

Ensuring America's Maritime Security

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KEY TAKEAWAYS

American shipping and shipbuilding have atrophied as we have neglected a core element of our security and prosperity: our historic maritime strength.

It is therefore imperative that we restore American maritime competitiveness in pursuit of a new multimodalism.

Doing this and hardening our maritime infrastructure will enhance the ability of the United States to deter Chinese economic coercion and military adventurism.

For too long, the United States has relied on less than friendly nations to transport its trade and has failed to invest adequately in its maritime industrial sector, including its ports. The costs of this neglect are plainly visible today with the nation's security and continued prosperity at risk. The recent collision (contact of a ship with a stationary object) by container ship *Dali* into Baltimore's Francis Scott Key bridge and the subsequent loss of life are only the most recent symptoms of this malaise.

Today, our nation's prosperity sails on others nations' ships while our ports rely on suspect Chinese cranes and potentially compromised logistic software that risks more than trade. From our ports sail the supplies needed to sustain military operations defending America's interests and citizens. Moreover, our ports and commercial ships serve a critical role in

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any disaster response, moving supplies to areas hit hard as Puerto Rico was by 2017's category five hurricane Maria.

Our maritime situation is a strategic vulnerability that China could use as leverage against us. A Chinese proverb says it best, with the borrower being a disadvantaged United States:

“Borrowing a boat to go out on the Ocean [借船出海].”

Key Vulnerabilities

The U.S. is vulnerable to Chinese economic coercion because of overreliance on foreign shipping. On top of that, the maritime sector is anemic and unable to respond to national crises without urgently needed investment. As a maritime nation, we have fallen far. Today, no U.S. port ranks in the top 25 for cargo handling: China holds eight of those spots.¹ Asia—led by China—also has the most vibrant maritime sector with the most commercial shipping entrants.²

The point is not that our ports do not meet today's need in general; the point is that a lack of competitiveness has not generated the vibrancy either to modernize or to attract and recruit new mariners and the shipyard workers that we need. There are seven relevant vulnerabilities that must be addressed to ensure the nation's maritime security.

Vulnerability 1: Reliance on Foreign Shipping. Of the more than 80,000 ships arriving at American ports, fewer than 200 are U.S.-flagged, U.S.-owned, and U.S.-crewed.³ The U.S. Department of Defense (DOD) concluded in a 2020 Mobility Capabilities Requirement Study that there is insufficient U.S.-flagged tanker capacity to meet defense requirements, necessitating an enduring need for foreign-flagged tankers. This shortfall was confirmed in April 2023 testimony by the Commander of U.S. Transportation Command. The specific numbers are classified, but it has been reported that more than 80 tankers would be needed—a number that probably does not consider the upward demand on tankers from the closing of Red Hill fuel depot in Hawaii.⁴ This also says nothing of the potential need to sustain a wartime national economy, which would add to the required number of tankers as well as bulk carriers and container ships.

Making matters worse, a fractured domestic energy logistic network makes it harder to ensure that fuel reaches cities and states where it is needed. For instance, New England has almost no pipeline connectivity to domestic sources, and existing pipelines are maxed out.⁵ These pipelines are also prone to cyberattack as demonstrated by a successful May 2021 attack on the Colonial Pipeline. That incident stopped critical energy flows from Gulf Coast

refineries to New York City for six days.⁶ This situation makes movement of fuel by ship essential, but shipping might not be readily available.

Vulnerability 2: Limited U.S. Port Infrastructure. The ability of ports in the U.S. to service large container ships (for example, Panamax) and tankers is limited by water depth and access to rail, piers, and crane services. The loss of any one of these ports can therefore significantly disrupt the national economy and security. Disruption of the Port of Houston, for example, would impact over 70 percent of all maritime container trade in the Gulf Coast region.⁷ Such a disruption is playing out now with the closing of Baltimore harbor, which is a hub for imports from and exports to the mid-Atlantic, because of the March 26, 2024, allision. Added to the limited number of viable ports, specialization has made the loss of some ports hard to make up in others: Baltimore, for example, is a major port for automotive exports and imports.⁸

Despite the importance of our waterways and ports to the nation's economic well-being and security, the much-championed Build Back Better effort has only resulted in relatively minuscule amounts of funding. For example, at the end of 2023, after two years and \$400 billion spent, ports and waterways accounted for 4.3 percent of total budget and 1.1 percent of total projects supported.⁹

Vulnerability 3: Zero-Day Dangers in Shipyard Cranes. Recent reporting has exposed the potential cyber vulnerability built into Chinese-sourced heavy-lift cranes at U.S. ports. Chinese manufacturer ZPMC holds a dominant position in the global crane market and accounts for more than 70 percent of all ship-to-shore container cranes at U.S. ports.¹⁰ While it is common for heavy equipment to communicate system diagnostics autonomously with the parent company for predictive maintenance, this option was not part of ZPMC purchase agreements. This raises serious concerns in view of recent reports by U.S. Coast Guard Cyber Command of long-running, concerted Chinese efforts to access critical U.S. infrastructure, most notably the recent Chinese cyberattack known as Volt Typhoon.¹¹ Recent efforts have done much to expose this vulnerability, but compromised cranes are not the only vector available for cyber espionage and attack.

Vulnerability 4: China's LOGINK Digital Logistics Risk. Global transportation of goods occurs over various logistic functionalities: freight forwarding services, container/shipment tracking, and national customs data submissions via Port Single Windows. As a logistics management platform, LOGINK was designed to improve the cost efficiency of shipping cargo by consolidating various data streams, including price and tracking information.

From its inception in 2007, LOGINK has been a product of the Chinese Communist Party (CCP), with stewardship since 2019 shifted to the Ministry of Transportation's China Transport Telecommunication and Information Center (CTTIC [中国交通通信信息中心]).¹² To encourage LOGINK's adoption overseas, the CCP has offered it free of charge; since 2010, LOGINK has been adopted at more than 20 ports in Japan, South Korea, Malaysia, Portugal, Spain, the United Arab Emirates, Ukraine, Israel, Latvia, the Netherlands, and Germany.¹³ Widespread adoption of LOGINK standards would give the CCP a vector to access—and potentially even to manipulate or sever access to—logistic and trade data. Similar non-Chinese logistic management platforms include Flexport, FreightPOP, Shipwell, Freightview, and DHL Salodoo. None of these approaches the scope of LOGINK's data sources, but competitors like Gnosis Freight offer a compelling alternative as their access to data streams and ports increases.

If LOGINK were adopted in the U.S., it would be subject to the Ocean Shipping Reform Act of 2022.¹⁴ That act empowers the Federal Maritime Commission to regulate shipping exchanges beginning in 2025; as this paper was being written, LOGINK was not registered with the FMC. CCP control of LOGINK is a national security risk and exposes the nation to predatory market behavior. U.S. antitrust law has struggled to address China's anti-competitive behavior, especially by Chinese State-Owned Enterprises (SOEs), which have claimed sovereign immunity pursuant to the U.S. Foreign Sovereign Immunities Act (FSIA).¹⁵

Vulnerability 5: Navigational GPS Spoofing. The Heritage Foundation's Diana Furchtgott-Roth has written and spoken about the risk of GPS spoofing and has drawn attention to a particular vulnerability.¹⁶ In 2019, Iran spoofed the navigation system of the British tanker *Stena Impero* in the Strait of Hormuz.¹⁷ The ship's crew thought they were in international waters when they were in Iranian territory. Iran held the ship and its crew for 10 weeks. The same year, NATO military exercises in the Baltic Sea were disrupted by Russian GPS spoofing.

Good navigational practices would dictate system redundancies and independent backup navigational positioning such as radar fixes, visual fixes, and running fixes to prevent incidents such as the *Stena Impero*. Sophisticated GPS and other navigational spoofing represents a risk that calls for enforcement of sound navigational practices and backup measures to ensure that ships can navigate safely U.S. restricted waters.

Vulnerability 6: Fuel Tampering and Contamination. The March 26, 2024, allision of container ship *Dali* into the Francis Scott Key bridge in Baltimore has raised the specter of tampered fuel. Speculation over fuel

contamination on the *Dali* appeared after an exclusive report in *The Wall Street Journal* cited a U.S. Coast Guard briefing that talked of engines sputtering and the smell of burned fuel in the engine room.¹⁸ A May 14, 2024, preliminary incident report seems to indicate that fuel tampering was not to blame,¹⁹ but the investigation is ongoing, and improper fuel handling such as shifting between fuel tanks could just as likely be found to have caused the ship's loss of power.

Typically, commercial ships use higher-grade fuels in port to meet environmental requirements as well as for greater reliability, shifting to lower-grade fuels once they are in the open ocean. Switching fuels while still navigating in port would be a procedural violation as well as an opportunity for human operational error at a critical navigational moment. Improper maintenance or poor material conditions could also lead to the loss of propulsion and calls for further investigation. In this case, the consequences of the allision are the loss of six lives, billions of dollars in damages, and the shuttering of the tenth-largest U.S. port.

Vulnerability 7: Too Few Mariners and Shipyard Workers. The lack of enough mariners and shipyard workers has had a deleterious effect on attempts to grow the maritime industry. Moreover, the lack of enough American merchant mariners leaves the nation too reliant on foreign sealift to meet military operational needs and sustain a wartime economy if that becomes necessary.

A 2017 study released by the U.S. Maritime Administration pointed out that the nation had a deficit of 1,839 certified and fit-for-service mariners in case of war; the actual deficit is unknown and higher, as the 2017 study focused on the number of those needed to support military operations and did not include the number needed to sustain a wartime economy. As that merchant mariner population retires (the average American merchant mariner was 47 years old in 2021) and the nation's need for sealift grows proportional to a potential war with China, the mariner deficit becomes much worse.

Despite the danger, commercial shipyards and naval shipbuilders alike have faced endemic workforce shortages. This is driven by several factors: uncompetitive wages, too few young workers willing to work in the challenging conditions of America's antiquated and austere waterfronts, and too few Americans with the requisite technical skills (naval architects, welders, pipe fitters, etc.). The effect has been to outsource American shipping, shipbuilding, and maintenance to Chinese ports. The most notable in the recent past has been the retrofitting of three of U.S. company Matson's container ships by China's COSCO.²⁰ While doing repairs in or

procuring commercial ships from China may be cheaper, it also represents a potential vector for material and cyberattacks and furthers dependence on a rival nation.

Port Safety and Security and the Allision in Baltimore

While it has already been mentioned, the allision of the *Dali* in Baltimore harbor provides several key considerations for port safety and security.

- 1. Potentially contaminated fuel and poor handling controls.**
Potential fuel contamination and/or improper handling remains a risk for large commercial ships losing power in constrained waterways. The consequence is collision with other vessels or damage to critical maritime infrastructure such as bridges and gas pipelines.
- 2. Disaster consequence management and limited salvage capacity.** Loss of power on today's very large container ships represents a hazard that most U.S. infrastructure has not been designed to withstand. The Francis Scott Key bridge, for example, opened in 1977 and had no barriers (dolphins) protecting its supports. This contributed to its collapse, especially as commercial ships had assumed gargantuan sizes in the years since the bridge had opened. Critical ports must be ready to clear their restricted waterways of obstructions (collapsed bridges, sunk ships, etc.) rapidly to resume port operations. In a conflict or natural disaster, delays in regaining operations could be fatal. An example of what is needed is the floating cranes that began to arrive on scene several days after the *Dali* incident to remove bridge debris and free the *Dali*.²¹ The opening of a temporary channel in Baltimore to resume limited harbor operations also points to the need to have dredging equipment nearby.²²
- 3. Cyber vulnerabilities that need to be thoroughly investigated.** Cyberattacks need to be routinely investigated in shipping incidents. The December 2020 National Maritime Cybersecurity Plan was intended to address these vulnerabilities in the maritime sector and would have required forensic cyberattack investigations.²³ While terrorism was ruled out quickly in the *Dali* allision, investigation of cyberattacks is time-consuming, requires exquisite skills, and until recently has not been enforced. A month before the *Dali* allision, the White House issued Executive Order 14116 to bolster the cybersecurity

of U.S. ports by granting additional authorities to the U.S. Coast Guard.²⁴ The day after this order was issued, the Coast Guard posted proposed changes in cybersecurity regulation for public comment.²⁵

4. **Too many chances for Chinese malfeasance.** China-sourced parts and ship maintenance done in China provide a potential vector for material tampering that could enable future cyberattacks. The case of modems discovered on ZPMC cranes represents only the first of such cases. On the same day the President signed the maritime cyber security executive order and after a prolonged period of review, a maritime advisory on LOGINK and ZPMC cranes was finally issued.²⁶ Future advisories should be expected with the *Dali* investigation serving as a benchmark.
5. **Protection of American undersea port infrastructure.** After the *Dali*'s allision, bridge debris wedged the ship on the harbor bottom and against high-pressure gas lines.²⁷ This raises another port safety and security concern: how to harden this submerged critical infrastructure against damage from today's larger vessels and potential attack. The mishap investigation should verify that the port of Baltimore adequately resourced and effectively executed its security plans as mandated by the Maritime Transportation Security Act of 2002,²⁸ items of specific interest being the securing of the gas pipeline after the allision and pre-incident assessments of the ability of the Francis Scott Key bridge to resist an allision from modern container ships.
6. **Enforcement of incident recording systems on ships in U.S. waters.** In an unusual occurrence, the *Dali*'s voyage data recorder (VDR), otherwise known as the ship's black box, stopped recording sensor data at a key point in the incident.²⁹ While audio recording continued with backup power, the loss of sensor data should be investigated, and remedies should be offered to prevent future occurrences that might hinder mishap investigations.

Time for a National Maritime Initiative

Our ports are both the gateways to the nation's prosperity and security and an integral part of a strategically important maritime industrial sector. Safeguarding our ports necessarily means bolstering our maritime resilience to attack as well as supply chain disruptions, whether man-made or caused by an act of God. This will require a national maritime initiative that:

- **Provides an adequate American-flagged commercial shipping fleet to sustain the nation in a major war, augmented by treaty ally shipping as required.** The Merchant Marine Act of 1920, known as the Jones Act,³⁰ although it was intended to meet this objective, has proven inadequate to the task and has not addressed the need to sustain a wartime economy of the sort we would need in a war with China. The 2019 Turbo Activation 19-Plus exercise showed that only 64 percent of the Ready Reserve Fleet—vessels that are intended to be ready to support rapid deployment of military forces—was able to deploy on time in support of national defense needs. Moreover, the average age of these merchant ships is 45 years, well over the industry end-of-life average of 20 years, and the DOD faces a significant gap (more than 80) in the number of fuel tankers available to meet surge sealift requirements.³¹

That said, a wholesale repudiation of the Jones Act without additional actions would be counterproductive and would not assure delivery of needed shipping. In the near term, fostering stronger cooperation with allies such as Japan, South Korea, and the Philippines can help to satisfy some clearly defined national shipping needs in wartime while working to regain American maritime competitiveness. The March 12, 2024, petition to the U.S. Trade Representative to act against unfair Chinese trade practices in the maritime, logistics, and shipbuilding sectors represents an opportunity not only to strengthen U.S. agencies like the Federal Maritime Commission to press America's case, but also to rally international support.³²

After decades of neglect, the U.S. maritime sector alone cannot take on China's huge state-controlled shipping and shipbuilding sectors, but a consortium of like-minded maritime nations could. Common interests regarding freedom of navigation, free trade, and a shared threat perception of China would bind such a group together. This new grouping could represent a formidable bloc that could be critical for an American-led revolutionary transformation in shipping—an informal Maritime Group of Nations not unlike the current Group of Seven (G7).³³

- **Expands shipbuilding and repair capacities and associated workforce to mitigate overreliance on China or other unfriendly nations.** This will require regaining America's maritime

competitiveness. Fostering a revolution in American shipping can energize a lethargic industrial sector that is critical to the nation's defense and able to sustain a wartime economy. This new intermodalism would combine existing and emerging technologies in a new logistics paradigm comprised of small modular nuclear reactor-powered container ships; unmanned drones (ship and vertical lift); smart port technologies; blockchain tracking of smart containers; and additive manufacturing.³⁴ It would embrace a truly multimodal logistics approach.

A stronger and globally competitive maritime sector serves as a deterrent to Chinese economic coercion and military adventures. With a more robust maritime sector, American trade could proceed with greater confidence in the U.S. military's ability to sustain combat operations on U.S.-flagged vessels. This shipping revolution could also mitigate environmental impacts of shipping, promote domestic production, and expand American exports to global markets, thereby spurring wider job growth and advancing technological innovation in the U.S. The primary task is to create a domestic landscape that can foster a sustainable competitive advantage in American shipbuilding, shipping, and multimodal logistics. This will require a maritime legislative agenda that incentivizes entry in the maritime workforce, rewards mariners sustaining critical certifications, and establishes maritime development zones.

- **Hardens maritime infrastructure and shipping against cyberattacks and material damage.** The lessons of the *Dali* bear witness that the status quo is not tenable and new efforts are needed. The current Maritime Security Act of 2002 was conceived for a different era when the principal threats were violent extremism and natural disasters. Today, the nation confronts a China that can conduct conventional attacks as well as highly advanced asymmetric attacks across the homeland. A new framework is needed that builds on the Maritime Security Act and incorporates and codifies in law the best elements of both the 2020 National Maritime Cybersecurity Plan and the recently issued Executive Order 14116.

The Biden Administration's Executive Order 14116 was issued a month before the deadly *Dali* collision in Baltimore Harbor, but there has been no indication that the National Transportation Safety Board (NTSB) has investigated, is currently investigating, or intends to investigate

whether cyber intrusions either caused or contributed to that incident. In addition, two programs that were devised in a post-9/11 world are ready for an update and revitalization: the Container Security Initiative (CSI)³⁵ and the Proliferation Security Initiative (PSI).³⁶ As of March 24, 2024, 112 countries were supporting the PSI's effort to prevent the movement of weapons of mass destruction, and the CSI is conducting screening of U.S. inbound cargo in 61 overseas ports to interdict the terrorist movement of weapons in maritime containers.

Moreover, to respond to maritime disasters and provide maritime support to the DOD more effectively at the local level, a naval component of the National Guard should be established in states with strategically important ports. Such forces have already proven their worth: New Jersey and New York naval militia provided critical support moving material and first responders into lower Manhattan following the September 11 attacks.³⁷

The Necessary Next Steps

Safeguarding the nation's strategically important maritime industrial sector will be a complex task and will be sustained only if America's commercial maritime competitive edge is regained. This will require a grand design: a *National Maritime Initiative*. One vehicle for this would be an update to the 1989 National Security Directive (NSD-28)³⁸ with enabling legislation from Congress to:

- **Harden the nation's maritime infrastructure.** Concerted efforts are needed to harden U.S. maritime infrastructure against cyber, kinetic, and acts of God, to include allision from current and future large commercial shipping. This must include adequate salvage and dredging capacity to restore harbor operations rapidly at critical ports.
- **Strengthen the ability of the U.S. to combat unfair Chinese maritime business practices and incentivize U.S. shipping.** Currently, the principal agencies (U.S. Coast Guard, Maritime Administration, National Oceanic and Atmospheric Administration, and Federal Maritime Commission) responsible for the nation's non-defense maritime sector are scattered across several departments. Structurally, this has not fostered coherent sustained or well-resourced maritime initiatives. Reorganizing for task as well as increased investment in the nation's maritime sector are past due.

- **Create maritime prosperity zones.** Incentivize investment in the maritime industry and waterfront communities, to include attracting treaty allies like Japan and South Korea in a common cause.
- **Establish a maritime innovation incubator.** The incubator would function to mature future maritime capabilities and new concepts of operations (small modular nuclear reactors, robotic shipping, drones and dirigibles useful for moving cargo at sea, etc.) and to train the next generation of naval architects and shipyard workers to operate and maintain these new methods and technologies.
- **Train more mariners.** Expand existing and, at the state level, establish new merchant marine academies to educate and certify merchant mariners. Also prioritize existing educational and technical training grants to specialties critical to shipbuilding (naval architects, welders, etc.).
- **Incentivize mariners who maintain certification.** Use favorable tax incentives and personal subsidies to attract American merchant mariners who remain in the maritime sector while sustaining Coast Guard mariner certifications.
- **Create a Naval Guard.** Expand select state National Guards to include a naval component.

Conclusion

For too long, the United States has neglected a core element of its security and prosperity: its historic maritime strength. As a result, American shipping and shipbuilding have atrophied. Yet America's domestic industry and capacity for innovation remain strong. To capitalize on this advantage, it is imperative that we restore American maritime competitiveness in pursuit of a new multimodalism. Doing this as we simultaneously harden our maritime infrastructure will do much to enhance the ability of the United States to deter Chinese economic coercion and military adventurism.

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