events occur. Preparation is therefore vital.

There are also important differences. In high-intensity conflicts where China decides to attack U.S. air bases, most U.S. aircraft losses occur on the ground. In the invasion project, that raised questions about the value of pursuing advanced fighter aircraft if so many were lost on the ground and could not use their advanced capabilities. In blockade scenarios where China did not attack air bases, more U.S. aircraft survived and had more kills against Chinese aircraft in air-to-air combat. For example, in free-play games 1 and 2, which escalated to high intensity, the United States lost five to seven times as many aircraft as China, mostly from ground attack. In the 3x3 dyad games, the ratios were reversed, with the United States inflicting two to three times as many aircraft losses on China as it suffered itself.

Although nearly all blockade scenarios had significant personnel casualties, these were generally much lower than in a typical invasion scenario. Total personnel losses, including all countries, did not reach the 10,000 level until the 3x3 scenarios. Even then, the main reason for the disparity is that ground forces were not in contact in a blockade, and ground combat is the major driver of casualties.

There are also some tensions. Preparing for a high-intensity conflict will drive Taiwan to adopt a porcupine strategy that relies heavily on defensive systems like ground-based antiship missiles, ground-based air defenses, and sea mines. Countering blockades below the high-intensity level requires surface ships, aircraft, and some offensive capabilities. In high-intensity conflicts, the United States needs to pull its surface fleet back and minimize massing aircraft on bases inside China's missile range. In most blockade scenarios, surface ships need to be forward deployed to operate as convoy escorts, and aircraft need forward bases to maximize time on station.

As Evan Montgomery and Toshi Yoshihara, two experts at the Center for Strategic and Budgetary Assessments, point out, "As the side looking to overturn the status quo, Beijing can already choose

when to strike. But it can also choose *how* to strike. That means Washington cannot afford to focus too closely on one particular threat, even as it cannot take its eye off the invasion ball."[27]

Thus, the United States and its coalition must be prepared to deter and, if necessary, fight a wide range of scenarios. There is no magic bullet that can bring success across all scenarios. Instead, success requires a deep toolbox of capabilities. While some tools are useful across many scenarios, others are needed, even vital, in only a few. All are needed for credible deterrence.

27 Evan Braden Montgomery and Toshi Yoshihara, "Conquering Taiwan by Other Means: China's Expanding Coercive Options," *Washington Quarterly* 48, no. 1 (2025): 145, https://doi.org/10.1080/0163660X.2025.2479328.

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Appendix A

Taiwan Food Requirements and Availability

Food is the first consideration that observers typically consider in a blockade because the economy and the population's will to resist will sag and eventually collapse without an adequate diet. Therefore, the project did a careful analysis of food availability and requirements in the case of a Chinese blockade of Taiwan.

Summary Observations from Research

Four key points emerged from the analysis:

- Feeding a population requires a relatively small flow of supplies compared with maintaining energy production or, more broadly, sustaining an economy.
- For Taiwan, sealift of food can maintain a pre-blockade level of subsistence with a single ship arrival per day.
- Domestic production and large Taiwanese food inventories provide a substantial buffer against blockade-induced shortages. Even if China cut off all imports, Taiwan could feed itself for about nine months.
- Bottom line: Hunger and malnutrition are unlikely to be factors in a blockade of Taiwan. Other factors, like electricity blackouts and unemployment, will pinch much earlier.

Food Requirements: The International Committee of the Red Cross (ICRC) sets 2.3 lb. per person per day as a humanitarian crisis minimum. That 2.3 lb. is allocated to different food

groups to produce a balanced diet of about 2,300 kilocalories for the average person.[1] The Berlin blockade provided 1 lb. of food per person per day. That is inadequate by ICRC standards unless supplemented by other sources. In the case of the Berlin blockade, smuggling was rampant and may have made up the difference since the Berlin population was receiving 2,300 kilocalories daily by the end of the siege.

According to the U.S. Department of Agriculture, Taiwan's annual consumption of foodstuffs was 25,018,000 metric tons (domestic production plus imports).[2] Per person, that comes out to 1,060 kg/2,330 lb. per year or 6.4 lb. per person per day.[3] Of this, 55 percent by weight is imported, for a daily island-wide import requirement of 37,700 metric tons at peacetime consumption rates.[4]

Much of the imported bulk foodstuffs goes to animal feed. Total human needs, imported and domestically produced, are 573 kg/1,262 lb. per year, or 3.5 lb. per day. Meeting this need requires importing about 2.1 lb. per person per day, with domestic production of 1.4 lb. per person per day. The difference between the ICRC's 2.3 lb. and the current level of consumption lies in the quality and variety of diet. Eating boxed rations day after day will keep a population alive but eliminates one of life's great pleasures.

About 7 percent of Taiwan's food imports (1 million metric tons annually) comes from China, though recent restrictions have reduced this number.[5] Taiwan exports a small amount of food, about 820,000 tons annually. Stopping these food exports reduces import needs by 6 percent, or 0.21 lb. per person per day. In a blockade, these food imports and exports would cancel each other out.

The airlift analysis assumes 1.5 lb. of food per person per day, with another 1.4 lb. coming from domestic sources. This provides a bit more than the ICRC (2.3 lb.) but less than current consumption (3.5 lb.). The U.S. Department of Agriculture analysis notes that the relatively high yields of Taiwan's agriculture depend on imported fertilizer for crops and grains for livestock. Domestic meat production, for example, requires grain imports and is inefficient from a weight perspective.

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1 Alain Mourey, Nutritional Manual for Humanitarian Action (Geneva: International Committee of the Red Cross Assistance, 2008), 470–471, Table 12.4 "Amounts for distribution and corresponding nutritional values" and Table 12.5 "Examples of full reference rations for planning purposes," https://www.icrc.org/sites/default/files/external/doc/en/assets/files/other/icrc_002_0820.pdf.

2 Foreign Agricultural Service, "Taiwan Food Security Situation Overview," U.S. Department of Agriculture, June 19, 2024, https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Taiwan%20Food%20Security%20Situation%20Overview_Taipei_Taiwan_TW2024-0030.pdf.

3 Oscar Lin, "Taiwan Food Security Situation Overview," Foreign Agriculture Service, U.S. Department of Agriculture, June 19, 2024, https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Taiwan%20Food%20Security%20Situation%20Overview_Taipei_Taiwan_TW2024-0030.pdf. Domestic production = 10,559 kt, imports = 14,459 kt, and exports = 1,457 kt. Data for 2022, the latest year available.

4 This import amount also aligns with data in "Table 8. Inbound Cargo by Merchandise" in Taiwan International Ports Corporation, Annual Statistical Report (Taipei: Taiwan International Ports Corporation, 2022), 27, https://www.twport.com.tw/en/media/Articles?a=452.

5 Huileng Tan, "China has banned more than 2,000 Taiwan imports amid Pelosi's visit as Beijing steps up trade weaponization," Business Insider, August 3, 2022, https://www.businessinsider.com/china-bans-thousands-taiwan-food-imports-pelosi-visit-weaponize-trade-2022-8.

A total airlift target of 3.65 lb. per person per day, the same as the successful Berlin Airlift, leaves 2.15 lb. for emergency materials, such as fuel, medical supplies, and spare parts.

Sealift has much less of a weight constraint because of the large capacity of cargo ships. One ship arrival per day would be enough to provide the 37,700 metric tons per day needed to sustain pre-blockade food levels, recognizing that the types of ships would need to vary (e.g., bulk, container, and reefer) to accommodate the different kinds of foodstuffs.

Taiwanese Agricultural Inventories and Self-Sufficiency: Taiwan's food self-sufficiency has eroded as its economy has shifted from farming to manufacturing. Whereas Taiwan was a net exporter of food in the 1960s, it is now a large importer.[6] Economically, this has had immense benefits, such as moving workers to higher-value jobs and greatly increasing the standard of living. Taiwan is aware of its vulnerability and is acting to strengthen its position. In 2020, President Tsai Ing-wen announced goals of 40 percent food self-sufficiency and 28 months of rice reserves.[7] In 2021, the Council of Agriculture (since upgraded to a ministry) stated that the country had 953,000 metric tons of rice in stock or 90 lb. per person. This was described as sufficient to feed the population for 18 months, but it actually meant replacing rice alone, not the entire diet. The rice reserve is kept at low temperature to lengthen shelf life.[8] Vegetable and fruit inventories could meet nationwide demand for six months. There are also substantial inventories of meat.[9] Between 2017 and 2021, the government subsidized food storage facilities covered 318 hectares (786 acres, or 1.2 square miles).[10]

The combination of domestic production (one-third of daily caloric requirements) and stockpiles (six months) would keep the population fed for about nine months, though this would entail eating a lot of rice. Even small deliveries from blockade runners, humanitarian supplies allowed by China, and regular shipments that get through the blockade could extend this timeline indefinitely.

Water resources would need to be managed carefully because agriculture uses a huge amount, as does industry, particularly microchip production. In 2022, agriculture made up 68 percent of total water utilization, compared with 22 percent for domestic consumption and 10 percent for industry.[11]

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6 Gustavo F. Ferreira and Jamie A. Critelli, "Taiwan's Food Resiliency—or Not—in a Conflict with China," U.S. Army War College, Parameters 53, no. 2, 2023, 41, https://press.armywarcollege.edu/cgi/viewcontent.cgi?article=3222&context=parameters.

7 John Van Trieste, "Tsai hopes to see Taiwan achieve 40% self-sufficiency in food," Radio Taiwan International, April 17, 2020, https://en.rti.org.tw/news/view/id/2003097; "Government soothes fears, says Taiwan has 6 months of food supplies," Taiwan News, May 14, 2021, https://www.taiwannews.com.tw/en/news/4203406; and Yimou Lee and Ben Blanchard, "Taiwan mapping out food plans in the event of war," Taipei Times, October 23, 2024, https://www.taipeitimes.com/News/taiwan/archives/2024/10/23/2003825738.

8 Steven Crook, "If Push Comes to Shove, Would Taiwan Starve?," Taiwan Business TOPICS, October 2023, https://topics.amcham.com.tw/2023/10/if-push-comes-to-shove-would-taiwan-starve/.

9 Total meat consumption in 2022 was 2,189,000 tons from both imports and domestic sources. John Van Trieste, "Tsai hopes to see Taiwan achieve 40% self-sufficiency in food," Radio Taiwan International; and "Government soothes fears, says Taiwan has 6 months of food supplies," Taiwan News.

10 Crook, "If Push Comes to Shove, Would Taiwan Starve?"

11 "Table 1. Utilization of Water Resources," Water Resources Agency Taiwan, 2022, https://www.wra.gov.tw/News_Content.aspx?n=2953&s=182766.

Historical Experience: Japan in World War II

Japan during the later stages of World War II provides a case study of what happens to an island blockaded by a more powerful air and naval power. By then, submarines and mines had attrited Japan's merchant fleet and reduced imports. However, this did not induce surrender. The cutoff of oil devastated the economy, but Japan produced enough food domestically that, when combined with food that did get through the blockade, the island had enough to keep the population fed. Before the war, 80 percent of the calories people in Japan ate came from food produced in Japan. By 1945, this had increased to 91 percent.[12] In other words, the amount of food derived from domestic production in 1945 on a caloric basis was 14 percent higher compared to prewar levels.

A close examination of food imports shows why the blockade failed to starve the island nation. First, Japan depended on imports of certain foodstuffs only: rice (17 percent of which was imported), soybeans (67 percent), sugar (84 percent), wheat (21 percent), and other grains and beans (37 percent).[13] Throughout the blockade, Japan continued to receive almost all of its prewar imports from Korea, Manchuria, or Formosa/Taiwan, except for wheat, which the United States had supplied.[14]

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12 United States Strategic Bombing Survey, The Japanese Wartime Standard of Living and Utilization of Manpower (Washington, DC: U.S. Government Printing Office, 1947), 2. https://www.google.com/books/edition/The_Japanese_Wartime_Standard_of_Living/n0jtAAAAMAAJ?hl=en&gbpv=0.

13 Ibid.

14 Ibid.

Appendix B

Notes on Shipping Availability in Module 1

This appendix provides data on the ship types, ship availability, and travel timelines that underpin the description of Module 1 in the main text ("What Merchant Ships Are Available for Transit to Taiwan?" in Chapter 4: Wargaming a Blockade).

The project analyzed the characteristics and numbers of different types of merchant ships: tankers, bulk carriers, container ships, liquefied natural gas (LNG) tankers, general cargo ships, roll-on/roll-off (Ro-Ro) ships, reefers, liquefied petroleum gas (LPG) tankers, and chemical tankers.

Table B.1 shows ship type, class, number worldwide, minimum and maximum deadweight tonnage, price when new, cargo size (in thousands of metric tons), and crew size. The data were used to determine the goods that would reach Taiwan to sustain its economy.

The project also analyzed global secondhand ship purchases in 2022 (the most recent year available when the table was developed). The database comprised 2,401 ships with 81,494,000 gross tons at a total sales amount of $29.1 billion. The analysis assessed each ship's type, class, number purchased, scrap price, scrap number, eager price, eager number, tough price, and tough number. This information was used to determine Taiwan's ability to purchase used merchant ships to supplement its fleet.

Table B.1: Ship Type Information

Ship Type [Total Number Worldwide]	Class	Number Worldwide	Minimum Deadweight Tonnage DWT Min (000)	Maximum Deadweight Tonnage DWT Max (000)	Deadweight Tonnage (000)	Price New (USD, millions)	Cargo Size (000 Tonnes	Crew Size[15]
Tankers[16] [12,437]	Very Large Crude Carrier (VLCC)	903	200	363	320	126	304[17]	25
	Suezmax	661	120	200	157	85	147	23
	Aframax	1,125	80	120	115	74	105	22
	Panamax[18]	454	70	80	75	57	67.5	22
	Medium Range Tanker	2,507	25	70	51	47	45	19
	Handy	454	10	25	37	32	33	16
	Small	6,333	0	10	6	17.5	5	16
Bulk carriers [16,7560]	Capesize	2,697	100	404	180	63.5	180	23
	Kamsarmax	3,690	70	100	75	35	82	21
	Supramax	4,185	50	70	62	33	62	21
	Handysize	6,188	0	50	38	30	38	16
Container ships [8,353]	12k+ TEU	776	140	281	150[19]	152[20]	196	30
	8-12k TEU	690	100	140	120	131	140	26
	3-8k TEU	2,226	40	100	80	93	90	21
	2-3k TEU	1,321	25	40	30	41	35	16
	900-2k TEU	2,374	10	25	20	31	20	14
	<900k TEU	966	0	10	8	15	7	12
LNG tankers [1,018][21]		1,018	0	155	87	261	174[22]	20

15 "Challenge to the Industry: Securing Skilled Crews in Today's Marketplace," Mondaq, February 17, 2011, https://www.mondaq.com/uk/marine-shipping/123404/challenge-to-the-industry-securing-skilled-crews-in-todays-marketplace.

16 Includes crude and product type tankers.

17 Assumes 95 percent of vessel DWT is oil for the largest ships, decreasing uniformly down to 85 percent for the smallest.

18 Taken as equivalent to the Long-range 1 Tanker.

19 Approximated from Clarksons Research, "Container Ship Sampling," American Association of Port Authorities, 2025, https://www.aapa-ports.org/files/PDFs/CONTAINER%20SHIP%20SAMPLING.pdf.

20 Price of Neo-Panamax 13,500 TEU.

21 Number from Poten's tri-fold to include ships under construction: "LNG Shipping & Trading Reference Tables (2024)," Poten & Partners, 2024, https://www.poten.com/wp-content/uploads/2024/01/LNG-Trifold-2024-Final.pdf.

22 Capacity in thousands of cubic meters.

General cargo vessels [23,445]		1,532	20	84	50	40[23]	45[24]	25
		6,630	5	20	12.5	30[25]	11.3	20
		15,283	0	5	2	13[26]	1.8	15
RoRo ships [1,111]		1,111	0	47	8.5[27]	57	10	22
Reefers [1,332]		1,332	0	23	7.5	25	6.75	21
LPG tankers [2,130][28]	Very Large Gas Carrier (VLGC)	428	50	64	55	99[29]	84[30]	25
	Medium	465	10	50	25	52	32.5	22
	Coaster	1,237	0	10	4	17.5[31]	4	15
Chemical tankers [7,376]	Oceangoing	1,869	40	102	50	45.7[32]	45	25
	Medium	2,401	10	40	22.2	32.3[33]	20	21
	Coastal	3,106	0	10	4.3	14	4	15

Source: CSIS Defense and Security Department.

23 Calculated by interpolation from other data points.

24 Assumes that all general cargo ships carry 90 percent of DWT as cargo.

25 "Taizhou Sanfu Shipbuilding wins 2 orders for multipurpose (MPP) vessels," iMarine News, October 16, 2023, https://www.imarinenews.com/1990.html.

26 George Delaney, "VesselsValue Newbuild Report 2021," Container News, February 28, 2022, https://container-news.com/vesselsvalue-newbuild-report-2021/.

27 Average size of 1,101 Ro-Ros: "Ro-Ro Cargo Ships," Vessels Database, https://www.vesselfinder.com/vessels?type=405.

28 Ranges for LPG ships determined by web scraping Vesselfinder and k-means clustering on deadweight. Returned clusters were:Cluster 0: Mean DWT = 54398.29, Number of items = 505; Cluster 1: Mean DWT = 23438.22, Number of items = 351; and Cluster 2: Mean DWT = 3946.23, Number of items = 1274.

29 Clarksons Research, World Fleet Monitor 14, no. 8 (2023): 22. Prices for all categories adjusted by taking a ratio of Clarkson's baseline ship (60,000 cubic meters) to the project's baseline ship (50,000 cubic meters). Data accessible with subscription through https://www.clarksons.net/wfr/.

30 Capacities taken from comparing the cubic meters and DWT of exemplar ships on sale from horizonship.com. For smaller ships, storage in cubic meters is about equal to DWT. For larger ships, a ratio was derived from available data (1.3 for medium, cargo capacity in thousands of cubic meters).

31 Data sourced from a 2023 LPG carrier of 5,500 m3 for sale.

32 "Nanjing Tanker Corporation to build 5 new tankers," iMarine News, September 10, 2024, https://www.imarinenews.com/13994.html.

33 Price of a coaster is inferred from this article: Adis Adjin, "Seacon in for chemical tanker at Wuhu," Splash247, March 19, 2024, https://splash247.com/seacon-in-for-chemical-tanker-at-wuhu/.

Table B.2: Secondhand Ship Purchases, 2022

Type	Class	Number of Ships	Scrap Price	Scrap Number	Eager Price	Eager Number	Tough Price	Tough Number
Tanker	VLCC	903	54	11	74.8	66	115.5	105
	Suezmax	661	40	7	64.4	36	79.2	59
	Aframax	1,125	36	17	46.6	77	71.5	142
	Panamax	454	24.4	7	26.2	30	55.5	72
	MR Tanker	2,507	22.6	31	24.2	162	45	294[34]
	Handy	454	6.5	6	15	29	19	44
	Small	6,333	3.5	77	8.5	407	10.5	611
Bulk Carriers	Capesize	2,697	17.7	26	37.1	156	61.5	248
	Kamsarmax	3,690	13	35	24.4	210	33	334
	Supramax	4,185	12.5	40	23.5	238	31	375
	Handysize	6,188	12	59	18.4	354	28.3	563
Container ships[35]	>12,000 TEU	776	31	4	72	15	90	25
	8-12k TEU	690	27	11	62	48	77	77
	3-8k TEU	2,226	19	15	44.5	63	55	135
	2-3k TEU	1,321	8.5	15	19.5	62	24.3	123
	900-2k TEU	2,374	5.9	26	14	107	17	185
	<900 TEU	966	4.3	9	10	36	12	48
LNG	LNG	1,018	130	4	182	18	202	39
General Cargo	General Cargo[36]	1,532	21.6	33[37]	30	179	32.5	319[38]
		6,630	16	142	22.5	778	24.5	1,386
		15,283	7	325	9.75	1,788	10.5	3,185
Ro-Ro	Ro-Ro	1,111	31	4	43	22	46.5	36
Reefer	Reefer	1,332	11.5	26	17.5	115	19	150[39]

34 Eager number inferred by taking the total number of the largest four classes and dividing by their Eager numbers, yielding an average of 8.5, then dividing the total number of tankers in that class by 8.5.

35 Used straight-line depreciation formula where a = new price and t = 15, 7, and 5. The several t-values are incorporated to measure the different appraisal values of these vessels at 15, 7, and 5 years.

36 An average depreciation rate of a general cargo ship is ~10 percent.

37 Calculated using distribution of ships and total number of scrapped ships to approximate distribution.

38 General cargo vessels have similar functions to Ro-Ro vessels. Used proportions of Ro-Ro quantities to calculate the "Tough" number.

39 "Eager" and "Tough" numbers were unavailable, so analogous data were used comparing Reefer to <3,000 TEU cargo ships (similar gross tonnage), and LNGs to LPGs (similar function).

Type	Class	Number of Ships	Scrap Price	Scrap Number	Eager Price	Eager Number	Tough Price	Tough Number
LPG[40]	VLGC	428	39	5[41]	64	23	72.5	50
	Medium	465	20.5	6	34	28	38	61
	Coaster	1,237	7	15	11.3	69	13	150
Chemical [7381]	Oceangoing	1,869	22.6	4	24.2	19	28	42
	Medium	2,401	7	5	15.5	25	19	55
	Coastal	3,106	3	7	7	35	8	77

Source: The data came from sources such as Clarksons Research, Barry Rogliano Salles (BRS), and Poten & Partners. Several numbers were interpolated using a Reuters article and a Congressional Research Service report.[42]

Table explanation:

- Purple cells have figures from a published industry data source, such as Clarkson, Barry Rogliano Salles, or Poten; yellow cells contain figures that were calculated or interpolated.[43]
- Scrap Price is the average price in millions of 2024 dollars over the last 5 to 10 years of a 15-year-old ship in that class.[44]
- Scrap Number is the number of serviceable ships scrapped per year in that class (average number scrapped minus minimum number scrapped, minimum number scrapped being a stand-in for unserviceable ships, since in the most high-demand year, only the worst ships would be scrapped).[45]

40 Calculated using 5 to 10 years of data using proportions of data in a similar class.

41 The scrap number of the LPG vessel data was calculated using four scrapped vessels and their distances, instead of the method described below this table. For the Tough and Eager numbers, this table refers to the whole numbers of the scrapped ships for each class (VLGC, Medium, Coaster) found in Table B.2 and the LNG data found in this table. The LNG vessel data was selected because the vessel types are similar.

42 "Insight: Russian Oil Sanctions Fuel Boom for Old Tankers," Reuters, December 5, 2022, https://www.reuters.com/business/energy/russian-oil-sanctions-fuel-boom-old-tankers-2022-12-05/; and John Frittelli, The Global Oil Tanker Market: An Overview as It Relates to Sanctions, CRS Report R47962 (Washington, DC: Congressional Research Service, March 18, 2024), https://www.congress.gov/crs-product/R47962.

43 Prices for 15 to 20-year-old used ships come from two sources. One is the Reuters article "Insight: Russian Oil Sanctions Fuel Boom for Old Tankers," which notes that the price of old tankers went from $12 million to $22 million during 2022—compared to the new tanker price of $60 million. The price by the end of 2023 was up to $30 million—from CRS report, Global Tanker Market. By this time, nearly all available tankers had been bought. New building prices are driven by construction factors like labor, raw materials, equipment, design, supervision, debt, and exchange rates, whereas secondhand prices are driven by demand. See S.D. Tsolakis, C. Cridland, and H.E. Haralambides, "Econometric Modelling of Second-Hand Ship Prices." Maritime Economics & Logistics 5, no. 4 (December 1, 2003): 347-77, https://link.springer.com/article/10.1057/palgrave.mel.9100086.

44 While the numbers listed are the scrap prices identified by the formula outlined below this table, it is not a realistic scrap price under the circumstances of this wargame scenario. The vessel owners would know that their ships—even if older than 15 years—can still sail and are in great demand by the United States and Taiwan, which are eager to buy. Thus, the assumed scrap price is higher due to this increase in demand.

45 Determined by taking the average number of ships scrapped in a class per year and subtracting that number from the minimum number scrapped in a class in one year over the last 5 to 10 years.

- Eager Price (the price demanded by a seller when faced with an eager buyer—the United States or Taiwan) is calculated as the average price in millions of 2024 dollars over the last 5 to 10 years of a used ship (of all ages other than new) in that category.[46]
- Eager Number is the average number of ships sold per year in that class over the last 5 to 10 years.
- Tough Price (the price needed to pay an unwilling seller) is calculated as the highest price over the last 5 to 10 years in millions of 2024 dollars of a used ship (of all ages other than new) in that category.
- Tough Number is the highest number of ships sold in one year in each class.

Table B.3 provides information on the distance to Taiwan and the annual traffic of regional ports that could act as transshipment points for shuttling to Taiwan. Note how limited Guam's capacity is compared with the major shipping hubs in the region. Establishing a transshipment point in Japan is the most attractive option because of the short distance to Taiwan and the large port capacity.

Table B.3: Potential Regional Transshipment Shuttling Ports

Port	Nautical miles from Taiwan	Annual Traffic		
		Million tons	TEU (1,000s)	Ships
Nagoya, Japan	1,028	158	2,844	28,000
Osaka, Japan	921	85	2,130	21,265
Apra, Guam	1,477	2	100	2,139
Sydney, Australia	4,344	20	2,401	1,200
Singapore	3,100[47]	591	39,000	130,000

Source: Distances between the ports listed and Taiwan came from sea-distance.org. The annual traffic data came from various sources, such as the respective cities' websites on ports and harbors data and the Census and Economic Information Center (CEIC).

Table B.4 provides the ship arrival times at Japanese transshipment points based on type and ship location at the time of activation or contracting. This is relevant to Taiwanese requisitioning in preparation for a blockade.

46 With the average age of a ship for sale known, the average price can be calculated (e.g., if the average VLCC sold is six years old, then the average sale price would be [{4*5y/o price} + {10y/o price}]/5.

47 Routed south of Borneo to avoid the potentially contested South China Sea.

Table B.4: Ship Arrival Times and Taiwanese Requisitioning

Ship Type	Avg. Speed	Ship Location			
		Already in Japan **Week of arrival**	Near (in the Western Pacific / South China Sea) **Week of arrival**	Medium (in the Indian Ocean, rest of Pacific Ocean) **Week of arrival**	Far, (in the Atlantic Ocean, Mediterranean Ocean) **Week of arrival**
Bulk carriers	15 knots	Week 1	Week 2–5	Week 6–8	Week 8–10
Container Ship	20 knots	Week 1	Week 2–4	Week 5–7	Week 8–22
RO/RO	20 knots	Week 1	Week 2–4	Week 5–7	N/A
Tanker	15 knots	Week 1	Week 2–5	Week 6–8	Week 8–15
LNG	19 knots	Week 1	Week 2–4	Week 5–7	Week 8–15
Reefer	15 knots	Week 1	Week 2–5	Week 6–8	N/A

Source: CSIS Defense and Security Department.

A few ships will already be in Japan—either docked or loading cargo. These ships would be available from the first week. Taiwanese-owned ships are predominately container ships that operate on a global scale, meaning some will be the first to arrive in Japan, whereas some will arrive several months later. Most Taiwanese Ro-Ros and reefer ships operate in the Indo-Pacific area, which is why the matrix does not account for later arrivals of these vessels.

Table B.5 presents the activation and travel times to Japan for the U.S. National Defense Reserve Fleet (NDRF) and Ready Reserve Force (RRF). This information is relevant if the U.S. government decides to mobilize government reserve assets and move them into theater. "Days from Activation to sailing" is the amount of time needed to prepare ships for sailing after the activation order is given. "Sailing time" is from the East or West Coasts of the United States, depending on where the ships are berthed. "Ship arrival time in Japan" is when the ship arrives at the trans-shipment port in Japan and is ready to participate in convoys going to Taiwan.

Table B.5: Availability of U.S. Reserve Fleet Ships (NDRF and RRF)

Ship Source	Days from Activation to Sailing	Ship Arrival Time in Japan	
		West Coast (Sailing time to JP: 20–30 Days)	**East Coast** (Sailing time to JP: 50–60 Days)
RRF	10 days	5 weeks	9 weeks
NDRF – Fast	30 days	8 weeks	12 weeks
NDRF – Slow	120 days	21 weeks	25 weeks

Source: CSIS Defense and Security Department.

Table B.6 shows estimates for the arrivals of commercial ships available for U.S. government use at a Japanese transshipment point, for example, under the VISA program. Some scenarios included a one-week delay in activation because of government decisionmaking time.

Table B.6: U.S. Commercial Ship Arrival Time at Japanese Transshipment Point

	Initial Ship Location		
	Near (in the Western Pacific/ South China Sea)	**Medium** (in the Indian Ocean, rest of Pacific Ocean)	**Far** (in the Atlantic Ocean, Mediterranean Ocean)
Current plans	6–10 weeks	11–15 weeks	16–20 weeks
Assuming a one-week delay for activation	7–11 weeks	12–16 weeks	17–21 weeks

Source: CSIS Defense and Security Department.

Table B.7 shows the World War II U.S. War Shipping Administration's training of merchant crewmembers. Although the system eventually produced huge numbers of new crew members from the civilian world, it took years to get established. That amount of time would not be available in a blockade of Taiwan. Therefore, crews for merchant ships that are activated or newly acquired must come from the pool of existing seafarers, whether Taiwanese or foreign.

Table B.7: United States World War II Additional Crewing

Year	Seafarers Added	Total at End of Year	Seafarers per Week	Growth
Prewar	--	67,500	--	--
1942	12,500	80,000	241	18.5%
1943	100,000	180,000	1,924	125%

Source: CSIS Defense and Security Department.

Appendix C

Details on Sea Mines

This appendix provides historical background and a brief literature review on the use of sea mines in conflict and blockades. It provides analytic support for China's escalation level 2 (submarines and mines).

The bottom line is that large numbers of mines are needed to interdict maritime traffic effectively, and minefields need constant reseeding to compensate for adversary minesweeping. Small numbers can harass but not interdict. However, China has both the mine inventory and methods for emplacement that would be needed for an effective mine campaign. Mine emplacement does require time; this is available in escalation level 2 but may not be at higher escalation levels where minelaying would be opposed.

Background

Mines have been integral to historical blockades and contemporary attempts by rogue actors to disrupt maritime traffic. Sea mines are an old technology, though their widespread employment began in the twentieth century during the Russo-Japanese War (1904-1905). Navies used mines to block passage and to create sanctuaries for friendly forces, in addition to inflicting casualties on adversaries. For example, in the final five months of World War I, the British North Sea Mine Barrage had 70,000 anchored mines across an area measuring roughly 230 miles by 25 miles,

effectively preventing German submarines from reaching the Atlantic.[48] Mines also accounted for over 30 percent of German submarine losses.[49]

With sea mines having proven themselves strategically effective in World War I, the great powers deployed them even more widely during World War II. Most notably, the United States' mass minelaying campaign Operation Starvation was central to blockading Japan in mid-1945, damaging two million tons of Japanese shipping and adding economic and military pressure on Japan to end the war. It forces an equally great, though ultimately insufficient, Japanese response–20,000 men on 349 ships for mine clearing.[50]

During the Korean War, a Soviet-led minelaying operation along North Korean ports delayed the U.S. advance by several critical weeks while a safe passage was swept.[51] During the Vietnam War, U.S. mining of North Vietnamese ports and waterways froze shipping and delayed deliveries of military equipment.[52] Recent decades have seen rogue actors in the Middle East use sea mines. Iranian forces deployed mines during the 1981–1988 Tanker War to harass Iraqi oil shipments.[53] During the Gulf War of 1990–1991, Iraq spread sea mines throughout the Persian Gulf to keep U.S. naval forces away from its coast, resulting in severe damage to the USS *Princeton* and USS *Tripoli*. Most recently, the Houthis, supplied by Iran, have laid hundreds of sea mines in the southern Red Sea. Minesweepers from the United States and Arab countries have removed hundreds of mines in recent years, though new mines continue to be deployed and kill coast guard and merchant crews.[54]

Use En Masse

Mines are most effective when used in large quantities, or "en masse," though the size of minefields has decreased over time as mines have become more effective. The World War I North Sea Mine Barrage had 70,000 mines. Operation Starvation against Japan in 1945 dropped 13,000 mines.[55] Iraq laid 1,000 mines off of Kuwait to deter a U.S. coalition amphibious landing. Today's Houthi

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48 Reginald R. Belknap, "The Yankee Mining Squadron or Laying the North Sea Mine Barrage," U.S. Naval Institute, Proceedings 45, no. 12, 1919, https://www.usni.org/magazines/proceedings/1919/december/yankee-mining-squadron-or-laying-north-sea-mine-barrage.

49 Robert M. Grant, "The Use of Mines Against Submarines," U.S. Naval Institute, Proceedings 64, no. 9, 1938, https://www.usni.org/magazines/proceedings/1938/september/use-mines-against-submarines.

50 Gerald A. Mason, Operation Starvation (Maxwell Air Force Base, AL: Air War College, 2002), 14, https://apps.dtic.mil/sti/tr/pdf/ADA420650.pdf.

51 Jason D. Menarchik, North Korean Protective Mine Warfare: An Analysis of the Naval Minefields at Wosan, Chinnampo, and Hungnam During the Korean War (Maxwell Air Force Base, AL: Air University, 2010), 9, https://apps.dtic.mil/sti/pdfs/ADA539219.pdf.

52 Edward J. Marolda, "U.S. Mining and Mine Clearance in North Vietnam," Naval History and Heritage Command, 2020, https://www.history.navy.mil/research/library/online-reading-room/title-list-alphabetically/u/u-s-mining-and-mine-clearance-in-north-vietnam.html.

53 Quentin Zimmer, "The Tanker War," U.S. Naval Institute, June 2025, https://www.usni.org/magazines/naval-history/2025/june/tanker-war.

54 Nabil Abdullah al-Tamimi, "'Floating Death': Houthis' Red Sea mines pose lasting threat," Al Mashareq, June 10, 2022, https://almashareq.com/en_GB/articles/cnmi_am/features/2022/06/10/feature-03.

55 Gerald A. Mason, Operation Starvation (Maxwell Air Force Base, AL: Air War College, 2002), 15, https://apps.dtic.mil/sti/tr/pdf/ADA420650.pdf.

minelaying represents a much smaller, less coordinated effort designed for harassment rather than blockade.[56] By 2021, the Houthis had scattered hundreds of floating mines; an Arab coalition removed 247.[57] Without professional minelaying capability, the Houthis laid these mines in small groups using speedboats and fishing vessels.[58]

The PLAN is well aware that mass mining can facilitate sea denial. A Chinese textbook notes that 810,000 mines sank 2,700 ships in World War II.[59] Chinese analyses of Operation Starvation and the Gulf War highlight mines as an effective tool for blockade.[60] Thus, mines would be part of any Chinese blockade of Taiwan, but particularly of lower escalation levels.

MINELAYING EFFORTS

While purportedly "easy to lay and difficult to sweep," mines have historically taken a concerted military effort to lay en masse. Naval vessels performed most World War I minelaying. For example, the specially configured minelaying ship USS *Canonicus* could plant 860 mines in an unbroken line in under four hours. Northern Barrage operations used groups of similar minelaying ships to lay thousands of mines in a few hours.[61]

During World War II, Allied powers used aircraft for minelaying in addition to ships. The British Royal Air Force conducted 19,917 sorties between 1940 and 1945 in their mining campaign against Germany, sinking 638 ships.[62] The Royal Australian Air Force conducted 1,130 sorties to lay 2,522 mines in Southeast Asian shipping lanes and ports, sinking 90 Japanese ships.[63]

U.S. mining in the Pacific had great success. The previously described Operation Starvation involved 1,150 minelaying sorties. Despite the sorties being flown near Japanese territory, they were relatively low risk. Operation Starvation lost only 15 aircraft out of 1,150 sorties (1.3 percent) at a time when the strategic bombing campaign against Japan was losing 1.6 percent per sortie.[64] The mining

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56 Leonardo Jacopo and Maria Mazzucco, "If the Gaza War Continues, Will the Houthis Mine the Gateways to the Red Sea?," Stimson, October 29, 2024, https://www.stimson.org/2024/if-the-gaza-war-continues-will-the-houthis-mine-the-gateways-to-the-red-sea/.

57 al-Tamimi, "'Floating Death'."

58 Jacopo and Mazzucco, "If the Gaza War Continues, Will the Houthis Mine the Gateways to the Red Sea?"

59 韩鹏,李玉才 [Han Peng and Li Yucai, eds.], 水 中兵器概论 (水雷分册) [Outline of Undersea Weaponry: Sea Mine Volume] (Xian: Northwest Industrial College Press, in cooperation with Beijing University of Aeronautics and Astronautics, Harbin Industrial College, and Harbin Engineering College, 2007), 1.

60 Lyle J. Goldstein, "Old-School Killers: Fear China's Sea Mines," National Interest, October 13, 2015, https://nationalinterest.org/feature/old-school-killers-fear-chinas-sea-mines-14069; and Andrew S. Erickson, Lyle J. Goldstein, and William S. Murray, Chinese Mine Warfare: A PLA Navy 'Assassin's Mace' Capability (Newport, RI: U.S. Naval War College, June 2009), https://www.andrewerickson.com/wp-content/uploads/2017/09/China-Maritime-Study-3_Chinese-Mine-Warfare_Erickson-Goldstein-Murray_200906.pdf.

61 Belknap, "The Yankee Mining Squadron."

62 Huan-Kai Tseng, "Minehunters and Taiwan's Mine Warfare Strategies," Global Taiwan Institute, February 21, 2018, https://globaltaiwan.org/2018/02/minehunters-and-taiwans-mine-warfare-strategies/.

63 Robert C. Duncan, America's Use of Sea Mines (White Oak, MD: U.S. Naval Ordinance Laboratory, 1962), 142, https://apps.dtic.mil/sti/pdfs/ADA061490.pdf.

64 Huan-Kai Tseng, "Minehunters and Taiwan's Mine Warfare Strategies," Global Taiwan Institute, February 21, 2018, https://globaltaiwan.org/2018/02/minehunters-and-taiwans-mine-warfare-strategies/.

operations caused heavy damage to Japan's shipping fleet. By the end of World War II, mines had sunk more than 650,000 tons of Japanese shipping and damaged 1,250,000 tons at a time when it took at minimum 70 days to repair a single vessel.[65]

China's Capability

China has a large minelaying capability based on surface combatants. Its primary destroyers can carry nearly 40 mines each, its frigates can carry 60, and its vast fleet of smaller boats (e.g., gunboats, minesweepers, and torpedo boats) can each carry a handful.[66] Surface combatants offer a trained crew, a high carrying capacity, and simpler command and control, but minelaying diverts the ships from other missions. Unlike other states, the PLA has engaged in minelaying training and practice exercises.

Extensive mine stockpiles complement China's large minelaying capability. Unclassified estimates from 2009 claim that China had approximately 50,000 to 100,000 mines.[67] China's stockpile today is much larger, given that mines are cheap to produce, production has grown, and they are easily stored.

Chinese civil-military integration in a Taiwan blockade could also employ civil vessels as minelayers. Based on estimates that 7,000 to 14,000 mines would be sufficient to blockade Taiwan, China's minelaying capabilities and resources have long exceeded what is needed for such an effort.[68]

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65 Naval Analysis Division, "The Offensive Mine Laying Campaign Against Japan," Department of The Navy, 1969, 27.

66 Erickson, Goldstein, and Murray, Chinese Mine Warfare.

67 Ibid.

68 Ibid.

Appendix D

Details of the Airlift Analysis

This appendix contains the "Airlift Worksheet," which was given to the U.S. and coalition teams in games at U.S./Taiwan escalation level 4. It provides summary information on the airlift analysis. The detailed analysis will be published separately.

Airlift Worksheet

This worksheet provides options if the U.S./coalition team wants to use an airlift to bypass a maritime blockade, harkening back to the Berlin Airlift of 1948–49. The options are mutually exclusive. Below the table is a set of benchmarks to give a sense of the impact of such an airlift. The data come from a detailed analysis that the project conducted and which is available separately.

It is important to note that an airlift for Taiwan would be about 10 times more demanding than the Berlin Airlift (supporting 23,600,000 people versus 2,300,000). It would also face the much greater distances of the Pacific. The greater capacity of modern aircraft fills some of this gap, but not all.

Table D.1: Airlift Options

Option	Aircraft Fleet Used	Transshipment Hub	Deliveries (tons/day)	Comments
1	Taiwan civilian AC only	Japan or the Philippines	4,800	Shows what Taiwan could do with its own resources.
2	1/4 U.S. tanker and cargo fleet; CRAF I; Taiwan civilian AC	Guam (constrained by airfield capacity to 300 sorties/day)	16,500	Shows what could be done from U.S. territory alone. Hawaii and the continental United States are too far away to contribute usefully.
3	1/2 total U.S. aerial tanker and LR cargo fleets; CRAF I, II; Taiwan civilian AC	Japan including Okinawa	72,100	Uses both military and civilian airfields, causes some disruption to civilian traffic
4	1/2 U.S. tanker and long-range cargo fleet; CRAF I, II; Taiwan civilian AC	Philippines	72,100	Like option #3, but with a different transshipment point.
5	Max effort: All U.S. aerial tankers, long-range cargo fleets; CRAF I, II, III; Taiwan civilian AC	Japan, Philippines, Guam	94,800	Japan's main islands—military airfields only; military and civilian on Taiwan, Okinawa, Guam; total flights limited by capacity on Taiwan.

Note: A transshipment hub is where aircraft that run the blockade pick up cargo. Cargo arrives at the transit shipment point by customary means, mostly by sea. CRAF = Civilian Reserve Air Fleet, available in three levels; AC = aircraft.

Source: CSIS calculation in separate paper, "Airlift as a Mechanism to Circumvent Surface Blockade."

Requirements

There are three requirements for a viable airlift:

- **A benign environment**: An airlift requires no interference by Chinese forces. That might occur as it did in the Berlin airlift, when the Soviet Union decided that interfering with humanitarian supplies would look bad on the world stage.
- **No substantial crisis elsewhere:** Airlift also requires that the United States not be distracted by a substantial crisis elsewhere. The United States could handle small contingencies elsewhere by using military aircraft not involved in the airlift, leasing civilian aircraft not committed to CRAF, and relying on allies. However, a major military operation would require shutting down most, if not all, of a Taiwan airlift.
- **Supply allocation on Taiwan:** The Taiwanese government would need to keep tight control over supplies delivered through official channels. Food needs to be rationed. Other supplies need central allocation to fill the most critical need. Disorganization in deliveries

or a perception of favoritism would undermine the legitimacy of resistance and risk social disintegration.

Benchmarks

Taiwan's minimum survival level for food and medical services is 43,100 tons per day. Anything above that could include spare parts to keep machinery operating and fuel for electricity production and transportation. Every additional 10,000 tons/day (shipped as coal) provides 0.5 percent of pre-blockade electricity production.

Aviation assets available include:

- Long-range cargo aircraft: C-5Ms, C-17s (222 total)
- Aerial tankers: KC-135s, KC-46As (467 total)
- CRAF levels: I (13 aircraft), II (+52 aircraft), III (+60 aircraft)
- Taiwan: 26 civilian cargo aircraft

Aircraft and cargo assumptions include:

- Aircraft availability adjusted for the number in the operational forces and day-to-day readiness.
- Average cargo loads estimated using the Desert Storm average loading (42 percent) rather than maximum loading. Cargo aircraft typically run out of space before they run out of payload capacity.
- Daily sorties estimated based on launch airfield distance from Taiwan and turnaround times at both ends.

Appendix E

Details on Escalation Levels

This appendix provides details for the China and U.S./Taiwan escalation levels discussed in Chapter 3, "A Framework for Analyzing Blockade." For each escalation level, it specifies the assumptions and parameters used in the game iterations.

Table E.1: Details on China's Escalation Levels

X = Allowed, [blank] = not allowed	**1 - Boarding**	**2 - Subs and Mines**	**3 - Offshore Kinetic**	**4 – Wider War**
Declaration of blockade and exclusion zone	X	X	X	X
Cross-strait trade	No change from pre-blockade	Proportional to overall trade	Stopped	Stopped
PAFMM/CCG/MSA	X		X (if desired)	X (if desired)
PLAN mines		X	X	X
PLAN Submarines		X	X	X
PLAN/PLAAF/PLARF attacks on shipping			X	X
Attacks in Taiwanese territorial waters				X

Strikes on Taiwan				X
Attacks in Japanese territorial waters				Allowed
Strikes on Japanese and U.S. territory				Allowed

Source: CSIS Defense and Security Department.

Definitions of rows in China escalation levels:

- **China establishes an exclusion zone:** China claims the right to stop and inspect any ship in the exclusion zone and, if they refuse, take "appropriate action." For game purposes, this zone was defined as the territory within China's Ten-Dash Line but outside of Taiwanese, Japanese, and Filipino contiguous zones.
- **Cross-strait trade:** Direct trade between China and Taiwan is large and would vary with the escalation levels.
- **PAFMM/CCG/MSA:** These non-military ships board, inspect, and seize vessels going to Taiwan.
- **PLAN mines:** China lays mines, overtly or covertly, inside Taiwanese territorial waters or outside, depending on the scenario.
- **PLAN submarines:** Submarines overtly or covertly attack vessels traveling to Taiwan.
- **PLAN/PLAAF/PLARF attack shipping:** China uses military forces overtly against vessels going to Taiwan.
- **Attacks in Taiwanese territorial waters:** China no longer treats Taiwan's territorial waters as a sanctuary.
- **Strikes on Taiwan:** China may strike the Taiwanese homeland. These strikes can be from aircraft or missiles and would focus primarily on harbor facilities, ships in harbor, and electricity production and distribution infrastructure.
- **Attacks in Japanese territorial waters:** Allowed in some variants of the "Wider War" escalation level. China strikes vessels going to or coming from Taiwan inside Japanese territorial waters.
- **Strikes on Japanese and U.S. territory:** Allowed in some variants of the "Wider War" escalation level. Note: Attacks on Japanese territory will bring the Japan Self-Defense Force (JSDF) into the fight.

Table E.2: Details on Coalition Escalation Levels

X = Allowed, [blank] = not allowed	1 - Taiwan Constrained	2 - Taiwan Assertive	3 - U.S. Constrained	4 - Wider War
Taiwan defends homeland	X	X	X	X
Taiwan buys ships	X	X	X	X
Transshipping in Japan	X	X	X	X
U.S. operations from bases in Japan	ISR only	ISR only	X	X
Taiwan offensive		X	X	X
Ship detachments, PMC		X	X	X, plus U.S. military
Sanctions/economic retaliation		Allowed in the Ukraine variant	Minor	Major
U.S. equipment aid beyond regular FMS		Allowed in the Ukraine variant	X	X
U.S. provides subsidies for war risk and crews			X	X
U.S. provides real-time targeting intel			X	X
U.S. mine clearing			X (International waters)	X
JMSDF Participation			Conditional	Conditional
VISA/RRF			X	X
U.S. escort + "safe corridor"			X	X
U.S. attacks PLA shooters in exclusion zone			X	X
Coalition participation			X (convoy defense)	X (includes offensive)
U.S. forces allowed on Taiwan				X
U.S. counter-blockade				X
U.S. strikes everywhere, including in Chinese territorial waters/ mainland				X

Note: The "Wider War" escalation level for both China and the United States uses the base assumptions from the First Battle series of wargames, plus "No JASSM for targeting moving ships."

Source: CSIS Defense and Security Department.

Definitions of rows in coalition escalation:

- **Taiwan defends its homeland:** Taiwan confines its actions to its territory and territorial waters.
- **Taiwan buys ships:** Taiwan buys ships on the open market to replace losses, particularly buying older ships that might otherwise have been scrapped.
- **Transshipping in Japan:** Taiwan and the United States can transfer cargo from vessels in normal global trade to those vessels willing to accept the risk of running the blockade.
- **Taiwan offensive:** Taiwan escorts convoys through the exclusion zone and can fire at Chinese forces if the escorts or their charges are fired upon or boarded.
- **Ship detachments:** Taiwan can hire private military contractors (PMCs) to provide ship detachments to protect against Chinese harassment. U.S. military provides detachments when the United States takes an active role.
- **U.S. provides real-time targeting intelligence:** Currently, the United States provides strategic intelligence to Taiwan. Here, the United States would provide Taiwan with intelligence that is precise and timely enough for targeting.
- **U.S. operations from bases in Japan:** The United States conducts different kinds of operations depending on the escalation level.
- **U.S. mine clearing:** The United States assists Taiwan in clearing mines within Taiwanese territorial waters and international waters.
- **U.S. ship reflagging:** The United States reflags ships from other nationalities to put them under its control and protection and to provide subsidized insurance and war risk benefits to companies and crew.
- **U.S. equipment aid**: Previously contracted foreign military sales continue at all escalation levels. In "Ukraine" variants, the United States uses drawdown authority to send Taiwan weapons and equipment from existing inventories.
- **Sanctions/economic retaliation:** Using standard diplomatic tools.
- **Voluntary Intermodal Sealift Agreement (VISA)/Ready Reserve Force (RRF):** The chart shows the scenarios in which these are activated. Once activated, there is no restriction on numbers. The United States mobilizes as many ships as necessary to meet the demands of the conflict.
- **U.S. escort plus "safe corridor":** The United States provides escorts through the exclusion zone and declares safe corridors for merchant ship operations of all countries.
- **U.S. forces allowed on Taiwan:** Although there are several hundred U.S. troops on Taiwan day-to-day conducting liaison and training activities, that number has been tightly controlled because China would regard the placement of significant U.S. forces on Taiwan as a major provocation. With this authorization, the United States/coalition can move forces to Taiwan if they can get there.

- **U.S. attacks PLA shooters in the exclusion zone:** U.S. kinetic operations are authorized but only within the exclusion zone defined by China. This reduces the possibility of horizontal escalation.
- **Coalition ROE:** These are the ROEs under which U.S. allies and partners, other than Japan, operate. "Defensive only" means that forces defend themselves if attacked.
- **Japan Maritime Self-Defense Force (JMSDF) participation:** Although Japan allows the United States to use its bases there for military operations, the JMSDF does not participate unless China attacks Japanese territory.
- **U.S. counterblockade:** Any increase in tensions, and especially the outbreak of kinetic operations, would disrupt maritime trade. Here, the United States intentionally restricts China's merchant trade.
- **U.S. strikes everywhere, including in Chinese territorial waters and mainland:** The United States is not restricted to attacks inside the exclusion zone.

Appendix F

Stance of Other Countries

The policies and actions of other countries are important because their presence and support can strengthen the United States' position. Conversely, the attitude of adversaries can make the U.S. position more difficult.

Allies and Partners

The positions of allies and partners are separated into three levels of involvement to provide nuance. "Fight" means that the country will send warships and use kinetic force to defend shipping. "Sail" means that a country will send government-controlled merchant ships to support freedom of navigation, but not warships. "Support logistically" means allowing access to bases, where agreements exist, providing maritime logistic services, and authorizing overflights. "Support diplomatically" means criticizing China and enforcing any sanctions that arise. Table F.1 shows the base case, an unprovoked blockade.

Interviews with experts over the course of the games indicated that countries would be reluctant to become involved without U.S. participation. Even medium-sized powers like Japan were just too small to risk taking on China militarily and economically alone. The analyses in Table F.1, therefore, assume U.S. participation at some level.

Table F.1: Summary of Allied and Partner Actions in a Chinese Blockade of Taiwan

	Fight	Sail	Support Logistically	Support Diplomatically
Japan (no Chinese attack)		X	X	X
Japan (attacked)	X	X	X	X
Philippines			X	X
Australia	X	X	X	X
NATO/Europe			X	X
UK/France	X	X	X	X
Singapore			X	X
South Korea				X
Vietnam				X
India			Some	X

Source: CSIS Defense and Security Department.

Japan

Japan has grown increasingly concerned with the regional military balance. China's ambitions concerning Taiwan's and Japan's "contested islands" have led Japan to rearm and expand its military forces after decades of restraint. Japan's alliance with the United States constitutes the backbone of Japan's national security strategy, and the two countries are likely to work extremely closely in a blockade situation. However, due to domestic political concerns and a skittish public, Japan is unlikely to engage China militarily unless attacked directly.

> **Base case:** Japan allows its ports to be used as transshipment points. It also allows the United States to use U.S. bases in Japan for both offensive and defensive operations. However, the JSDF does not participate unless China attacks Japan.

Philippines

The Philippines is much closer to the United States under the Marcos administration than under the Duterte administration, which leaned toward China. Further, the Philippines has experienced continuous tension with China over competing territorial claims in the Second Thomas Shoals.[69] China's harassment of Philippine resupply efforts has been highly aggressive.

> **Base case:** The Philippines allows the United States to use the nine bases in the islands covered under a U.S./Philippine agreement, but only for defensive and humanitarian

69 "Philippines: Calming Tensions in the South China Sea," International Crisis Group, May 23, 2024, https://www.crisisgroup.org/asia/south-east-asia/philippines-south-china-sea/philippines-calming-tensions-south-china-sea.

purposes. It does not allow U.S. offensive operations from its territory and will not participate operationally itself because of its military weakness and vulnerable position.

Australia

Australia has a close economic and security relationship with the United States secured by many treaties, including the 1951 ANZUS treaty and the 2021 AUKUS agreement. The Australian government's official position has been strongly supportive of the United States.[70] However, there are countervailing concerns about whether Taiwan constitutes a vital interest for Australia, so the final decision in a crisis cannot be predicted with certainty.

> **Base case:** Australia provides one destroyer and one frigate, arriving at the beginning of week four, to support convoys.

NATO

Predicting NATO's reaction is difficult because of a split between the organization and the attitudes of the European population, as revealed by polling. NATO has expressed concern about China's aggression: "We strongly oppose any unilateral attempts to change the status quo by force or coercion in the East China Sea. . . . Our basic positions on Taiwan remain unchanged, and we emphasize the importance of peace and stability across the Taiwan Strait as an indispensable element in security and prosperity in the international community."[71] The United Kingdom and France—subsets of NATO and Europe—still have global interests, and the Royal Navy and the French Navy have made deployments to the Pacific as a result.

However, "strongly oppose" does not necessarily mean with military force. Polling by the European Council on Foreign Relations found that 62 percent of Europeans would want to remain neutral in a potential conflict between the United States and China over Taiwan. By contrast, 55 percent see Russia as an adversary.[72] European populations are far more focused on the near threat than the far threat.

> **Base case:** A middle ground is adopted. The United Kingdom and France each send two destroyers/frigates for freedom of navigation operations, with the ships available for operations at the beginning of week nine. The other NATO nations provide diplomatic support only.

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70 Stephen Dziedzic, "Australia backs Taiwan in Senate motion likely to infuriate China," Australia Broadcasting Corporation, August 21, 2024, https://www.abc.net.au/news/2024-08-22/australia-backs-taiwan-in-senate-motion-likely-to-anger-china/104255756.

71 Mark Rutte and Shigeru Ishiba, "Joint Press Statement," NATO, April 9, 2025, https://www.nato.int/cps/en/natohq/opinions_234396.htm.

72 Jana Puglierin and Pawel Zerka, "Europeans' views on how their country should respond to a potential conflict between US and China over Taiwan" in "Keeping America close, Russia down, and China far away: How Europeans navigate a competitive world," European Council on Foreign Relations, June 7, 2023, https://ecfr.eu/publication/keeping-america-close-russia-down-and-china-far-away-how-europeans-navigate-a-competitive-world/.

Singapore

Although strongly aligned with the United States after the United Kingdom withdrew in the 1970s, it must nevertheless be careful because of its small size and large Chinese minority. As one commentator noted, "The Republic of Singapore is an indispensable partner for the United States but not an ally."[73]

> **Base case:** Singapore would allow the United States to use its port facilities there but would not participate in any operations.

South Korea

South Korea's president has said that the country will not participate in a conflict with China over Taiwan but would instead focus its efforts on maintaining deterrence against any North Korean action.[74] The wargame base case assumes, as in the previous wargames, that U.S. forces remain on the peninsula except for two of the four fighter squadrons, which can redeploy.

> **Base case:** There is no South Korean military involvement and no U.S. military operations from South Korean territory, but South Korea would join some diplomatic protests against China's action.

India

India is a major regional power with a long history of border clashes with China. Its actions would be important in any Pacific conflict; however, its long history of non-alignment would make active participation unlikely. India would most likely support Taiwan in non-military ways, such as trade sanctions, but it would need to be consulted and feel it had agency in choosing the types of sanctions. It gets harder for India if the United States and traditional allies present a predetermined package of sanctions. A coalition—for example, with Japan, Australia, perhaps key Southeast Asian nations, and elements of NATO on board—makes India's cooperation more likely, allowing some light logistics and quiet intelligence support.[75]

The disputed India/China border is a wild card. While China reportedly began to withdraw from new positions it had taken in the last five years, India's maintenance of a force presence in the region will cause China to divert some of its military forces to its west/southwest border. For instance, reports indicate China has J-20 stealth fighters near the border.[76]

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73 Blake Herzinger, "Friends, Partners, But Not Allies," U.S. Naval Institute, Proceedings 149, no. 1,443, 2023, https://www.usni.org/magazines/proceedings/2023/may/friends-partners-not-allies.

74 Jung H. Pak, Trying to Loosen the Linchpin: China's Approach to South Korea (Washington, DC: Brookings Institute, 2020), https://www.brookings.edu/research/trying-to-loosen-the-linchpin-chinas-approach-tosouth-korea/.

75 "Three Indian Shipyard Wins U.S. Navy Approval for Ship Repairs," Maritime Executive, April 9, 2024, https://maritime-executive.com/article/third-indian-shipyard-wins-u-s-navy-approval-for-ship-repairs.

76 "Satellite images show China's J-20 stealth fighters near Indian border in Sikkim," Economic Times, May 30, 2024, https://economictimes.indiatimes.com/news/defence/satellite-images-show-chinas-j-20-stealth-fighters-near-indian-border-in-sikkim/articleshow/110569521.cms?from=mdr.

Base case: India provides diplomatic support and light logistics, but no more.

Adversaries

China has few allies or partners, but three are worth discussing: Russia, North Korea, and Iran. Given China's past aid to them in crises, all would back China. For purposes of the wargame, these countries might take one of three postures, as shown in Table F.2:

- **Diplomatic support:** Voting with China in the United Nations and other international organizations; ostentatiously complying with China's exclusion zone and related requirements; and refusing to support any criticisms or sanctions against China.
- **Covert military aid:** Diplomatic support, plus sending equipment, intelligence, and specialists, but done quietly.
- **Overt military aid:** Diplomatic support and covert military aid, plus sending forces and participating kinetically, if necessary, as well as coordinating military operations.

Table F.2: Summary of Adversary Actions in a Chinese Blockade of Taiwan

Country	Overt Military Aid	Covert Military Aid	Diplomatic Support
Russia		X	X
North Korea		X	X
Iran			X

Source: CSIS Defense and Security Department.

Russia

China has supported Russia covertly during the Russo-Ukrainian War, so Russia would likely reciprocate.[77] It would also help China diplomatically, particularly since China's attitude toward Taiwan is analogous to Russia's attitude toward Ukraine. However, Russia would not provide any overt military support. Its forces in the Pacific are weak, its territory is exposed, and regardless of how the war in Ukraine resolves, Russia will need years to rebuild its exhausted military.[78]

77 "China's Position on Russia's Invasion of Ukraine," U.S.-China Economic and Security Review Commission, last modified June 11, 2025, https://www.uscc.gov/research/chinas-position-russias-invasion-ukraine.

78 Igor Delanoe, "Russia's Navy in the Pacific: the Forgotten Fleet?," U.S. Naval Institute, Proceedings 144, no. 1,385, 2018, https://www.usni.org/magazines/proceedings/2018/july/russias-navy-pacific-forgotten-fleet.

North Korea

China is North Korea's primary patron, and North Korea relies on China to sustain its economy.[79] North Korea will therefore likely provide China with whatever it needs short of supplying military forces. That would be risky because of the constant tensions on the Korean Peninsula. North Korea might ratchet up tensions to distract the United States and Japan from activities around Taiwan. However, North Korea would not move south because it would be betting the regime's survival, something the Kim dynasty has been loath to do.

Iran

Iran cannot provide much tangible aid because of the distance. Further, tensions with Israel, the United States, and Gulf countries will keep Iran focused on regional matters.

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79 Anton Sokolin, "North Korea's economic dependence on China reached new heights in 2023: Report," NK News, July 22, 2024, https://www.nknews.org/2024/07/north-koreas-economic-dependence-on-china-reached-new-heights-in-2023-report/.

Appendix H

Calculating the Effect of Chinese Attacks on Taiwan's Energy System

This appendix begins with an outline of Taiwan's current system of electricity production and distribution and efforts to make it more resilient. It then analyzes how Chinese air attacks might degrade Taiwan's electrical system and how quickly capacity could be restored. This analysis is based mainly on after-action reports from the 1991 Persian Gulf war, supported by data from the German and Japanese experiences in World War II and Ukraine's experience coping with Russian attacks in the current conflict.

The bottom line of the analysis is that every ton of munitions dropped would reduce electricity capacity by 8.2 megawatts (MW), and Taiwan could restore 1,920 MW per week.

Taiwan's Electrical System

Because electricity drives so much of the economy, the electrical system received close attention in the module of the wargame assessing a blockade's effects on Taiwan's society and economy. This section provides some of the background that went into developing that module.

Characteristics and Organization

Taiwan's electrical grid, illustrated in Chart H.1, has an installed capacity, or maximum production level, of 64,000 MW.[80] Fossil fuels like coal and gas drive over 80 percent of this production. The state-sponsored Taiwan Power Company (Taipower) manages energy transport, distribution

80 "Power Development Planning," Taiwan Power Company, last modified February 11, 2025, https://www.taipower.com.tw/2764/2826/2829/2834/25101/normalPost.

networks, and most of the island's generation facilities, including thermal plants, limited nuclear units, and renewable sources like wind and solar. Independent power producers contribute 14 percent of Taiwanese electrical production from hydroelectric, coal-fired, and liquified natural gas (LNG) plants that feed into Taipower's networks.[81]

Three extra-high-voltage (EHV) transmission lines form the backbone of Taiwan's grid, running primarily north-south to transport electricity from rural generation hubs to semiconductor facilities and dense cities in the north.[82] Less powerful transmission lines connect electricity substations to urban and industrial infrastructure, while secondary substations distribute electricity to lower-voltage customers, households, and businesses.[83] A map showing the system can be found on Taiwan Power Company's website.[84]

Taiwan imports nearly 97.7 percent of its energy supply, making the island highly vulnerable to supply chain and maritime traffic disruption.[85] To store its imported energy supply, Taiwan has LNG and coal stockpiles located on its west coast. The placement of these stockpiles on Taiwan's west coast, and therefore their proximity to Chinese military bases, makes them particularly vulnerable to an attack or blockade. Taiwan's LNG inventory would last for 11 to 14 days of average consumption, while coal reserves would last 40 to 42 days.[86]

Taiwan's electrical system—or that of any country—has three components.[87] The first component is electricity production. The second component is the transmission system that gets the electricity from where it is produced to the region where it is used. Finally, the distribution system links individual facilities to the electrical system.

Dependencies, Vulnerabilities, and Weaknesses

Taiwan's centralized electricity infrastructure has great value for efficient operations but creates vulnerabilities, as demonstrated in a March 2022 blackout. A circuit malfunction at the Hsinta Power Plant affected a transmission substation, causing cascading failures across southern Taiwan's

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81 "Electricity Purchase Overview," Taiwan Power Company, last modified August 9, 2024, https://www.taipower.com.tw/2764/2826/2842/2847/25155/normalPost.

82 Hwa Meei Liou, "The Development of Electricity Grid, Smart Grid and Renewable Energy in Taiwan," Smart Grid and Renewable Energy 8, no. 6 (2017): 163-177, https://doi.org/10.4236/sgre.2017.86011.

83 "Electrical Grid Supply Information," Taiwan Power Company, last modified January 3, 2019, https://hc1.taipower.com.tw/2764/2826/2829/2833/25095/normalPost.

84 "Power Plants and Grid Map," Taiwan Power Company, Accessed June 1, 2023, https://www.taipower.com.tw/2764/2809/2814/25012/normalPost.

85 Walker Robinson, "Energy Is the Achilles' Heel of Taiwan's National Security," Newsweek, June 11, 2024, https://www.afpc.org/publications/articles/energy-is-the-achilles-heel-of-taiwans-national-security.

86 Yun-Ling Ko and Chia-Wei Chao, "Navigating Geopolitical Turbulence through Taiwan's Energy Transition Policy," China Observers in Central and Eastern Europe, May 20, 2025, https://chinaobservers.eu/navigating-geopolitical-turbulence-through-taiwans-energy-transition-policy/; and Jane Rickards, "Taiwan worsens its vulnerability to a Chinese energy blockade," Australian Strategic Policy Institute, May 13, 2025, https://www.aspi.org.au/strategist-posts/taiwan-worsens-its-vulnerability-to-a-chinese-energy-blockade/.

87 "Electrical Grid Supply Information," Taiwan Power Company, January 3, 2019, https://www.taipower.com.tw/2764/2826/2829/2833/25095/normalPost.

power plants and transmission systems that left millions without power.[88] Above-ground EHV lines, distribution networks, and substations are weak points where targeted attacks could paralyze the national grid.

Taiwan's energy resiliency is further compromised by its dependence on fuel imports. The limited inventory capacity and coastal concentration of LNG terminals and coal ports magnify this vulnerability. In a total blockade where no imports reach the island, Taiwan would have only 15 percent of its pre-blockade electricity production once inventories of natural gas and coal run out.

Since its electricity production relies heavily on coal and gas, Taiwan's electricity infrastructure is centralized around a few key plants and distribution networks. Despite their potential to reduce strain on this central system and minimize the impact of major plant or EHV transmission line disruptions, implementation of solar and wind capacity has been slow, and nuclear energy faces political resistance.[89]

To cope with system failures, Taipower implements power rationing and planned outages when necessary.[90] In the event of power rationing, Taipower would first reduce the power supply to business customers with loads more than 5 MW by 5 percent, followed by a 5 percent reduction to those consuming between 1 and 5 MW if the problem persists.[91] Taiwan's energy systems operate with particularly slim reserve margins—the buffer between generation capacity and energy demand—reaching as low as 1.64 percent.[92] Fifteen percent is considered a healthy reserve margin.

Taiwan's Resilience Initiatives

Recognizing these vulnerabilities and impelled by widespread blackouts, Taipower launched its Grid Resilience Strengthening Construction Plan in 2022, committing NTD $564.5 billion (USD $18.9 billion) to make Taiwan's energy network more resilient.[93] This 10-year plan focuses on decentralizing the transmission system, burying central lines to protect them from typhoon damage, increasing energy storage, and building local renewable energy facilities.[94] By connecting offshore wind farms directly to industrial centers, Taipower aims to improve grid resiliency and reduce dependence on the vulnerable EHV backbone. While environmental and economic

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88 Lisa Wang, "Taipower unveils power resiliency plan," Taipei Times, September 16, 2022, https://www.taipeitimes.com/News/biz/archives/2022/09/16/2003785374.

89 Jordan McGillis, "Taiwan's Electrical Grid and the Need for Greater System Resilience," Global Taiwan Institute, June 14, 2023, https://globaltaiwan.org/2023/06/taiwans-electrical-grid-and-the-need-for-greater-system-resilience/.

90 "Power Rationing Information," Taiwan Power Company, last accessed May 21, 2025, https://www.taipower.com.tw/2764/2826/2850/2852/25158/normalPost.

91 Samson Ellis and Chinmei Sung, "Sweltering Taiwan's Power Squeeze Risks First Rationing Since 2002," Bloomberg NEF, August 9, 2017, https://about.bnef.com/blog/sweltering-taiwans-power-squeeze-risks-first-rationing-since-2002/.

92 "The Electric Power Supply and Demand Report of Taiwan 2018," Taiwan Ministry of Economic Affairs, https://www.moeaea.gov.tw/ECW/main/content/wHandMenuFile.ashx?file_id=7047.

93 "Taipower Announces Grid Resilience Strengthening Construction Plan, with NT$564.5 Billion Investment Over 10 Years, Preventing Recurrence of Massive Power Outages," Taiwan Power Company. https://www.taipower.com.tw/2764/2804/2805/24982/normalPost.

94 McGillis, "Taiwan's Electrical Grid and the Need for Greater System Resilience."

concerns drive these modernization efforts, they would also harden the electrical system against Chinese attack.

Case Studies in Damage and Repair of Electrical Systems

This section examines the historical experiences of electricity systems under attack to ascertain how much degradation a certain amount of bombing will produce and how quickly the system can be restored. This was a critical element in the wargame module estimating the effects of blockade on Taiwan's economy and society because air attacks on the island could easily accompany a blockade. Historical case studies were necessary because, except for Ukraine, little contemporary information is available.

Iraq's Experience in the Gulf War

In 1990, Iraq's electrical grid had a 9,500 MW generation capacity from 28 power stations and five switch stations. Between January 17 and February 28, 1991, U.S. and coalition air power delivered 1,350 tons of bombs on Iraq's electrical system.[95]

Unguided bombs dropped from aircraft with advanced fire-control systems, which made up 77 percent of the total tonnage, caused damage comparable to that of precision-guided munitions (23 percent of total tonnage).[96]

Most precision strikes occurred in the first two weeks of the campaign and employed Tomahawk Land-Attack Missiles (TLAMs). Many of Iraq's largest power plants were damaged or shut down after these initial strikes. Even in cases where generators or turbines survived initial attacks, damage to switching stations and transmission systems isolated them from the power grid. The first two weeks of bombing delivered 920 tons and reduced Iraqi power generation by 75 percent, or 8.2 MW per ton dropped.

Numerous restrikes and attacks on smaller plants rendered the Iraqi power grid virtually nonfunctional; at the end of the campaign, the power grid was reduced to 15 percent of prewar generation capacity, or 1,425 MW.[97] The lasting impact of these air strikes against the power grid was especially pronounced because the underlying infrastructure was fragile and air defenses were quickly depleted, thus allowing more accurate bombing.

Repairs to the power grid were slow due to sanctions, unreliable equipment, and a limited supply of spare parts. Between the end of February 1991 and September 1991 (24 weeks), Iraq was able to

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95 Eliot A. Cohen, ed., Gulf War Air Power Survey (Washington, DC: U.S. Government Printing Office, 1993), vol. 5, A Statistical Compendium, 418–461.

96 U.S. Government Accountability Office, "Chemical and Biological Defense: U.S. Forces Are Not Adequately Equipped to Detect Chemical and Biological Attacks," NSIAD-97-134, June 1997, 160, https://www.gao.gov/assets/nsiad-97-134.pdf.

97 Cohen, Gulf War Air Power Survey, vol. 2, Part II, Effects and Effectiveness, 302–303.

restore only 86 MW every week, or about one percent per week of initial capacity.[98] Despite the partial restoration, the peak electrical demand (68 percent of prewar levels) was still higher than its generation capacity (39 percent of prewar levels), which left the grid vulnerable to shortages and blackouts.

Germany's Experience in World War II

The experiences of the German and Japanese systems in World War II might be more analogous to Taiwan, as both were technically sophisticated societies. While damage per ton in World War II is less relevant given advances in fire control and precision weapons, the restoration rate is relevant.

In October 1944, Allied bombing dropped more than 60 tons of bombs on Germany's Goldenberg electrical plant. Goldenberg was the largest plant in Germany and had a generation capacity of 496,000 KW (496 MW) before the attack. After three months of repairs, approximately 27,000 KW, or 5.4 percent of capacity, was back in operation. This averages 0.42 percent of capacity restored per week. Despite additional repair, Goldenberg's generation capacity remained around 27,000 KW into 1945 due to a lack of transmission lines.[99]

Looking at a different energy system, Allied bombing dropped 238 tons of bombs on Germany's largest oil refinery and synthetic fuel production plant in May 1944. After the initial attack, repairs were able to restore 50 percent of normal production per week. However, this rapid reconstitution was possible only when repair activities were uninterrupted. When later attacks delivered an additional 640 tons of bombs, repairs could only restore approximately 6.5 percent of output per week.[100]

Japan's Experience in World War II

Japan's electric system was not a primary strategic target of aerial bombing during World War II, although some production and transmission infrastructure was damaged. Bombing of urban areas reduced industrial activity and consequently lowered energy demand. Unlike U.S. wartime energy consumption, which grew by 33 percent between 1941 and 1943, Japan's consumption grew only 3 percent (peaking in 1943).[101] The decline of industrial function and the relative survival of Japan's energy grid created an energy surplus after the war.

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98 Walid Doleh et al,, "Electrical Facilities Survey," in International Study Team, Health and Welfare in Iraq After the Gulf Crisis: An In-Depth Assessment (Oct 1991), 2, https://www.cesr.org/sites/default/files/Health_and_Welfare_in_Iraq_after_the_Gulf_Crisis_1991.pdf.

99 United States Strategic Bombing Survey, Goldenberg Thermal Electric Power Station at Knapsack near Cologne, Germany. Physical Damage Report no. 23 (1945): https://hdl.handle.net/2027/nyp.33433032060950

100 Peter Kelly, "The United States Army Air Force bombing campaign against the Leuna Synthetic Fuel Plant in 1944-45 and the German response," Journal of Military History and Defence Studies 4, no. 1 (2024): p149, https://doi.org/10.33232/JMHDS.4.1.83.

101 United States Strategic Bombing Survey (Pacific), Electric Power Division, The Electric Power Industry of Japan (Washington, DC: U.S. Government Printing Office, 1946), 7, https://www.google.com/books/edition/The_Electric_Power_Industry_of_Japan/qEeUwQEACAAJ?hl=en&gbpv=1.

Air strikes reduced Japan's generation capacity by 1,500 MW, or 15 percent of its prewar levels. However, damage to electrical infrastructure was often the result of stray bombs from attacks on adjacent facilities.[102] Hydroelectric stations, which accounted for 83 percent of energy produced in 1943, sustained limited damage. These stations, which consisted of small generators with individual capacities scattered across complex terrains, were impractical targets. Transmission and distribution networks suffered more extensive damage than power plants but often as inadvertent casualties of air strikes on other targets. Transmission and distribution stations accounted for 1,161 MW, or 77 percent of total capacity lost to aerial bombing.[103]

The blockade-induced fuel shortage played a larger role in limiting energy production than air strikes. Japan's fuel supply was largely seaborne as Taiwan's is today, making it highly vulnerable to shipping attacks. In 1942, Japan's central utility company maintained a three-month supply of over 1 million tons of coal. By February 1945, it had only 224,000 tons, a two-week supply at that year's reduced wartime consumption rate.[104]

Ukraine's Experience in the Russo-Ukrainian War

Before 2022, Ukraine was one of Europe's largest energy producers, with 59 gigawatts (GW) of installed capacity, despite an energy demand of only 26 GW.[105] More than 70 percent of Ukraine's power came from nuclear and thermal plants, supported by a smaller number of hydroelectric and renewable generators. Since Russia's February 2022 invasion of Ukraine, however, approximately two-thirds of Ukraine's energy capacity destroyed by Russian drone and missile attacks or is under Russian control.[106]

Since October 2022, Russia has launched thousands of attacks against Ukrainian energy infrastructure, disrupting more than 1.5 million Ukrainians' access to electricity and, in some cases, causing widespread power outages. Russia typically deploys long-range ballistic or cruise missiles or long-range loitering drones to attack Ukraine's generating facilities and key distribution substations. As of the summer of 2024, Ukrainian frontline communities experienced blackouts for up to 12 hours daily.[107] These impacts were likely exacerbated in the new year after Russia began another massive air campaign, launching nearly 1,000 Shahed drones against Ukraine's energy sector every week.[108]

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102 Ibid., 5.

103 Ibid., 5, 6, 80.

104 Ibid., 44.

105 Iryna Doronina et al., "Why Renewables Should Be at the Center of Rebuilding the Ukrainian Electricity System," Joule 8, no. 10 (2024): 2715–20, https://doi.org/10.1016/j.joule.2024.08.014; and United Nations Human Rights Office of the High Commissioner, Attacks on Ukraine's Energy Infrastructure: Harm to the Civilian Population (Geneva: OHCHR, September 2024), https://ukraine.ohchr.org/sites/default/files/2024-12/ENG_Attacks_on_Ukraine%E2%80%99s_Energy_Infrastructure_Harm_to_the_Civilian.pdf.

106 International Energy Agency, Empowering Ukraine Through a Decentralized Electricity System (Paris: IEA, 2024), https://www.iea.org/reports/empowering-ukraine-through-a-decentralised-electricity-system.

107 OHCHR, Attacks on Ukraine's Energy Infrastructure.

108 Benjamin Jensen & Yasir Atalan, "Drone Saturation: Russia's Shahed Campaign," CSIS, CSIS Brief, May 13, 2025, https://www.csis.org/analysis/drone-saturation-russias-shahed-campaign.

Repeated attacks make wartime recuperation nearly impossible. As of March 2025, Ukraine is reported to have restored only 5 GW of the more than 25 GW in lost production capacity.[109] International support has played a critical role in mitigating energy disruption. Weeks after Russia's full-scale invasion, Ukraine was able to synchronize with the European Network of Transmission System Operators for Electricity (ENTSO-E) to source energy, an option unavailable to Taiwan.[110] Rebuilding Ukraine's energy capacity to prewar levels will be a costly, long-term struggle. In February 2025, analysts estimated repair costs of $68 billion.[111]

Conclusion

The project settled on a restoration rate of 3 percent per week, or 1,920 MW of capacity in Taiwan's case. This was substantially higher than Germany's or Iraq's experience, though not as rapid as Germany's restoration of its oil industry. Taiwan is much richer and better positioned than Iraq, which had a frail economy after years of war and dictatorship. Germany was wealthy and technologically sophisticated but had experienced years of bombing, and its economy was focused on wartime production. Ukraine's experience might be applicable because of the constant destruction and repair of that system. The fact that Ukraine has been able to keep the lights on at all in the face of repeated attacks indicates a strong recovery capability.

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109 Caspar Hobhouse, "Keeping the Lights on: How Ukraine Can Build a Resilient Energy System (and Why This Matters to the EU)," European Union Institute for Security Studies, March 28, 2025, https://www.iss.europa.eu/publications/commentary/keeping-lights-how-ukraine-can-build-resilient-energy-system-and-why.

110 International Energy Agency, Ukraine's Energy Security and the Coming Winter (Paris: IEA, 2024), https://www.iea.org/reports/ukraines-energy-security-and-the-coming-winter.

111 "Updated Ukraine Recovery and Reconstruction Needs Assessment Released," World Bank Group, February 25, 2025, https://www.worldbank.org/en/news/press-release/2025/02/25/updated-ukraine-recovery-and-reconstruction-needs-assessment-released.

Appendix I

Turn-by-Turn Descriptions of Free-Play Games

Because teams in the free-play games had more latitude for decisionmaking, it is worth describing those games in detail. The descriptions will also give readers a sense of what gameplay was like.

All convoys run from Japan to Taiwan unless otherwise stated. Acronyms are the same as covered in the main text, with the addition of TW = Taiwan, JP = Japan.

Chart I.1: Free-Play Game 1, April 24, 2025

	China	United States	Japan	Taiwan
Week 1	– Joint Fire Power Strike (JFPS) on Taiwan destroys most of ROCAF// ROCN	– Mobilizes forces, but not authorized to strike PLA	– Mobilizes forces, but not authorized to strike PLA	– Strikes PLAN/ PLAAF assets within range
Week 2	– Attacks Taiwan's military/power infrastructure with CRBMs – Authorizes PLAAF to strike U.S. planes entering Taiwan airspace	– Runs convoys from Japan to Taiwan – MPAs around Taiwan – TACAIR on CAP over Taiwan – B-1/B-52 bombers strike Chinese SAG	– Allows transshipment to Taiwan via Japan	– Implements mandatory reductions in fuel usage throughout the economy – ASCMs strike any Chinese ships in range

Week 3	– Continues attacks against Taiwan's military and electrical infrastructure. – TBM attacks against U.S. bases in Japan; Japan enters the war.	– Reinforces convoys with more SAGs – Uses TACAIR, bombers, and subs to attack PLAN ships/subs	– Continues transshipment	– ASCMs strike any Chinese ships in range – Sends SAG to support convoy
Week 4	– Cyberattack on U.S. bombers and space-based infrared systems – TBM attack against Taiwanese ports and Japan – Attacks U.S. assets in Guam and near Taiwan	– Halts convoys – Attempts an attack on mainland China bomber bases (neutralized by cyber) – Lands MLR and MDTF on Taiwan – Fires TLAMs at Chinese airfields	– Puts TACAIR on CAP over Japan – Targets Chinese SAGs – Disperses naval forces – Sends forces for a coalition amphibious landing on Taiwan	– Electricity production down to 60 percent
Week 5	– Mass air strikes against convoy – Ships overwhelmed and pull back from forward positions in first island chain – TBMs against Guam and Japan	– CAP over convoy – Bombers attack air bases on mainland China – Massive fighter transfer into theater from CONUS – Moves bombers from Guam to Alaska for security	– Joins convoy with naval assets – Two SAGs in forward position	– Moves fast-attack craft into the Taiwan Strait – SAG escorts convoy – Electricity production at 75 percent

Source: CSIS Defense and Security Department.

Table I.2: Free-Play Game 2, May 1, 2025

	China	United States	Japan	Taiwan
Week 1	– CCG opens fire on convoy – Shoots down a humanitarian cargo plane	– Sinks a CCG Jiangdao with SM-6 in convoy scuffle – Partial airlift of humanitarian supplies	– Uninvolved	– Sails a convoy of five ships from Japan to Taiwan – Halts civilian air traffic over Taiwan

Week 2	– CCG helicopters attempt to board ships in convoy (shot down) – CGA/CCG convoy battle	– Airlift halted – With Taiwan, sends a convoy of TW-owned, U.S.-flagged ships – SM-6s sink two CCG ships	– Refuses to authorize the United States to launch combat operations from Japan	– With U.S., sends a convoy of TW-owned, U.S.-flagged ships – CGA/CCG convoy battle
Week 3	– Mass air and missile attack on Taiwan destroys much of the ROCAF/ROCN/ASCMs – Attacks Guam with LR missiles	– SSNs sink two Jiangkais – Runs convoy	– Assists convoy	– Communications degraded by China's missile attack – ROCAF protects convoy
Week 4	– TBM attacks on U.S. and JSDF aircraft on Japan – Convoy battle – Launches invasion of Penghu	– Attacks Chinese ports – Escorts convoy – Convoy battle	– Continues convoy assistance	– ROCAF squadron protects convoy – ASCMs destroy several Chinese amphibs

Source: CSIS Defense and Security Department.

Table I.3: Free-Play Game 3, May 2, 2025

	China	United States	Japan	Taiwan
Week 1	– Exchanges water cannon spray with CGA; brings boarded merchant ships to Chinese mainland – Orders aircraft traffic through Taiwan to divert	– Defers Taiwan's request to reflag ships – Sends chartered aircraft with arms shipment to Taiwan	– Denies permission for Taiwanese aircraft and ships to operate from Japan	– Purchases ships – Mobilizes ships – Runs convoy from Guam
Week 2	– Does not release ships from inspection – CCG/CGA convoy battle; cargo ships brought to mainland – Tech and trade proposal to Japan	– First U.S.-owned and purchased ships arrive in theater – Freezes Chinese assets in U.S.	– Uninvolved	– First Taiwan-owned and -purchased ships arrive in theater – CCG/CGA convoy battle – Curtails semiconductor exports to China

Week 3	– Convoy Battle: CCG attacks convoy ships with deck guns; surviving Taiwanese ships sunk by submarines	– Reflags TW-owned energy ships and places PMC detachments on them – Armed UASs in ISR role	– Uninvolved	– Convoy battle: destroys CCG helicopters – Implements mandatory reductions in domestic fuel usage
Week 4	– PLAN/PLAAF trade fire with ROCAF – Massive missile attack on Taiwan with CRBMs – PAFMM approaches Taiwan ports	– Two C-17 SQNs with military equipment fly into Taiwan each day – Initiates counter-blockade on tankers headed to China	– Freezes Chinese assets in Japan	– ROCAF attacks CCG – ROCN patrol boats and ASCMs attack approaching PAFMM
Week 5	– Expands JFPS attacks to energy infrastructure – Executes SEAD missions	– Expands the distant blockade from tankers to all China-flagged ships – Prepares to strike Chinese infrastructure near Suez, Panama, and Singapore	– Expands sanctions on China	– ROCAF sorties destroy CCG ships – Continues mandatory reductions in fuel usage

Source: CSIS Defense and Security Department.

Table I.4: Free-Play Game 4, June 2, 2025

	China	United States	Japan	Taiwan
Week 1	– Sends warships and aircraft forward – Submarines leave mainland ports – Moves two SAGs to the Straits of Malacca	– Puts subs out to sea – Initiates counter-blockade of China – VBSS boards seven Chinese ships	– Sanctions China – Runs CAP over its own territory – Mobilizes ships for humanitarian aid	– Ends cross-strait trade – Rations fuel – Raises alert levels – Fishing vessel sunk by sea mine

Week 2	– Cyberattacks on Taiwan – Confronts JP humanitarian convoy; has Chinese SAG escort humanitarian convoy – Sinks JP oil tanker, TW FFGs	– Airlifts Patriot battery to Taiwan – Hunts Chinese subs – Sends U.S. military advisers to Taiwan – Terminates trade with China	– Sends humanitarian convoy – Commits an oil tanker to travel to Taiwan with Taiwanese convoy	– Commits convoy to escort Japanese oil tanker – Sends merchant ships into exclusion zone with PMC detachments on board
Week 3	– Declares air blockade of TW – Negotiates with Taiwan – U.S./PLAN SAGs trade fire – U.S./PLAAF air battle	– Allows attacks on Chinese aircraft – CAP over Taiwan – B-2s destroy a Chinese SAG – U.S./PLAN SAGs trade fire – U.S./PLAAF air battle	– Continues sanctions and export restrictions – Expands submarine positions to the north of Taiwan	– Authorizes blockade running from the south – SAMs to target Chinese aircraft in Taiwan airspace
Week 4	– Negotiates with Taiwan	– Removes Patriot from Taiwan as part of negotiations	– Supports the United States in its negotiations with China	– President steps down

Source: CSIS Defense and Security Department.

Table I.5: Free-Play Game 5, June 4, 2025

	China	United States	Japan	Taiwan
Week 1	Occupies Quemoy/ Kinmen and Matsu Deploys mines Attacks convoy Air battle with Taiwan	Mobilizes RRF and VISA ships C-5 and C-17 flights into Taipei Moves squadrons from CONUS to Japan Convoy battle; merchants turn back	Purchases 15 cargo ships Mobilizes flagged ships for a coalition convoy with humanitarian aid	Purchases 12 cargo ships Ends cross-strait trade with China Convoy battle; merchants turn back Air battle with PLAAF

Week 2	U.S./China CAP battle JP/CCG convoy battle Sponsors rallies for reunification in Quemoy/Kinmen and Matsu	SAG and MPAs escort JP convoy CAP over convoy and Taiwan U.S./PLAAF air battle over convoy U.S./China CAP battle over Taiwan	Sends convoy of JP-flagged merchant ships Deploys additional forces to Okinawa JP/CCG convoy battle	Continues CAP over Taiwan Pro-reunification demonstrations at Taiwan's National University KMT calls for peace
Week 3	Agrees to joint escort of Japanese convoy into port in Taiwan Conducts bomber exercise at sea southeast of TW and north of Tindal Pulls back CSG and SAG	Agrees to Chinese and Japanese joint escort Conducts bomber exercise as demonstration Show of force; eight additional fighter squadrons escort convoy	Agrees to a joint convoy deal with China and US CAP around Kyushu and southern Japan	Maintains CAP only around island Accepts PLAN escorts of merchant shipping Convoy of 20 merchant ships arrives in TW
Week 4	Negotiates with Taiwan	Keeps forces deployed in Indo-Pacific Moves CSGs beyond second island chain	Calls for peaceful resolution of cross-strait issues acceptable to both sides Runs convoys without military escort	Negotiates with China

Source: CSIS Defense and Security Department.

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