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Addressing PACFLT,S Surface Ship Maintenance Challenges: Leveraging Japanese and South Korean Ship Repair Capabilities to Overcome Domestic Capacity Constraints

June 2025

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ABSTRACT

The U.S. Navy's Pacific Fleet (PACFLT) faces a severe maintenance capacity crisis that threatens its operational readiness in the Indo-Pacific region. This research examines how insufficient domestic ship repair capacity directly contributes to persistent maintenance delays, creating a cascade of operational challenges. Analysis of Government Accountability Office data reveals consistent schedule overruns for surface ship maintenance periods, significantly reducing fleet availability for training and operations. Aging infrastructure, workforce limitations, and insufficient dry dock capacity compound these challenges. While the Navy has initiated domestic improvement programs like the Shipyard Infrastructure Optimization Program (SIOP), these efforts will require decades to mature fully.

This thesis proposes leveraging Japanese and South Korean maritime industrial capabilities to supplement domestic maintenance capacity. Both nations possess world-class shipbuilding and repair industries with demonstrated technical compatibility with U.S. Navy vessels. This approach would address immediate maintenance backlogs while providing time for the revitalization of the domestic industrial base. Implementation challenges include legal, political, and economic considerations. The research concludes that a strategic partnership with these allies offers a possible solution to enhance PACFLT readiness in the near term while supporting the long-term health of the industrial base.

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LIST OF ACRONYMS AND ABBREVIATIONS

AOR	Area of Responsibility
BAE	British Aerospace Engineering (BAE Systems)
BRAC	Base Realignment and Closure
CG	Guided Missile Cruiser
CMAV	Continuous Maintenance Availability
CNO	Chief of Naval Operations
COMUSFLT FORCOMINST	Commander, U.S. Fleet Forces Command Instruction
CONUS	Continental United States
CVN	Nuclear-powered Aircraft Carrier
DDG	Guided Missile Destroyer
DICAS	Defense Industrial Cooperation, Acquisition and Sustainment
DOGE	Department of Government Efficiency (proposed)
DSRA	Docking Selected Restricted Availability
FAR	Federal Acquisition Regulation
FDNF	Forward Deployed Naval Forces
FFG	Guided Missile Frigate
FY	Fiscal Year
GAO	Government Accountability Office
HM&E	Hull, Mechanical, and Electrical
INDOPACOM	Indo-Pacific Command
JFMM	Joint Fleet Maintenance Manual
JMU	Japan Marine United Corporation
JMSDF	Japanese Maritime Self-Defense Force
JRMC	Japan Regional Maintenance Center
KHI	Kawasaki Heavy Industries
LCS	Littoral Combat Ship
LHA	Landing Helicopter Assault
LHD	Landing Helicopter Dock
LPD	Landing Platform Dock
LSD	Landing Ship Dock
MCM	Mine Countermeasure Ship
MHI	Mitsubishi Heavy Industries

MRO	Maintenance, Repair, and Overhaul
MSC	Military Sealift Command
NAVSEA	Naval Sea Systems Command
NNSY	Norfolk Naval Shipyard
OFRP	Optimized Fleet Response Plan
OPNAVINST	Chief of Naval Operations Instruction
PACFLT	Pacific Fleet
PHNSY & IMF	Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility
PLAN	People's Liberation Army Navy
PMO	Program Management Office
PNSY	Portsmouth Naval Shipyard
PRC	People's Republic of China
PSNSY & IMF	Puget Sound Naval Shipyard & Intermediate Maintenance Facility
RMC	Regional Maintenance Center
ROH	Regular Overhaul
ROK	Republic of Korea
RSF	Regional Sustainment Framework
SCA	Shipbuilders Council of America
SEVENTHFLT	Seventh Fleet
SIOP	Shipyard Infrastructure Optimization Program
SRA	Selected Restricted Availability
SRF	Ship Repair Facility
SRF-JRMC	Ship Repair Facility and Japan Regional Maintenance Center
SSBN	Ballistic Missile Submarine
SSGN	Guided Missile Submarine
T-AKE	Dry Cargo Ammunition Ship (Military Sealift Command)
TYCOM	Type Commander
USC	United States Code
USN	United States Navy
USNI	United States Naval Institute

I. INTRODUCTION

A. PROBLEM

The U.S. Navy's Pacific Fleet (PACFLT), the largest of the Navy's fleets, faces a severe maintenance crisis that threatens its ability to maintain America's strategic presence in the Indo-Pacific region. According to a May 2024 testimony before Congress by Diane Maurer, Director of Defense Capabilities and Management of the Government Accountability Office, fewer than 40% of ships complete maintenance on time (GAO, 2024b, p. 20-21). In fiscal year 2019 alone, maintenance delays were equivalent to losing 19 surface ships from the fleet for the entire year (GAO, 2019b, p. 6).

PACFLT shoulders critical missions of deterrence, power projection, and defense of vital sea lanes. These missions demand ships in peak operational condition, yet constrained shipyard capacity creates a cascade of operational challenges. Maintenance periods stretch beyond scheduled timelines, forcing difficult decisions about training and deployability. These decisions create operational gaps that disrupt the fleet's deployment schedule. The problem intensifies as ships age and require more extensive maintenance. Aging shipyard infrastructure and a shrinking skilled workforce compound these challenges, creating a maintenance deficit that grows more severe with each passing year.

B. QUESTIONS AND HYPOTHESIS

This study addresses three critical questions surrounding PACFLT's maintenance challenges:

1. Is the U.S. Navy able to adequately maintain PACFLT's surface ships?

2. What causes the maintenance delays for surface ships in PACFLT?

3. Could utilization of Japan and South Korea's shipbuilding and repair industry solve the USN's maintenance dilemma?

Based on preliminary research, this thesis proposes the following hypothesis: Limited domestic shipyard capacity is the primary driver of PACFLT's ship maintenance delays. Increasing ship maintenance capacity by utilizing our Japanese and South Korean allies' shipyards to repair PACFLT ships in theater will reduce maintenance delays and deferred maintenance backlogs while strengthening PACFLT's operational readiness and regional response capabilities. This approach provides immediate relief to the maintenance crisis while allowing time for domestic industrial base revitalization.

C. SIGNIFICANCE

Strategic rivalry in the Indo-Pacific, particularly between the United States and China, has heightened regional tensions. PACFLT's effectiveness in maintaining forward presence hinges on consistent ship maintenance and repair capabilities. Maintenance delays ripple through the fleet, undermining both power projection capabilities and strategic objectives. This makes resolving the maintenance crisis not just an operational concern, but a strategic imperative for national security.

This research bridges critical gaps in thought between sustained naval operations and surface ship maintenance. The exploration of international maintenance partnerships offers pragmatic solutions to the U.S. Navy's ship maintenance problems while strengthening strategic alliances. By leveraging allied nation repair facilities, the Navy can address immediate maintenance challenges while rebuilding the domestic ship repair industrial base.

Defense planners, policymakers, and Navy leadership will find actionable insights for increasing shipyard capacity in the PACFLT Area of Responsibility (AOR). The analysis supports strategic decisions about shipyard infrastructure investment, workforce development, and international partnerships. These findings will directly contribute to enhancing PACFLT's power projection and sustained operational readiness in an increasingly contested Indo-Pacific.

D. OBJECTIVES AND RESEARCH DESIGN

1. Objectives

This study pursues three key objectives:

1. Evaluate the impact of surface ship maintenance delays on PACFLT Readiness: Document how maintenance delays and deferrals degrade PACFLT's operational capabilities

2. Map U.S. Ship Repair Capacity Constraints: Identify critical bottlenecks in domestic repair facilities, focusing on workforce gaps, infrastructure limitations, and operational inefficiencies

3. Develop International Partnership Solutions: Assess opportunities to leverage allied nation ship maintenance facilities in Japan and South Korea to expand repair capacity and enhance fleet readiness

2. Research Design

This study employs a qualitative review methodology focusing on three key variables:

1. Maintenance Completion Rates: Tracking the percentage of maintenance availabilities completed on schedule

2. Capacity Constraints: Evaluating specific limitations in workforce, infrastructure, and scheduling

3. International Partnership Opportunities: Assessing the capability and capacity of allied nation shipyards

E. SCOPE AND LIMITATIONS

This research examines PACFLT's surface ship maintenance challenges and evaluates international partnerships as potential solutions. To provide a focused analysis, the study concentrates on PACFLT Cruisers and Destroyers. We selected these vessel classes because both Japan and South Korea operate similar warships in their naval fleets, creating a natural alignment in maintenance capabilities and technical expertise. Expanding the analysis to different classes of ships (aircraft carriers and submarines) would introduce significantly greater complexity, as maintenance requirements vary substantially between those very different ship types and would require evaluation of different sets of shipyard capabilities.

The analysis specifically addresses surface combatant/surface ship Chief of Naval Operations (CNO) maintenance availabilities, major ship maintenance periods extending beyond six months, as these represent the most significant maintenance challenges and opportunities for international partnership.

While many nations possess advanced maritime maintenance, repair, and overhaul (MRO) capabilities, this study limits its scope to Japan and South Korea. This focused approach leverages existing U.S. military presence and infrastructure in both countries, including established command and control relationships, logistics networks, and security agreements. These existing relationships significantly reduce the barriers to expanding maintenance partnerships and provide established frameworks for increased cooperation.

F. THESIS STRUCTURE/OVERVIEW

This thesis develops across five chapters:

- Chapter II investigates previous research on ship maintenance issues and establishes the historical context of American shipbuilding and repair capabilities. It examines PACFLT's current material state, including ship composition, homeport locations, and maintenance infrastructure. This chapter details the Navy's maintenance ecosystem, from organizational to depot-level work, and explores how maintenance schedules align with ship life cycles.

- Chapter III examines the relationship between capacity limitations in domestic repair facilities and persistent maintenance delays. This chapter demonstrates through statistical evidence, leadership recognition, and case studies how these constraints impact PACFLT's operational capabilities and mission readiness.

- Chapter IV presents a solution to address the maintenance capacity problem by leveraging allied nations' repair industries in Japan and South

Korea. This chapter analyzes the capabilities of these potential partners, addresses implementation challenges including legal and regulatory barriers, and examines additional factors contributing to the maintenance crisis.

- Chapter V synthesizes key findings, presents policy implications, and offers specific recommendations to enhance fleet maintenance capabilities. This chapter explores the strategic implications of the recommended approach, including enhanced regional deterrence in the INDO-PACOM AOR, strengthened alliance relationships, and industrial base resilience. It concludes by emphasizing how resolving maintenance delays and backlogs directly strengthens PACFLT's strategic posture in the Indo-Pacific region.

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II. HISTORICAL CONTEXT AND CURRENT FRAMEWORK

A. CHAPTER OVERVIEW

The U.S. Pacific Fleet's (PACFLT) ship maintenance, repair, and overhaul (MRO) environment encompasses one of the most complex industrial sustainment operations in the Department of Defense. Understanding the surface ship maintenance challenges facing PACFLT requires a thorough examination of the complex ecosystem that supports fleet maintenance across the Pacific region.

This chapter examines the critical components that comprise PACFLT's MRO environment:

- **Geographic Scope**: The chapter maps PACFLT's extensive area of responsibility and analyzes how maintenance facilities spread strategically across the Pacific region.
- **Force Structure**: PACFLT operates a diverse vessel inventory, including nuclear and conventional ships, each demanding specific maintenance requirements. This section details these assets and their sustainment needs.
- **Ship Repair Infrastructure Network**: A comprehensive network supports PACFLT maintenance, including:
    - Public and private shipyards
    - Regional maintenance centers
    - Dry dock facilities and their capabilities
- **Policy Framework**: Key directives and guidelines govern surface ship maintenance, training and operations:
    - OPNAVINST 4700.7M (Navy Maintenance Policy)

- Joint Fleet Maintenance Manual (COMUSFLTFORCOMINST 4790.3)
- The Optimized Fleet Response Plan (OFRP)

- **Organizational Structure**: Multiple commands, organizations, and stakeholders collaborate to plan and execute surface ship maintenance activities.
- **Legal Constraints**: Current U.S. law dictates the type of required maintenance and where it can be completed for U.S. Navy vessels.

B. LITERATURE REVIEW

1. Review of Existing Research

The U.S. Navy's persistent surface ship maintenance challenges represent a critical threat to fleet readiness and operational capabilities. Despite the magnitude and strategic importance of these issues, the body of academic literature examining Navy maintenance failures remains surprisingly limited. A review of existing research reveals both important insights and significant gaps in our understanding of these challenges.

2. Scale and Scope of Research

The most comprehensive analyses of Navy maintenance challenges come from the Government Accountability Office (GAO) reports, testimonies, and investigations. These studies provide valuable quantitative data documenting the extent of surface ship maintenance delays and their impact on fleet readiness. GAO-21-246 offers a particularly detailed analysis of maintenance completion rates and their operational implications. Similarly, GAO-22-104510 examines how maintenance inefficiencies affect submarine availability, documenting over 2,500 days of lost operational availability between 2015 and 2020.

However, given the scale of the Navy's surface ship maintenance crisis, with billions in deferred maintenance and thousands of lost operational days annually, the breadth of academic research examining these issues remains remarkably thin. Few studies provide comprehensive analysis of the complex interplay between infrastructure limitations, workforce constraints, and operational demands that drive maintenance failures.

3. Alternative Approaches and Human Factors

Recent scholarship has begun exploring unconventional solutions to maintenance delays. Notably, Sears (2021) presents an innovative analysis challenging traditional approaches to private sector ship repair. His thesis argues that conventional solutions focusing solely on funding and policy adjustments overlook critical human factors, including communication, coordination, and stakeholder relationships within the maintenance enterprise. Through case studies of two private shipyards implementing alternative maintenance strategies, Sears demonstrates how improvements in organizational dynamics and workforce engagement can enhance maintenance efficiency. His research identifies four key areas for improvement:

1. Refocused purpose and vision
2. Updated motivation techniques
3. Systems thinking
4. Effective coordination between shipyards, maintenance centers, and operational commands (Sears, 2021, p.3)

4. Workforce Analysis

Complementing Sears' organizational focus, other researchers have examined specific workforce challenges. Cirone, Glaeser, and Kadlec (2023) provide valuable insight through their root cause analysis of skilled labor shortages in Navy shipyard maintenance. Their application of the Ishikawa method identifies multiple systemic issues, including economic factors, public policy constraints, and insufficient workforce development initiatives.

This analysis is complemented by Gormley and Walters' (2023) examination of labor shortages in the Virginia ship repair industry. Their research highlights how funding instability creates destructive cycles of hiring and layoffs that exacerbate workforce development challenges. Together, these studies suggest that workforce constraints represent a crucial yet understudied aspect of maintenance delays.

5. Operational Considerations

Research examining maintenance capabilities during potential conflicts adds another crucial dimension to the literature. Hoey (2021) analyzes the Pacific repair industry's capacity to handle battle damage during high-intensity conflict, using mathematical modeling to assess repair capabilities for destroyer-class vessels. His findings indicate current facilities would be insufficient for wartime demands, connecting maintenance capacity issues to broader strategic concerns.

6. Process Improvement Research

Several studies explore potential process improvements within existing constraints. Northrup (2015) examines the surface fleet depot maintenance program from a business process perspective, highlighting inefficiencies in contract execution and supplier relationships. Naldo (2021) investigates scheduling optimizations across multiple ports, developing models to minimize workload fluctuations and improve maintenance efficiency within current capacity limitations.

7. Critical Gaps in Current Research

The existing literature reveals several critical gaps in understanding Navy maintenance challenges:

- While various studies document maintenance delays and their immediate causes, few examine the systemic relationships between different contributing factors.
- Despite the potential strategic importance of leveraging allied nation shipyards to address maintenance backlogs, there is a notable absence of research examining this approach. No significant studies were found

analyzing the feasibility, benefits, or challenges of expanding maintenance partnerships with allied nations.

- The literature lacks comprehensive analysis of how infrastructure limitations, workforce constraints, and operational demands interact to create and perpetuate maintenance delays.
- Few studies propose comprehensive solutions that address both immediate maintenance needs and long-term capacity development.

8. Conclusion

The limited scope of existing research relative to the magnitude of Navy maintenance challenges represents a significant obstacle to developing effective solutions. While GAO reports and recent academic studies provide valuable insights into specific aspects of these issues, major gaps remain in understanding their systemic nature and potential solutions.

Understanding these research gaps provides important context for examining both the historical evolution of American shipbuilding capacity and the current framework governing PACFLT maintenance operations.

C. THE EVOLUTION OF AMERICAN SHIPBUILDING: CYCLES OF GROWTH AND DECLINE

Understanding the current maintenance challenges facing the U.S. Pacific Fleet requires examining both the historical evolution of American shipbuilding and repair industry capacity and the contemporary framework governing fleet maintenance. This chapter traces the cyclical pattern of expansion and contraction in U.S. shipbuilding capacity from colonial times to the present, then describes the current organizational and policy structure supporting PACFLT maintenance operations.

1. Colonial Origins and First Golden Age (1631-1831): Capacity Expansion

The early growth of American shipbuilding is thoroughly documented by Brown (1989), who describes how the industry emerged during the colonial period. By the American Revolution, every colony had developed shipbuilding and repair capabilities, with New England leading the industry, followed by the Chesapeake Bay region. He notes that the industry's remarkable success manifested in the construction of approximately 23,000 vessels by 1771 (Brown, 1989, p. 27).

He attributes this success to several key factors:

- Abundant raw materials, particularly century-old oak trees
- Skilled craftsmen including carpenters, riggers, metalsmiths, and sailmakers
- Steady demand through the British mercantile system
- Significant cost advantage, operating at nearly half the expense of British competitors (Brown, 1989, p. 27)

2. The Second Golden Age (1830-1855): Capacity Expansion

According to Brown (1989), following a brief post-revolutionary decline, American shipbuilding entered its most celebrated period. Growing demand for larger and faster vessels to serve North Atlantic passenger routes, China trade, and California commerce spurred unprecedented growth. American shipyards revolutionized their capabilities to construct the legendary clipper ships, marking this pre-Civil War generation as the industry's zenith (Brown, 1989, p. 32).

Brown also points out that this expansion benefited from protectionist legislation. The Navigation Acts effectively barred foreign vessels from coastal trade through strategic fees and taxes, thereby restricting that trade to U.S.-flagged ships (Brown, 1989, p. 31).

3. Decline and Technological Disruption (1855-1914): Capacity Contraction

Brown (1989) argues that the Civil War marked the beginning of a prolonged decline in American shipbuilding. The industry failed to adapt to the technological revolution of steam-powered iron ships, remaining committed to wooden sailing vessels. This resistance to change proved catastrophic. He highlights that American shipyards lacked the capacity to construct or repair modern vessels, hampered by inferior iron ore quality and insufficient industrial infrastructure. The absence of necessary foundries, machine tools, and iron plate benders left the industry unable to compete in the new era of maritime technology (Brown, 1989, p. 35).

4. World War Mobilizations and Cold War Changes: Capacity Expansion

As Brown (1989) documents, World War I catalyzed the first significant expansion of American shipbuilding capacity in the twentieth century. The industry underwent a remarkable transformation, expanding from 61 private shipyards with 45,000 workers and 235 repairways at the war's start to 341 shipyards employing 380,000 workers and operating 1,284 repairways by November 1918 (Brown, 1989, p. 38-40).

Di Mascio (2024) further reports that World War II triggered an even more dramatic mobilization. The U.S. Maritime Commission orchestrated the construction of 6000 plus vessels in just five years between 1936 and 1941 (Di Mascio, 2024). Brown (1989) also notes that effort increased the workforce from 80,000 workers in 1939 to approximately 1.46 million by 1943, yielding an astounding 5,200% increase in productivity (Brown, 1989, p. 49).

5. Modern Decline and Industry Consolidation: Capacity Contraction

Di Mascio (2024) explains that the Reagan administration's policies accelerated the decline of U.S. commercial shipbuilding. The 1981 withdrawal of federal shipbuilding subsidies severely impacted the industry's competitiveness (Di Mascio, 2024). From 1981 to 1986, foreign shipyards received orders for 44 U.S.-flagged vessels, while American yards secured only 21 orders (Brown, 1989, p. 61).

Additionally, Di Mascio (2024) emphasizes the impact of the 1990 Base Realignment and Closure (BRAC) process. This event dealt another significant blow to the industry. Half of all naval shipyards closed, leaving only four public naval shipyards: Pearl Harbor, Puget Sound, Portsmouth, and Norfolk. The skilled workforce contracted to approximately 30,000 workers, retaining only one-third of its previous capacity (DiMascio, 2024).

D. CURRENT PACFLT STRUCTURE AND ORGANIZATION

According to their website, the U.S. Pacific Fleet (PACFLT) commands approximately 200 ships, 1,200 aircraft, and 130,000 sailors and civilians across the Indo-Pacific region. Established in February 1941, PACFLT maintains its headquarters at Pearl Harbor, Hawaii, serving as the Navy's largest naval force (Commander, U.S. Pacific Fleet, n.d.).

1. Geographic Scope

The U.S. Pacific Fleet's area of responsibility (AOR) stretches nearly 100 million square miles, spanning from the west coast of the United States to the Indian Ocean. This vast territory encompasses the entire pacific ocean, covering nearly 50% of the earth's surface. Ships require weeks to traverse these unique, expansive distances between ports (Commander, U.S. Pacific Fleet, n.d.).

2. Operational Structure

PACFLT maintains command and control through its numbered fleets:

- The 3rd Fleet executes operations in the Eastern Pacific
- The 7th Fleet executes operations in the Western Pacific (Commander, U.S. Pacific Fleet, n.d.).

E. PACFLT FORCE STRUCTURE

1. Ship Classes

The diverse composition of PACFLT shapes its maintenance requirements. Each ship class requires unique maintenance capabilities and specialized facilities, though all naval vessels follow similar maintenance schedules and patterns. U.S. homeports host the majority of PACFLT's vessels, while Japan maintains a significant forward-deployed contingent.

PACFLT's major ship classes include:

- Destroyers (DDG)
- Cruisers (CG)
- Aircraft Carriers (CVN)
- Amphibious Ships (LPD, LSD, LHD, LHA)
- Submarines (SSBN, SSGN)
- Littoral Combat Ships (LCS)
- Mine Counter Measure Ships (MCM) (Commander, Naval Surface Force, U.S. Pacific Fleet, n.d.)

2. Homeports

PACFLT's area of responsibility (AOR) encompasses several major homeports, where ships maintain their operational base. Figure 1 illustrates the ships within this AOR. These major homeports include:

- Pearl Harbor, HI
- San Diego, CA
- Everett, WA

- Bremerton, WA
- Yokosuka, Japan
- Sasebo, Japan (Commander, Naval Surface Force, U.S. Pacific Fleet, n.d.)

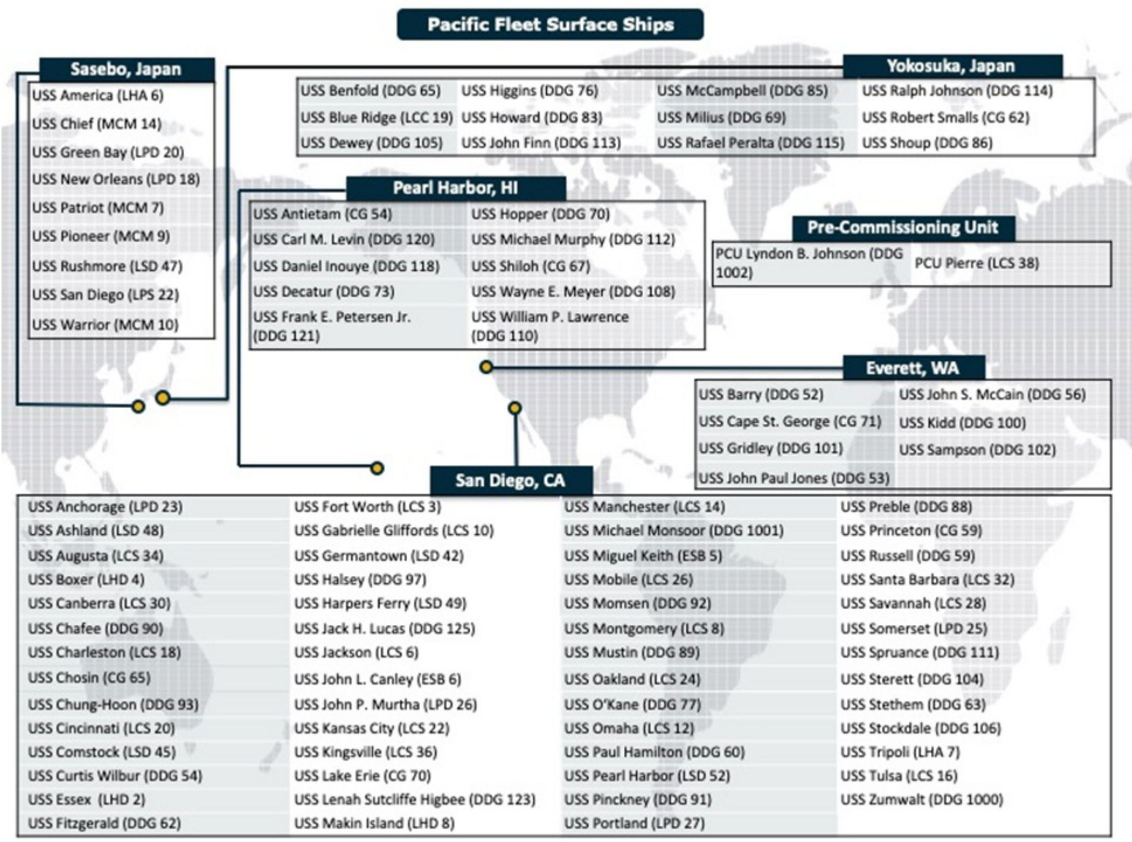

Figure 1. Pacific Fleet Surface Ships. Source: Commander, Naval Surface Force (n.d.).

F. MAINTENANCE INFRASTRUCTURE NETWORK

PACFLT's operational effectiveness throughout its AOR depends on its maintenance infrastructure's ability to provide reliable and timely ship maintenance. The fleet utilizes both private and public shipyards to accomplish this mission. Public "naval shipyards" primarily focus on the MRO of nuclear-powered vessels, including aircraft carriers and submarines, while privately owned shipyards MRO conventional/non-nuclear vessels (GAO, 2019b, p. 2). However, this division of labor is a matter of policy. Naval shipyards have the capability to MRO all ship types. Privately owned shipyards can also MRO all types of shipyards, but most likely do not have the capability to conduct maintenance and repairs associated with nuclear propulsion.

U.S. Navy-owned and operated regional maintenance centers (RMCs) also contribute to surface ship maintenance. They conduct intermediate-level ship repairs as well as some limited depot-level repairs. The Navy's Southwest Regional Maintenance Center (SWRMC), located in San Diego, CA, and the U.S. Naval Ship Repair Facility and Japan Regional Maintenance Center (SRF-JRMC) in Yokosuka and Sasebo, Japan are the two primary RMCs servicing PACFLT.

This thesis primarily focuses on shipyards that conduct major, depot-level repairs, including access to and control of a graving dock or floating dry dock certified by the U.S. Navy for its vessels.

1. Public "Naval" Shipyards

The U.S. Navy established its original six naval shipyards in the early 1800s: Boston, Brooklyn, Philadelphia, Portsmouth, Norfolk, and Washington, to build and repair the fleet. This public shipyard system expanded over the next 150 years, reaching its peak of 11 ship repair facilities in 1943 before gradually contracting to 8 shipyards in the 1970s-1980s (Turnstile Tours, 2021). The GAO reports that today, only four naval shipyards remain operational, with their workforce reduced by half from historical levels. These same ship repair facilities, now used to MRO the current fleet, were initially established in the age of sail and early steam power. Many have remained in use for over a century, with some dating back more than 250 years (GAO, 2022a, p. 2-3).

Of the four remaining public shipyards operated by the U.S. Navy, two reside within the PACFLT AOR:

- Puget Sound Naval Shipyard & Intermediate Maintenance Facility (PSNSY & IMF)

- Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility (PHNSY & IMF)

These public shipyards specialize in servicing nuclear-powered vessels, including aircraft carriers and submarines. This specialization restricts the maintenance options available for these vessel types (Naval Sea Systems Command, n.d.a).

2. Private Shipyards

The United States maintains 154 active private shipyards across 29 states and the U.S. Virgin Islands (U.S. Department of Transportation, Maritime Administration, 2021, p. 2). Multiple privately owned maintenance, repair, and overhaul (MRO) companies operate throughout these locations, conducting both shipbuilding and ship repair activities. As shown in Figure 2, these companies are spread across the West Coast, the Gulf Coast, and the Eastern Seaboard. PACFLT maintains access to four primary ship repair facilities:

- General Dynamics NASSCO, San Diego, CA
- BAE Systems, San Diego, CA
- Vigor Shipyards, Seattle, WA
- Vigor Shipyards, Portland, OR

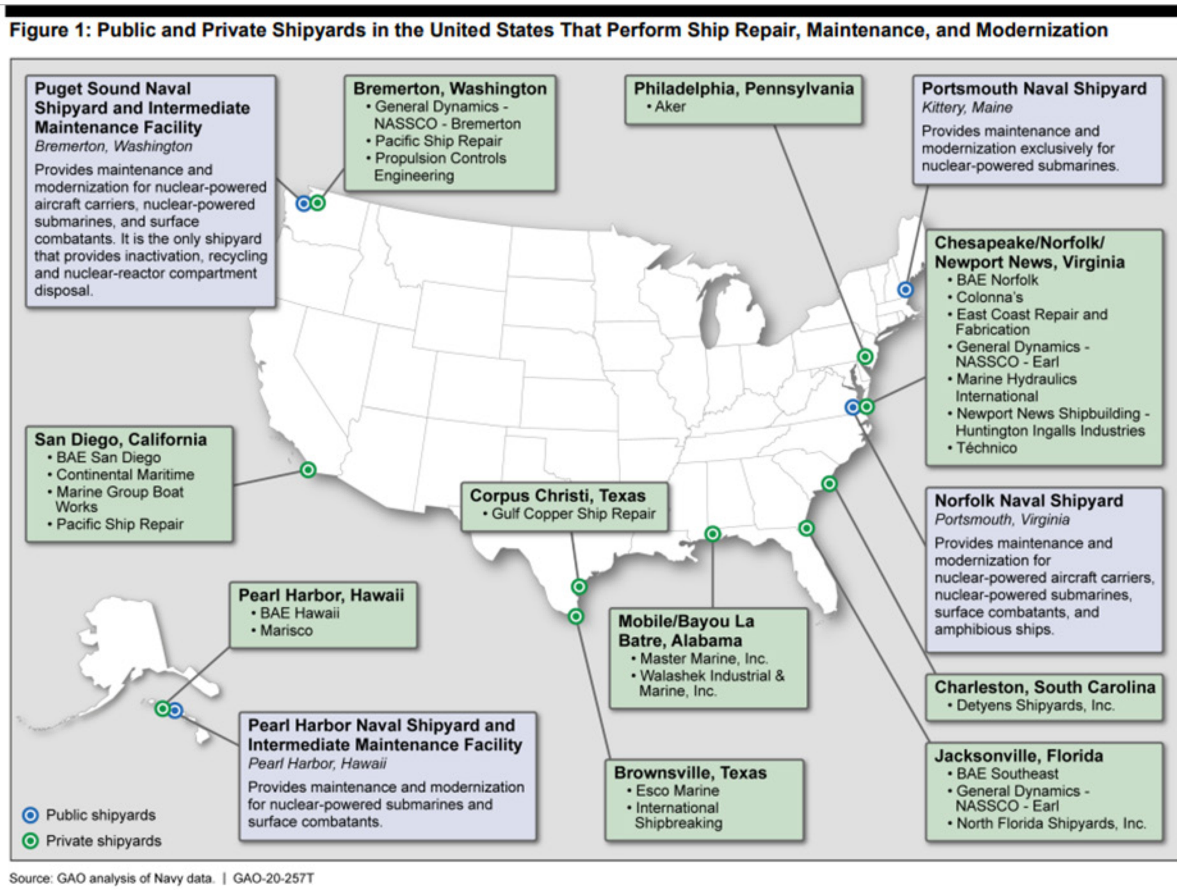

Figure 2. Public and Private Shipyards in the United States. Source: GAO (2019b).

3. Regional Maintenance Centers

The United States Navy's Southwest Regional Maintenance Center (SWRMC) is the primary CONUS-based naval ship repair facility servicing PACFLT surface combatants. Established in San Diego, CA on 10 April 1996, SWRMC delivers ship maintenance, repair and modernization to the Pacific Fleet vessels (Naval Sea Systems Command, n.d.b). Working with private commercial industrial partners, SWRMC is responsible for the execution of surface ship maintenance and overhaul activities for surface ships executing their pre-deployment maintenance and training cycles in preparation for deployment to PACFLT's seventh and third Fleets.

The U.S. Naval Ship Repair Facility and Japan Regional Maintenance Center (SRF-JRMC) serves as the primary naval ship repair facility in the INDO-PACOM AOR (Naval

Sea Systems Command, n.d.c). This facility provides comprehensive ship repair, modernization, and support services to forward deployed naval forces (FDNF) vessels serving the U.S. 7th Fleet, while also conducting voyage repairs for visiting and foreign ships.

SRF-JRMC performs various depot-level maintenance activities, including:

- Chief of Naval Operations selected restricted availabilities (SRA)
- Docking selected restricted availabilities (DSRA)
- Continuous maintenance availabilities (CMAV)

These maintenance activities ensure 7th Fleet ships maintain operational readiness throughout their deployment cycles (Naval Sea Systems Command, n.d.c).

G. NAVY MAINTENANCE POLICY FRAMEWORK

The U.S. Navy maintains a comprehensive framework of policies and instructions that govern ship maintenance. Two primary documents establish these maintenance requirements: OPNAVINST 4700.7M and COMUSFLTFORCOMINST 4790.3 (Joint Fleet Maintenance Manual). The Optimized Fleet Response Plan (OFRP) integrates these maintenance policies into the Navy's operational schedule.

1. Maintenance Instructions

a. OPNAVINST 4700.7M

OPNAVINST 4700.7M, the Navy's primary maintenance instruction, establishes official policy and procedures for ship maintenance across the fleet. As issued by the Office of the Chief of Naval Operations (2019), the instruction defines the requirements for planning, executing, and evaluating all ship maintenance, from routine upkeep to major overhauls (Office of the Chief of Naval Operations [OPNAV], 2019).

A key aspect of the instruction, as outlined by OPNAV (2019), is its integration with the Optimized Fleet Response Plan (OFRP). This alignment ensures that maintenance schedules are synchronized with training and deployment cycles, maximizing fleet readiness and operational availability. The instruction directs maintenance activities to support:

- Long-term sustainability of the force
- Surge capability for operational requirements
- Timely completion of required maintenance
- Achievement of expected service life
- Cost-effective maintenance practices

According to OPNAV (2019), the instruction applies to all ships and commands responsible for vessel maintenance, with specific exceptions for military sealift command, special operations command, service craft and boats, and Coast Guard vessels not operating as part of the Navy (OPNAV, 2019, p. 1.1-1.2).

b. COMUSFLTFORCOMINST 4790.3 REV D CHG 4 SEP 2024 Joint Fleet Maintenance Manual (JFMM)

The Joint Fleet Maintenance Manual (JFMM), designated as COMUSFLTFORCOMINST 4790.3, serves as the U.S. Navy's comprehensive guide for standardizing maintenance procedures across the fleet. The manual provides detailed instructions for planning, executing, and documenting maintenance activities to ensure consistent adherence to Navy standards and optimal fleet readiness (Commander, U.S. Fleet Forces Command & Commander, U.S. Pacific Fleet, 2024).

Naval maintenance personnel, including ship's force, regional maintenance centers, shipyards, and fleet commanders, use the manual as one of their primary references. The JFMM standardizes maintenance practices to ensure consistency across the fleet while providing a common language for all maintenance activities.

The JFMM integrates with the Optimized Fleet Response Plan (OFRP), providing additional guidance along with the 4700.7M, as a framework that coordinates maintenance schedules with operational requirements (Commander, U.S. Fleet Forces Command & Commander, U.S. Pacific Fleet, 2024).

c. OPNAVINST 3000.15A Optimized Fleet Response Plan (OFRP)

The U.S. Navy implements the Optimized Fleet Response Plan (OFRP) as its operational framework to enhance fleet readiness and deployment capabilities. As described by the Office of the Chief of Naval Operations, the OFRP aligns and synchronizes Navy activities, including manning, maintenance, modernization, training, and deployments, to create a balanced, sustainable, and predictable force generation cycle (OPNAV, 2014). Figure 3 depicts the general cycle of the OFRP, while Figure 4 gives an example of a notional OFRP schedule for a Cruiser or Destroyer, providing a visual example of how ships move through each phase. This structure maximizes naval force employability while ensuring proper maintenance and training (OPNAV, 2014).

The OFRP executes through five distinct phases:

(1) Maintenance Phase

- Initiates the OFRP cycle.
- Requires approximately 28 weeks for surface combatants (CNO availability).
- Extends up to 16 months for aircraft carriers.
- Accommodates major repairs and modernization for ships.

(2) Basic Phase

- Develops unit core capabilities and skills.
- Completes basic-level inspections, certifications, and training.
- Prepares units for advanced training and specific tasking.

(3) Advanced Phase

- Conducts mission-specific training.

(4) Integrated Phase

- Combines individual units into coordinated forces.
- Culminates in deployment certification.

(5) Sustainment Phase

- Follows integrated/advanced phase through post-deployment.
- Maintains and enhances warfighting readiness.
- Supports additional deployments as required (OPNAV, 2014).

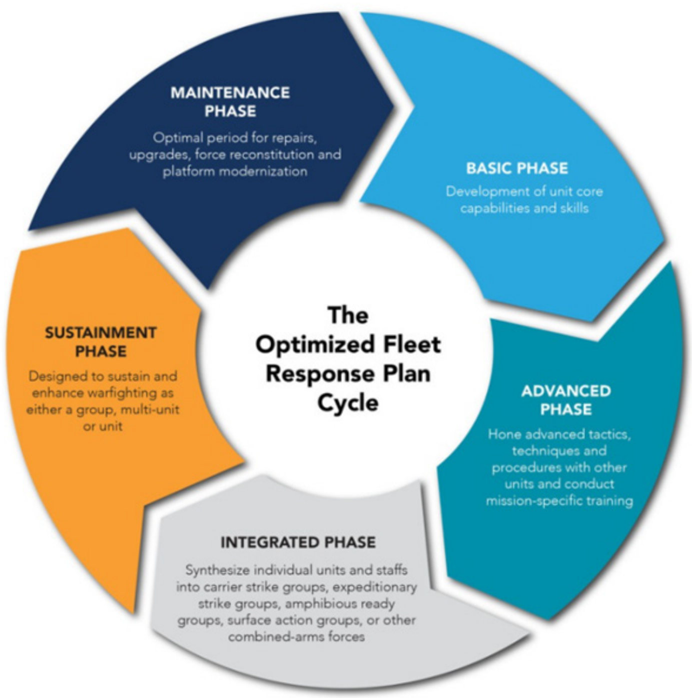

Figure 3. OFRP. Source: United States Fleet Forces (n.d.).

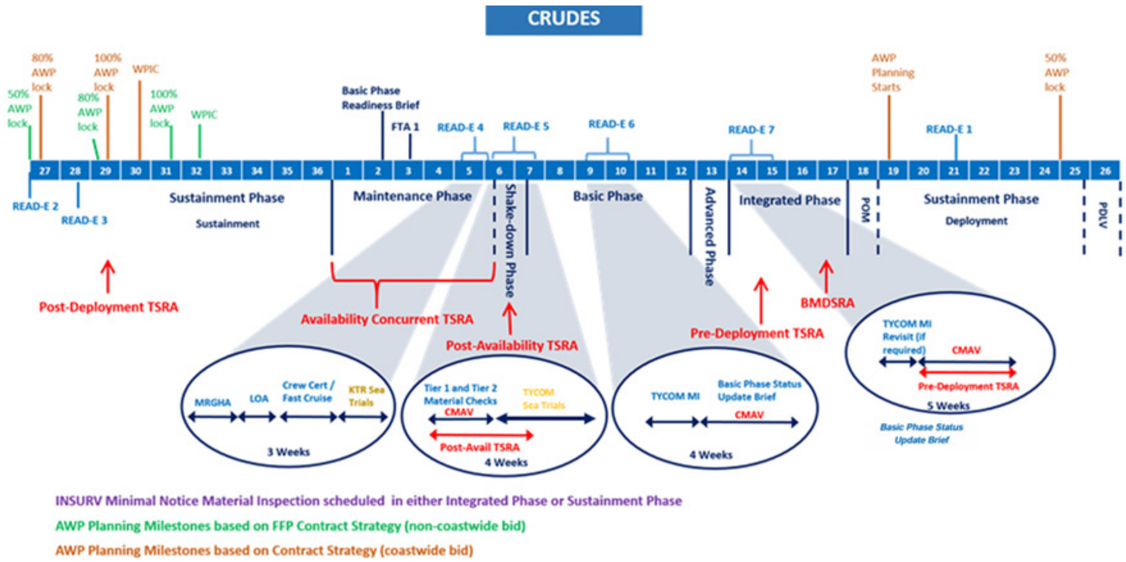

Figure 4-1. 36-Month CRUDES Notional OFRP Schedule

Figure 4. Notional OFRP Schedule. Source: Commander, Naval Surface Force, U.S. Pacific Fleet and Commander, Naval Surface Force Atlantic (2022)

H. MAINTENANCE LEVELS

Ship repair, maintenance, and modernization complexity directly affects maintenance period duration. These maintenance, repair, and overhaul (MRO) activities can span from several weeks to six months or longer. The Navy executes maintenance across three distinct levels (OPNAV, 2019):

1. Organizational Level (O-Level)

- Ship's force performs maintenance tasks.
- Conducts preventive maintenance activities.
- Executes routine system checks.
- Completes basic repairs within crew capability.

2. Intermediate Level (I-Level)

- Addresses maintenance beyond ship's force capability.

- Regional maintenance centers provide technical support.
- Requires specialized technical expertise.
- Utilizes shore-based facilities and equipment.

3. Depot Level (D-Level)

- Performs complex maintenance actions.
- Operates specialized industrial facilities.
- Executes major system overhauls.
- Utilizes public or private shipyards.

I. MAINTENANCE TYPES

The Navy executes four distinct maintenance categories based on scope, time, and operational requirements:

1. CNO Availabilities

According to the GAO, CNO type availabilities are used to perform depot-level repairs and modernization alongside intermediate-level MRO activities (GAO, 2020c, p. 9). These periods execute complex structural, mechanical, and electrical repairs. Surface ships often require dry docking for below-water maintenance. Key characteristics include:

- Planned depot-level maintenance periods.
- Duration exceeding 6 months.
- Occurrence every 2–3 years throughout the ship's service life.
- Execution of major repairs and modernization.

2. Continuous Maintenance (CMAV)

Continuous maintenance periods conduct intermediate-level and select depot-level repairs between longer CNO maintenance periods. Commanders adjust, postpone, or cancel these availabilities based on operational demands. These periods feature:

- Duration of 2–6 weeks.
- Execution between CNO availabilities.
- Focus on intermediate-level repairs.
- Maintenance of operational readiness.

3. Emergent Repairs

- Executes unplanned critical repairs.
- Addresses immediate readiness issues.
- Occurs during deployment phases.
- Prioritizes based on operational impact.

4. Voyage Repairs

During these periods, corrective maintenance is accomplished. This type of maintenance is essential to mission completion or safety requirements, enabling ships to deploy or continue deployment. These repairs include:

- Mission or safety-essential maintenance
- Support for deployed operations
- Limited scope activities
- Enablement of continued deployment

J. PACFLT MAINTENANCE RESPONSIBILITY STRUCTURE

OPNAVINST 4700.7M assigns maintenance responsibilities across multiple organizational levels to ensure effective ship maintenance (OPNAV, 2019). According to the instruction, the Chief of Naval Operations (CNO) maintains overall responsibility for naval ship readiness, including resource planning, life cycle management, and establishment of maintenance policies (OPNAV, 2019).

Fleet Commanders execute direct responsibility for the material condition of their fleet. They manage both emergent and scheduled maintenance while implementing standardized policies across the fleet. Fleet Commanders balance operational requirements against maintenance needs to maintain fleet readiness (OPNAV, 2019).

Type Commanders (TYCOMs) ensure their assigned ships maintain mission readiness through effective maintenance management. They prioritize corrective actions, advise on process standardization, and manage maintenance resources to meet operational commitments. TYCOMs work closely with both Fleet Commanders and individual ships to coordinate maintenance activities (OPNAV, 2019).

Naval Sea Systems Command (NAVSEA) is the lead authority for ship maintenance. NAVSEA establishes technical requirements, oversees modernization efforts, and provides critical engineering support across the fleet. The command validates maintenance requirements and ensures technical standards meet operational needs (OPNAV, 2019).

At the unit level, Forces Afloat bear responsibility for their own maintenance execution. Individual ships conduct self-assessments, execute preservation and repair activities, and maintain proper documentation of all maintenance actions (OPNAV, 2019). This responsibility extends to maintaining material readiness and managing required maintenance activities. To place this in a broader context, Figure 5 presents a top-down overview of the chain of responsibility for surface ship repair and maintenance, illustrating how the different levels of responsibility fit into the Navy’s overall maintenance responsibility structure.

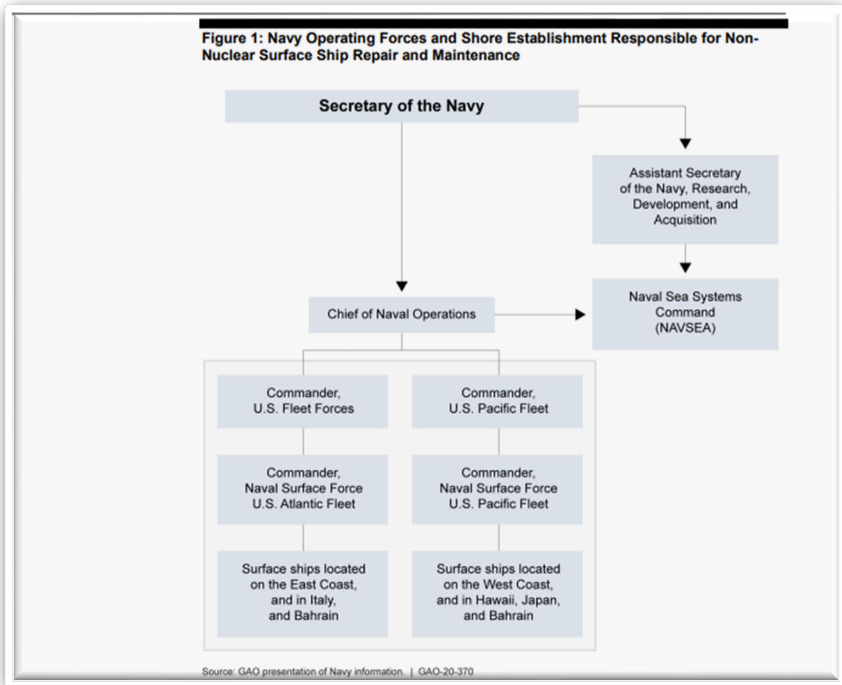

Figure 5. Diagram of Responsibility for Surface ship maintenance. Source: GAO (2020b)

K. LEGAL CONSTRAINTS

U.S. government policy plays a crucial role in the surface ship maintenance, repair, and overhaul (MRO) landscape through several key regulations:

1. Title 10, U.S. Code Section 2460

Title 10 USC 2460- the term “depot-level maintenance and repair” means (except as provided in subsection (b)) material maintenance or repair requiring the overhaul, upgrading, or rebuilding of parts, assemblies, or subassemblies, and the testing and reclamation of equipment as necessary, regardless of the source of funds for the maintenance or repair or the location at which the maintenance or repair is performed (10 U.S.C. § 2460, 2025).

2. Title 10, U.S. Code Section 8680

Title 10 USC 8680- Overhaul, repair, etc., of vessels in foreign shipyards: restrictions

(a) Vessels Under Jurisdiction of the Secretary of the Navy With Homeport in United States or Guam.-(1) A naval vessel the homeport of which is in the United States or Guam may not be overhauled, repaired, or maintained in a shipyard outside the United States or Guam.

(b) Vessel Changing Homeports.-(1) In the case of a naval vessel the homeport of which is not in the United States (or a territory of the United States), the Secretary of the Navy may not during the 15-month period preceding the planned reassignment of the vessel to a homeport in the United States (or a territory of the United States) begin any work for the overhaul, repair, or maintenance of the vessel that is scheduled to be for a period of more than six months.

(2) In the case of a naval vessel the homeport of which is in the United States (or a territory of the United States), the Secretary of the Navy shall during the 15-month period preceding the planned reassignment of the vessel to a homeport not in the United States (or a territory of the United States) perform in the United States (or a territory of the United States) any work for the overhaul, repair, or maintenance of the vessel that is scheduled-

(A) to begin during the 15-month period; and

(B) to be for a period of more than six months (10 U.S.C. § 8680, 2025).

To summarize, these regulations do the following:

- Severely restricts overseas maintenance and repair of ships homeported in the continental United States and Hawaii & Guam (CONUS).
- Requires maintenance work of those ships to be performed in U.S. shipyards unless:
- The ship requires emergent repairs while deployed.

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III. ANALYSIS OF MAINTENANCE DELAYS AND CAPACITY CONSTRAINTS

A. INTRODUCTION

The surface ship maintenance predicament facing the U.S. Pacific Fleet represents more than just statistics on a spreadsheet; it could easily be described as the Navy's number one readiness issue. Indeed, as Admiral James Kilby, Vice Chief of Naval Operations, testified before Congress, "ship production and repair" tops the Navy's list of priorities for improving fleet readiness (Grady, 2024, p. 3). This chapter examines the straightforward relationship between maintenance delays and capacity constraints, building a compelling case that insufficient ship repair capacity drives PACFLT's persistent maintenance challenges.

B. PART I: THE GROWING CRISIS OF MAINTENANCE DELAYS

1. Historical Trend Analysis

The story of PACFLT's maintenance delays unfolds over the course of almost two decades informed by government oversight and naval leadership testimony. A detailed examination of Government Accountability Office data reveals a persistent and worsening pattern of delays across three distinct periods.

The first comprehensive analysis covered 2011–2014, revealed that 72% of surface combatant maintenance availabilities completed behind schedule. These delays resulted in 4,759 lost operational days (days ships could not get underway for training/ops/deployment) over just four years, averaging 46 days lost per maintenance availability (GAO, 2016, p. 14,23). Figure 6 illustrates a visual representation of this data. This initial data set established the baseline for understanding the scale of the problem.

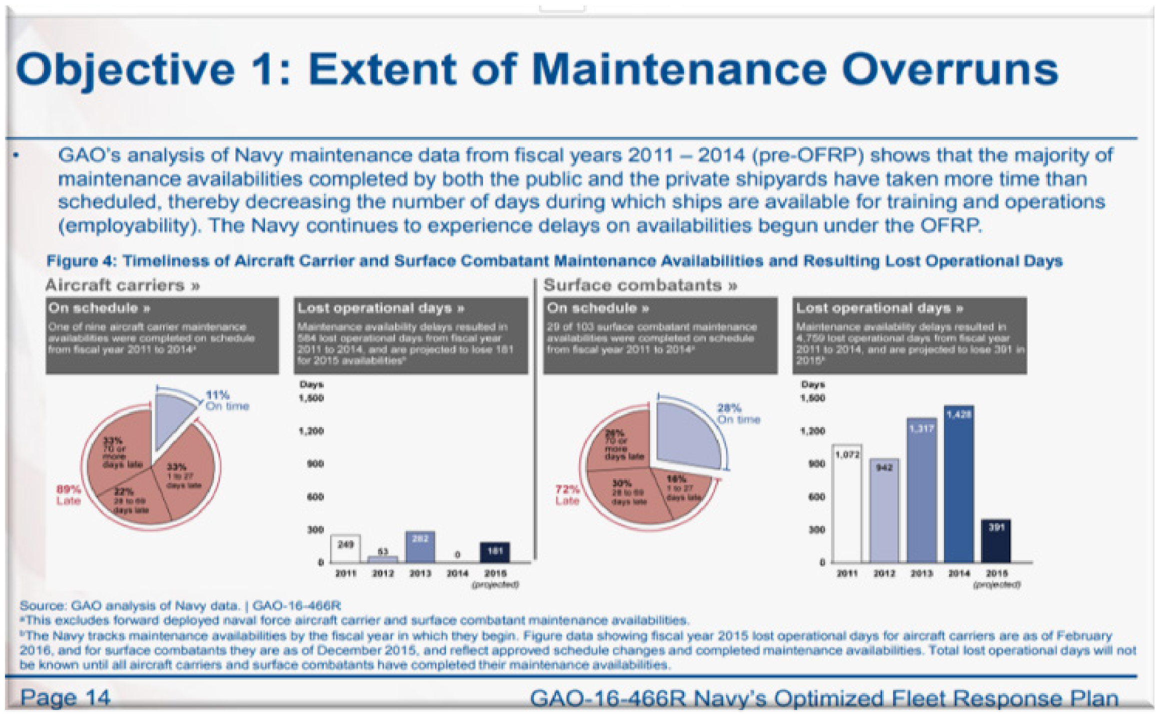

Figure 6. Surface Ship Maintenance Delays 2011–2014. Source: GAO (2016).

The situation deteriorated further during fiscal years 2014–2020, with 75% of maintenance periods running late, as represented in Figure 7. The cumulative impact grew to 28,238 total days of maintenance delays for surface ships (GAO, 2020a, p. 5). To put this in perspective, these delays effectively removed 15 ships on average per year from operational availability (GAO, 2021, p. 2).

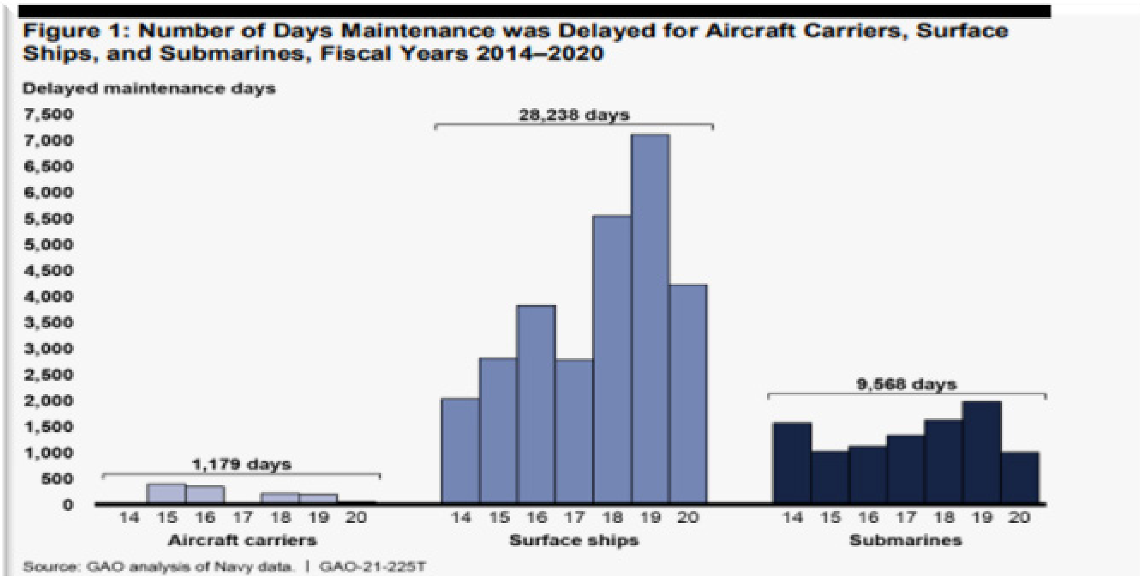

Figure 7. Delayed maintenance days. Source: GAO (2020a).

The most recent data, covering fiscal years 2015–2022, demonstrates the persistent nature of these challenges. In Figure 8, a year-by-year analysis of data from GAO report 24–107463 shows the following completion rates:

For fiscal year 2015, 21 of 32 availabilities (65%) failed to complete on time. This pattern continued through subsequent years:

- FY 2016 saw 22 of 30 availabilities (73%) running late.
- FY 2017 experienced 17 of 29 availabilities (58%) behind schedule.
- FY 2018 reached a concerning peak with 23 of 29 availabilities (79%) delayed.
- FY 2019 showed slight improvement with 15 of 30 availabilities (50%) late.
- FY 2020 saw 16 of 28 availabilities (57%) missing deadlines.
- FY 2021 marked another peak with 49 of 61 availabilities (80%) delayed.

- FY 2022 continued the trend with 17 of 28 availabilities (61%) completing late. (GAO, 2024b, p. 21)

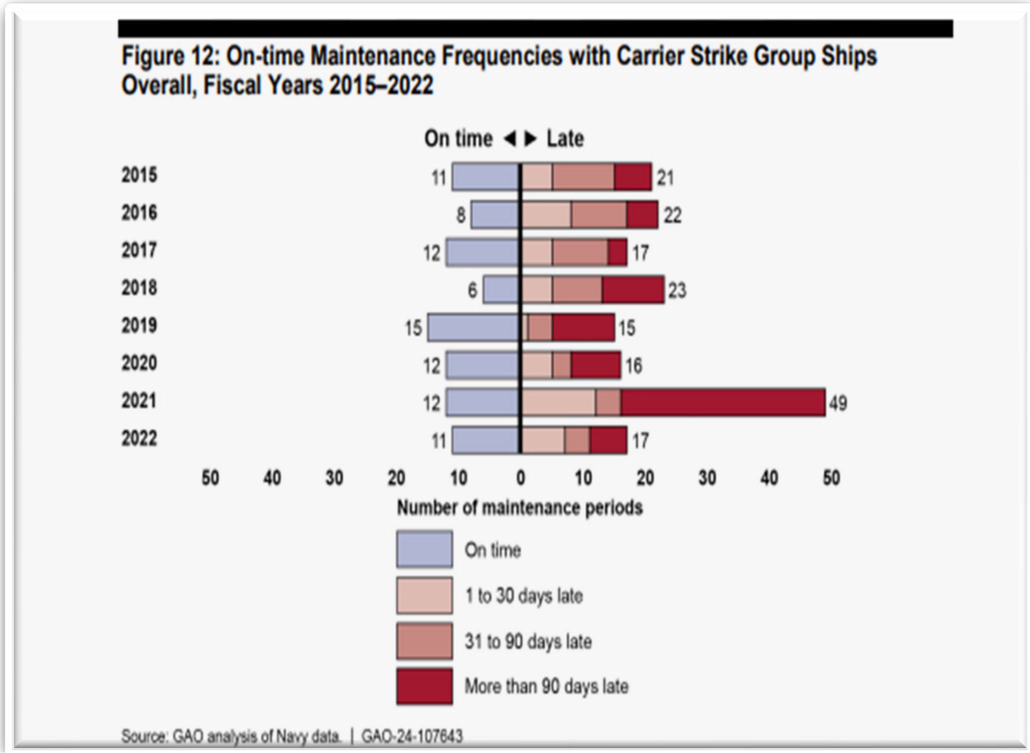

Figure 8. On-time maintenance frequencies. Source: GAO (2024b).

2. Impact Analysis

a. Operations

Failure to complete maintenance on schedule may reduce the availability of ships for operational and training commitments. Admiral Phil Davidson, former commander of U.S. Fleet Forces Command and INDOPACOM, highlighted how these delays create operational consequences. During his testimony about the comprehensive review of surface force incidents, he explained that forward deployed naval forces in Yokosuka, Japan, faced increasing operational demands while simultaneously experiencing longer maintenance periods. “When your ops are pushing from the right hand side of the force life cycle of the ship and maintenance pushing from the left side,” Davidson noted, “we all know what gets squeezed in the middle is training” (Eckstein, 2018, p. 2). Notably, the comprehensive review found this situation to be causal in the death of sailors, underscoring the severe human cost of maintenance delays (Eckstein, 2018, p. 2).

b. Smaller Fleet

The GAO calculated that the total deferred maintenance backlog has reached $1.8 billion, with surface ships accounting for $1.7 billion of this amount. Within this figure, $1.2 billion is concentrated in just nine ships, vessels that subsequently required early decommissioning, resulting in the loss of 34 years of collective service life (GAO, 2022c, p. 29). These early decommissionings directly shrink the operational fleet size, reducing the Navy's capacity to project power and maintain forward presence in the Indo-Pacific region.

c. Financial Impact

The Navy incurs significant costs without obtaining operational benefits when ships remain idle due to maintenance delays and backlogs. While this specific financial data related to surface ships is not available in GAO reports, the submarine fleet provides a concerning parallel. According the GAO "From 2008 to 2018, the Navy spent $1.5 billion to support attack submarines that provided no operational capability, submarines sitting idle no longer certified to conduct normal operations, while waiting to enter the shipyards and those delayed in completing their maintenance at the shipyards" (GAO, 2019b, p. 6).

This inefficient use of resources likely extends to the surface fleet as well. Funds spent maintaining non-operational vessels could otherwise support fleet modernization, capacity expansion, or other readiness initiatives. The fiscal impact of maintenance delays thus compounds their operational effects, creating a negative feedback loop that further diminishes fleet capabilities.

C. PART II: THE REALITY OF CAPACITY CONSTRAINTS

1. Physical Infrastructure Assessment

The current state of maintenance infrastructure presents a sobering picture of aging facilities and limited capacity. Public shipyards face significant challenges:

The GAO remarks that the 17 certified dry docks in the public naval shipyards lack sufficient capability to complete one-third of required maintenance periods through 2040 (GAO, 2022a, p. 4). These facilities, averaging 76 years in age, operate well beyond their intended service life (GAO, 2019a, p. 18). A detailed GAO condition assessment depicted in Figure 9 reveals:

- Norfolk Naval Shipyard: approximate rating of 69 (poor)
- Pearl Harbor Naval Shipyard: approximate rating of 73 (poor)
- Portsmouth Naval Shipyard: approximate rating of 74 (poor)
- Puget Sound Naval Shipyard: approximate rating of 78 (poor)

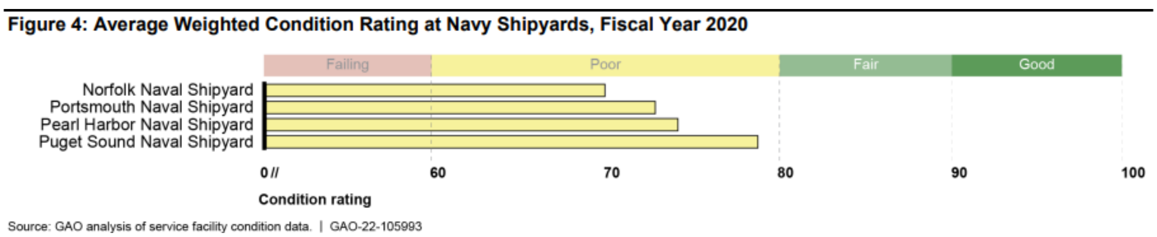

Figure 9. Average weighted condition at Navy shipyards. Source: GAO (2022a).

The GAO evaluated shipyard facility conditions by applying a weighting system based on each facility's replacement cost, also called plant replacement value. This methodology ensures that more expensive facilities have greater influence on the overall condition ratings than less expensive structures. This approach aligns with the Navy's own method for calculating average facility conditions.

All facilities score below the Navy's minimum standard of 80, with more than 50% of equipment beyond its intended service life (GAO, 2022a, p. 10).

The private sector faces constraints similar to public shipyards. Megan Eckstein the former deputy editor for USNI News, observed that "In recent years, the ship building and repair industry has relied on seven shipyards owned by four companies" (Eckstein, 2020).

The scarcity of dry docks available for use by the private ship repair industry is perhaps the strongest indicator of a lack of capacity. As seen in Figure 10, only 21 Navy-certified dry docks exist to service all surface ships homeported in the United States. This shortage becomes even more pronounced on the West Coast, where just seven dry docks must accommodate anywhere from 50–60 ships homeported within PACFLT's AOR (NAVSEA, 2020, p. 3). This geographic imbalance creates particular challenges in the Indo-Pacific area of responsibility, where surface ship maintenance demands seem to routinely exceed available capacity.

In his article for the Eno Center of Transportation, Aaron Klein notes that in a global context, the private shipbuilding and repair industry supporting U.S. Navy maintenance represents just 0.35% of worldwide commercial shipbuilding capacity (Klein, 2015, p. 3). This data point highlights the limited scale of domestic resources available for naval maintenance operations.

Rear Admiral Eric Ver Hage, until recently responsible for surface ship maintenance as commander of Navy regional maintenance centers, offered a stark assessment: "We don't have enough ship repair capacity for peacetime, let alone to repair combat-damaged ships during wartime" (Eckstein 2020, p. 2).

Fleet	Port	Number of Certified Dry Docks	Homeported Surface Ships
Atlantic	Norfolk, VA [1]	6	34
	Mayport, FL [1]	2	15
	Charleston, SC	3	0
	Pascagoula, MS	1	0
	Great Lakes & Bath	2	0
	Atlantic Total	14	49
Pacific	San Diego, CA [1]	4	45
	Pearl Harbor, HI [1]	1	10
	Seattle (Everett), WA [1]	1	5
	Portland, OR	1	0
	Pacific Total	7	60
	Total	21	109

Note 1: Only includes non-nuclear surface ships.

Table 2. Private Shipyard Dry Docks Locations

Figure 10. Number of NAVSEA-certified dry docks. Naval Sea Systems Command (2020).

2. Workforce Capacity Analysis

The workforce situation compounds these physical constraints significantly. Beyond just physical infrastructure limitations, the human capital challenges present a severe bottleneck to maintenance completion. Current analysis reveals concerning workforce trends across both public and private shipyards:

- Total workforce of 30,000, representing just one-third of historical capacity (Di Mascio, 2024, p. 1-2).
- 32% of employees have less than 5 years of experience (GAO, 2016, p. 24).
- Critical shortages in key skilled trades (GAO, 2016).
- Significant recruitment and retention challenges (GAO, 2016).

Admiral Kilby highlighted this challenge in his testimony, noting the difficulty of "turning a very green newly recruited workforce into skilled welders and electricians" while maintaining production schedules (Grady, 2024, p. 5).

D. PART III: CONNECTING DELAYS TO CAPACITY

The relationship between capacity constraints and maintenance delays becomes clear through multiple lines of evidence. Statistical correlations, expert testimony, and detailed case studies together build a compelling case that capacity limitations directly drive maintenance delays.

1. Statistical Evidence

Perhaps the best statistical evidence linking ship repair maintenance delays to repair capacity shortfalls is GAO data for maintenance delays, workload, and material readiness presented alongside one another.

The GAO documented an average of 62% ship maintenance delays during the period FY 2019–2022 (GAO, 2024b, p. 21). The GAO used Navy data to compile maintenance workload predictions and forecasts for PACFLT's largest surface ship homeport, San Diego, CA. Those forecasts projected FY 2019–2022 workloads that exceeded the average available capacity in San Diego (GAO, 2020b, p. 39).

It is not unreasonable to link the maintenance delays to workloads that exceed maintenance capacity. Indeed, it is common sense to do so. It also makes sense that the Navy reported below satisfactory material condition assessment scores (below 60%) of its ships during the same FY 2019–2022 timeframe (GAO, 2022c, p. 26).

Poor shipboard readiness during a 4-year period when completion of ship maintenance is delayed and workload exceeds repair capacity is not a coincidence.

2. Leadership Recognition

Diane Maurer, the GAO's Director of Defense Capabilities and Management, testified before the Senate Armed Services Readiness Subcommittee that ship maintenance is one of the most serious readiness challenges for the Department of Defense, second only to the high cost of sustaining the F-35 program (Grady, 2024). This assessment aligns with consistent warnings from naval leadership (cited throughout this paper) about ship repair capacity constraints.

3. Case Study Evidence

Two recent cases provide compelling evidence of how capacity constraints directly drive maintenance decisions and delays.

a. USS Bonhomme Richard: Capacity Dictating Strategic Choices

The USS Bonhomme Richard case demonstrates how capacity constraints can force decisions that permanently impact fleet capability. In his article for the Heritage Foundation, Brent Sadler reported that following the catastrophic fire in July 2020 that damaged over 60% of the vessel, the Navy faced three options regarding ship repairs (Sadler, 2020, p. 3):

1. Full restoration to original condition ($2.5-3.3 billion over 5–7 years)

2. Conversion to a different vessel type ($1 plus billion over 5–7 years)

3. Decommissioning and scrapping ($30 million over 9–12 months)

While the financial differences between options were substantial, capacity proved the deciding factor. Then-CNO Admiral Mike Gilday explained in Senate Armed Services Committee testimony that repairing or repurposing the ship would have strained the naval repair industrial base and negatively impacted overall fleet maintenance (Sadler, 2020, p. 3). As Kim (2023) explained in his USNI article, there was no available industrial capacity to repair the ship promptly without impacting other shipbuilding, maintenance, and modernization projects. Increased funding would not have altered the situation, as the extra dry dock and skilled labor required were not present domestically (Kim, 2023).

This case clearly demonstrates that capacity constraints, not funding, often determine maintenance decisions and their operational impact. When infrastructure and workforce limitations create absolute barriers, no amount of additional funding can overcome the physical constraints of limited dry docks and skilled labor.

b. USS Boxer: The Cascading Impact of Capacity Limitations

In September 2023, the Boxer Amphibious Ready Group, composed of USS Boxer, USS Somerset, and USS Harpers Ferry, was scheduled to deploy. However, according to the GAO, maintenance delays across all three ships prevented a coordinated departure, and each vessel ultimately deployed separately at later dates (GAO, 2024a, p. 9). USS Boxer did not deploy until April 2024 and, soon after getting underway, she suffered a rudder failure that forced the ship to come back to port for repairs. USS Boxer completed repairs and deployed in July 2024, 10 months late. During this delay, the 15th Marine Expeditionary Unit was unable to embark and deploy to the PACFLT and NAVCENT areas of responsibility (GAO, 2024a, p. 9).

Maintenance delays leading to USS Boxer's (LHD-4) failure to deploy on time in September 2023 illustrate how capacity constraints create cascading maintenance delays and force suboptimal ship deployment solutions. What began as a complex but relatively standard $200 million maintenance period in 2020 evolved into a series of compounding maintenance problems that highlight the results of chronic ship repair capacity shortfalls. Consistent with maintenance delay statistics cited at the beginning of the chapter, USS

Boxer's 18-month maintenance period was delayed and its completion date extended beyond the two-year point because of:

- A lack of a technically competent workforce that failed to repair critical propulsion equipment, including forced draft blowers.
- Deferral of 6 months' worth of major structural work, including repairs to a rudder that subsequently failed and required additional, emergent repairs (GAO, 2024a, p. 19)

The rudder situation, in particular, demonstrates how ship repair capacity constraints can negatively impact the deployment of critical naval forces to the Pacific. When Boxer required emergency repairs in April 2024, no suitable dry docks were available. USS Oakland occupied the nearest dry dock at BAE Systems' San Diego yard, and USS Chung Hoon at General Dynamics NASSCO's dry dock (LaGrone, 2024). Moving either vessel would have created a domino effect of maintenance delays across multiple ships.

Navy Secretary Del Toro acknowledged that the Boxer situation exemplifies the Navy's simultaneous struggle with aging amphibious platforms and insufficient repair capacity (Ekstein, 2024). Vice Chief of Naval Operations Admiral James Kilby expanded on this in congressional testimony, noting that aging steam plants create "larger growth work than most of our ships and it's a challenge because of availability of parts, artisans, etc." (Grady, 2024, p. 3). This situation perfectly illustrates how maintenance delays, caused by a lack of ship repair capacity, can result in cascading interruptions to training and, ultimately, deployment

E. CAUSAL RELATIONSHIP ANALYSIS

The evidence presented in this chapter strongly suggests a relationship between capacity constraints and maintenance delays, though the relationship involves multiple interconnected factors. While correlation alone does not establish causation, the consistent patterns observed across multiple data sources, expert testimony, and case studies collectively build a compelling case for capacity limitations as a primary driver of maintenance delays through several mechanisms:

(1) Direct Physical Limitations

- Insufficient dry dock availability prevents timely maintenance.
- Aging infrastructure reduces maintenance efficiency.
- Limited workforce size restricts parallel work.

(2) Cascading Effects

- Delayed maintenance periods impact subsequent schedules.
- Workforce limitations extend completion timelines.
- Infrastructure constraints force suboptimal solutions.

(3) Strategic Impacts

- Capacity constraints force early decommissioning decisions.
- Limited surge capacity removes repair options.
- Workforce specialization gaps affect specific platforms disproportionately.

Admiral Kilby's advocacy for expanding existing ship maintenance capabilities, coupled with Rear Admiral Ver Hage's warning about insufficient capacity for even peacetime operations, reinforces the critical nature of this challenge as the Navy continues its strategic pivot to the Indo-Pacific (Eckstein, 2020).

The evidence demonstrates a strong relationship between limited ship repair capacity and maintenance delays. More importantly, the consistent testimony from naval leadership across multiple commands, supported by detailed case studies and statistical analysis, confirms that addressing capacity limitations represents the key to resolving PACFLT's maintenance crisis.

F. CONCLUSION AND PATH FORWARD

The comprehensive analysis presented in this chapter reveals a clear pattern: the U.S. Navy faces a significant maintenance capacity shortfall that directly impacts fleet readiness. The statistical evidence, leadership recognition, and case studies collectively demonstrate that without addressing this fundamental capacity constraint, PACFLT will continue to experience maintenance delays and their associated operational impacts. While domestic initiatives like the Shipyard Infrastructure Optimization Program (SIOP) represent important long-term investments, they will require decades to fully implement, a time the Navy cannot afford given current readiness challenges and strategic competition in the Indo-Pacific.

This analysis naturally raises the question: if domestic capacity is insufficient and will remain so, where can the Navy find additional maintenance capabilities to address this crisis? As the next chapter will explore, a promising solution lies in leveraging the shipbuilding and repair capabilities of our closest allies in the Indo-Pacific region. By supplementing domestic ship repair capacity with allied capabilities, the Navy can address its immediate maintenance backlog while simultaneously creating the space needed for domestic industrial base revitalization. This balanced approach offers a pragmatic solution to resolving PACFLT's maintenance crisis while strengthening America's strategic posture in an increasingly contested Indo-Pacific environment.

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IV. RECOMMENDATIONS

A. LEVERAGING ALLIED MRO INDUSTRIES TO ADDRESS THE MAINTENANCE CRISIS

As Di Mascio (2024) observes, given the wide gap between the Navy's requirements for PACFLT surface ship repair capacity and "what reality can deliver," a plan of action to bridge that gap is needed (Di Mascio, 2024, p. 3). The U.S. Navy should leverage Japan's and South Korea's ship repair industrial capabilities to supplement domestic ship repair capacity. This strategic approach addresses two critical needs: first, it provides immediate relief to the maintenance crisis by reducing surface ship maintenance delays and clearing deferred maintenance backlogs; second, it relieves pressure on domestic shipyards and gives them an opportunity to strengthen critical industrial infrastructure, implement industry best practices, and develop their workforce.

The utilization of Japan and South Korea's robust ship repair industries to maintain, repair, and overhaul (MRO) PACFLT surface combatants "in theater" would meet the Navy's critical needs while providing the necessary time for domestic initiatives like the Shipyard Infrastructure Optimization Program (SIOP) to mature. As U.S. Ambassador to Japan Rahm Emanuel (AMB Emanuel) stated, "Whether Washington is focused on maintaining our ships or on building overall naval strength, Japan is the key" (Tanaka, 2024, p. 1).

In May 2018, the United States Navy initiated a 20-year, $21 billion effort to rebuild the public shipbuilding and repair industrial base through the Shipyard Infrastructure Optimization Program (GAO, 2023, p. 2). This initiative represents a positive step toward addressing the domestic maintenance capacity shortfall challenging Navy surface ship readiness. According to the Naval Facilities Engineering Systems Command, the SIOP has already:

- Completed more than 30 facilities projects worth up to $900 million.
- Currently working 40 facilities projects worth up to $6 billion.

- In the process of renovating 4 dry docks.

(Naval Facilities Engineering Systems Command, n.d.).

However, current fleet maintenance improvements have slowed progress, and the program now faces extended timelines. The GAO reported that the backlog of projects "has increased by over $1.6 billion over the past five years" (GAO, 2022a, p. 1). Furthermore, they stated that "more than half the equipment at the shipyards is past its expected service life" (GAO, 2022a, p. 1). The GAO estimates that completing the SIOP will require funding "well above" the tens of billions in Navy estimates, along with extensive coordination and oversight over more than 20 years (GAO, 2022a, p. 1).

By leveraging Japanese and South Korean maintenance capabilities in the near term, the Navy can create the space needed for the SIOP and other domestic ship repair initiatives to fully mature while ensuring fleet readiness is not compromised. This is not an either/or proposition but a complementary approach that addresses immediate needs while supporting long-term domestic capacity development.

In May 2024, the Department of Defense formally recognized the strategic importance of leveraging regional capabilities by introducing the Regional Sustainment Framework (RSF), designed to utilize strategic allies' MRO capabilities to service U.S. military assets (Office of the Assistant Secretary of Defense for Sustainment, 2024). This framework acknowledges what has become increasingly clear: the solution to the Navy's maintenance crisis cannot wait for domestic capacity to catch up with demand. By tapping into the established ship repair capabilities of our closest allies in the region, we can address immediate readiness concerns while simultaneously creating the space needed for long-term domestic industrial base revitalization.

B. JAPAN AND SOUTH KOREA: OPTIMAL PARTNERS FOR NAVAL MAINTENANCE

1. Japan's Historic and Strategic Maritime Industrial Base

Japan possesses a unique and robust ship repair industry that makes it an ideal partner for U.S. Navy maintenance operations. This capability is not merely theoretical; it is already proven and operational through the U.S. Naval Ship Repair Facility and Japan Regional Maintenance Center (SRF-JRMC), which currently maintains and repairs PACFLT surface combatants homeported in Yokosuka and Sasebo, Japan.

According to NAVSEA, SRF-JRMC Yokosuka is the Navy's largest overseas ship maintenance facility and was established as a United States repair facility in 1947. However, before this, SRF-JRMC was one of the largest and most vital repair facilities for the Japanese Imperial Navy during WWII, servicing dozens of battleships and aircraft carriers (Naval Sea Systems Command, n.d.d). Additionally, SRF-JRMC played a vital role in the MRO of the entire seventh fleet during the Korean and Vietnam conflicts (U.S. Naval Ship Repair Facility and Japan Regional Maintenance Center, 2019). According to Navy officials, SRF-JRMC in Yokosuka offers capabilities comparable to those found at public and private shipyards in the United States (GAO, 2020c, p. 15). Its infrastructure and capacity enable it to support a wide range of maintenance and repair operations, including:

- Dry docks: Three dry docks capable of servicing all ship classes based in the PACFLT AOR (GAO, 2020c, p. 15).
- Berthing space: 19 wet ship berths available for maintenance alongside the pier (NAVSEA, n.d.c).
- Industrial facilities: 10 large, co-located industrial buildings with a combined 960,000 square feet of workshop space (NAVSEA, n.d.c).
- Pier facilities: 15,300 square feet of pier area to directly support ship repair and maintenance (NAVSEA, n.d.c).

Importantly, SRF-JRMC in Yokosuka has as much ship repair capacity or potential capacity as any of the Navy's other five CONUS-based regional maintenance centers or public/private shipyards (GAO, 2020c, p. 14-16, 55). This means the Navy already has access to world-class maintenance facilities in Japan that match or exceed domestic capabilities.

The SRF-JRMC workforce includes over 350 USN and U.S. civilian personnel, as well as 2,341 full-time Japanese national employees (GAO, 2020c, p. 55). According to the GAO, this arrangement is "part of a bilateral agreement between the United States and the government of Japan to support the U.S. military presence there… this arrangement includes approximately 2,800 Japanese personnel employed as the organic workforce for the SRF-JRMC in Yokosuka and Sasebo (GAO, 2020c, p. 15). This cost-sharing arrangement provides exceptional value, as the Japanese government assumes a significant portion of the labor costs.

Unlike other regional maintenance centers, SRF-JRMC Yokosuka directly manages the detailed planning for each maintenance period. The GAO notes that instead of relying on contractors to plan the work, as is common practice at many U.S. and overseas maintenance centers, SRF-JRMC organizes and schedules all individual maintenance and repair tasks internally (GAO, 2020c, p. 16). This higher level of planning and oversight contributes to more effective maintenance operations.

The second SRF-JRMC facility in Sasebo, while smaller than Yokosuka, maintains PACFLT's only forward-deployed amphibious ready group (5 large, deep draft ships used to project USMC combat power throughout the Western Pacific) as well as 4 smaller minesweepers. The SRF-JRMC detachment in Sasebo includes two Navy dry docks, as well as pier space, industrial buildings, and workshops used for depot-level maintenance periods (GAO, 2020c, p. 56). Though currently operating at a smaller scale, it's worth noting that the Imperial Japanese Navy had approximately 50,000 people working in the Sasebo dockyard and local area at the peak of World War II, demonstrating the immense potential capacity of this location (Commander, Navy Region Japan, n.d.). Figure 11 depicts SRF-JRMC ships, facilities, and capacity.

Table 1: U.S. Navy and Contractor Industrial Base Available for Depot-level Maintenance of U.S. Surface Ships Based at Homeports in Japan, Spain, and Bahrain, as of September 2018

U.S. Navy maintenance organization	Surface ships based at homeport[a]	U.S. Navy maintenance facilities and capacity[b]	Contractor industrial base capacity
		Pacific Fleet Area of Responsibility	
U.S. Naval Ship Repair Facility and Japan Regional Maintenance Center (SRF-JRMC) Yokosuka, Japan	12 surface ships[c] • 8 Destroyers (DDG) • 3 Cruisers (CG) • 1 Amphibious command ship (LCC)	Navy dry-dock capacity: 6 • 3 Navy-certified docks can accommodate DDG, CG, and LCC • 1 Navy-certified dock can fit approximately MCM-sized ships • 2 dry docks not certified SRF-JRMC authorized workforce[c] • U.S. military and civilian: 380 • Japanese nationals: 2,341	Dry-dock capacity • Work generally conducted on base; possible contractor docks available Contractor industrial base • One contractor for most work • Additional smaller contractors and vendors
SRF-JRMC Detachment Sasebo Sasebo, Japan	8 surface ships[d] • 1 Amphibious assault (LHD) • 1 Amphibious transport dock (LPD) • 2 Dock landing ships (LSD) • 4 Mine countermeasures (MCM)	Navy dry-dock capacity: 2 • 1 Navy-certified dry dock fits LSD; does not easily fit larger amphibious ships • 1 larger dry dock not certified SRF-JRMC authorized workforce • U.S. military and civilian: 105 • Japanese nationals: 450	Dry-dock capacity • Work generally conducted on base; possible contractor docks available Contractor industrial base • About a dozen smaller Japanese contractors and vendors

Figure 11. U.S. Navy Ship Repair Facility and Japan Regional Maintenance Center Capabilities. Source: GAO (2020c).

2. Japan's Maritime Cluster

Beyond the existing SRF-JRMC infrastructure, Japan's private maritime industry represents a tremendous untapped ship repair resource. In his article for the Center of Strategic and International Studies (CSIS), Moyuru Tanaka reports that Japan's shipbuilding and repair industry generates $93.8 billion annually and accounts for approximately 1 percent of the nation's GDP. He explains that this industry is structured as what experts call a "maritime cluster"(Tanaka, 2024, p. 3).

The Center for Strategic and International Studies (CSIS), a bipartisan, nonprofit policy research organization, defines a maritime cluster as a "rare concentration of shipbuilding and repair, ship machinery and equipment, and shipping industries, along with closely related entities such as research institutes, financial institutions, and trading companies" (Tanaka, 2024, p. 3). Japan's maritime cluster represents one of the most comprehensive and integrated industrial ecosystems in the world.

According to Tanaka (2024), this cluster approach enables Japanese shipbuilding and repair industries to achieve exceptional efficiencies by integrating research, design, manufacturing, and repair capabilities within a closely connected industrial network. The cluster includes major corporations, specialized machinery and equipment suppliers, maritime technology research institutions, and financial services focused on maritime industries (Tanaka, 2024). This comprehensive ecosystem could allow for innovations to flow quickly across the shipbuilding and repair value chain, creating capabilities that could significantly benefit U.S. Navy maintenance operations.

3. Major Japanese Shipbuilding and Repair Companies

Japan's maritime industrial base includes several world-class corporations with extensive experience in naval vessel construction and maintenance (Tanaka, 2024):

- **Mitsubishi Heavy Industries (MHI)**: One of Japan's largest defense contractors, MHI builds and repairs all naval ships that support Japan's maritime security. MHI has extensive experience with building AEGIS-equipped vessels and has facilities in multiple locations throughout Japan. Their shipyards have the technical capability to design, build, and repair the most complex naval systems.

- **Japan Marine United Corporation (JMU)**: Formed through the merger of IHI Marine United and Universal Shipbuilding, JMU is one of Japan's largest shipbuilders with significant naval vessel experience. Their technical capabilities include construction and repair of frigates, destroyers, and support vessels.

- **Kawasaki Heavy Industries (KHI)**: A diversified manufacturing corporation with substantial shipbuilding operations, KHI has expertise in naval vessel construction and maintenance, particularly with advanced propulsion systems comparable to those used in U.S. Navy vessels.

- **Sumitomo Heavy Industries**: Currently the main contractor for ship maintenance in Yokosuka, Sumitomo already has established ship repair relationships with the U.S. Navy through SRF-JRMC. In fiscal year 2018, Sumitomo conducted about one-third of the total ship maintenance workload at Yokosuka (GAO, 2020c, p. 15).

These corporations represent only the largest entities within Japan's maritime cluster. The industry also includes numerous specialized subcontractors and suppliers with expertise in specific ship systems and components. Together, they constitute a maritime industrial ecosystem with few equals globally.

The foundation for Japan's phenomenal shipbuilding and repair capabilities dates back to World War II. In their Proceedings article, Nakayama and Chihaya (1966) note that remarkably, almost all of the Japanese shipyards, including the dry docks, escaped bombing by allied forces during the war (Nakayama & Chihaya, 1966). Most of the shipbuilding engineers and skilled workforce were not harmed either. After the war, these engineers and skilled workers rehabilitated the shipyards and laid the foundation for today's modern Japanese shipbuilding and repair industry (Nakayama & Chihaya, 1966).

In the 1950s, Japan's shipbuilding and repair industry was arguably the best in the world (Tanaka, 2024). Japan had about 50 percent of the world's shipbuilding and repair capacity until the early 1990s. Though now ranked third globally (behind China and South Korea), Japan's maritime industry remains impressive, with capabilities particularly well-aligned with U.S. Navy requirements (Tanaka, 2024).

Mr. William Schneider, a senior fellow at the HUDSON Institute, identified several reasons for Japan's success in shipbuilding:

- Japan has substantial shipbuilding and repair infrastructure.
- Japan has a history of revolutionizing shipbuilding and repair technology.
- Japan is a leading contributor to the development and production of advanced materials.
- Japan's defense industry is closely aligned with America's (Schneider, 2024)

Japan's maritime industry is particularly valuable as a partner because Japanese Maritime Self-Defense Force (JMSDF) surface combatants are remarkably similar to the USN's Arleigh Burke class Aegis destroyers. In his article in Proceedings, Kim (2023) notes that they share similar characteristics: hull designs, gas turbine propulsion systems, shipboard electrical systems, and the Aegis combat system suite and weapons. He further points out that the Japanese Kongo class Aegis destroyer and follow-on variants Atago and Maya class ships are essentially Arleigh Burke class destroyers (Kim, 2023). Additionally, he describes the JMSDF class frigates Akizuki, Asahi, Takanami, and Murasame as Japan's "mini Aegis ships" and are similar to the highly anticipated USN Constellation class frigates (Kim, 2023).

Tanaka (2024) adds that, given these similarities, the shipbuilders that build JMSDF Aegis class destroyers and frigates should be able to perform most of the maintenance, repairs, and overhauls for USN Aegis combatants as well as other PACFLT ships (Tanaka, 2024). Companies like Mitsubishi Heavy Industries, which builds and repairs all naval ships supporting Japan's maritime security, represent valuable potential partners for U.S. Navy maintenance operations.

For voyage repairs and potential battle damage repair during wartime in the Western Pacific, Japan's proximity to potential conflict zones provides strategic advantages that CONUS-based facilities cannot match. The SRF-JRMC facilities played a vital role during the Korean and Vietnam conflicts and would be equally valuable in any future Indo-Pacific contingency.

C. SOUTH KOREA'S WORLD-LEADING SHIPBUILDING CAPACITY

The Republic of Korea (ROK) offers substantial complementary capacity as part of the Regional Sustainment Framework (RSF). According to Tanaka, South Korea ranks second in global shipbuilding and repair capacity, second only to the People's Republic of China (Tanaka, 2024). This position represents a rapid and impressive ascent, as South Korea rose to prominence in the 1990s and has established itself as a global maritime powerhouse (Tanaka, 2024).

The ROK's shipbuilding and repair industry has demonstrated exceptional efficiency and capability, particularly notable in their construction of advanced naval vessels. As Di Mascio (2024) explains, the ROK's Sejong the Great class Aegis destroyer shares many of the same characteristics as Japan's Aegis class destroyers and the USN's Arleigh Burke class destroyer. They are all built upon similar hull forms, are Aegis equipped, utilize gas turbine propulsion, and have similar hull/mechanical/electrical (HM&E) systems (Di Mascio, 2024).

What sets South Korea apart is its remarkable cost efficiency. Di Mascio (2024) reports that South Korea's maritime industry builds its Aegis destroyer variant at a cost of $920 million, compared to Japan's cost of $1.6 billion and the U.S. shipbuilding industry's $2.5 billion price tag (Di Mascio, 2024). This cost efficiency, building essentially the same class of warship at nearly one-third the cost of U.S. shipyards, demonstrates the extraordinary capabilities and efficiency of South Korean shipbuilders.

1. Proven Success in U.S. Navy Maintenance Operations

Like Japan, South Korea's shipbuilding and repair capabilities have been demonstrated through successful U.S. Navy shipboard maintenance operations. A recent landmark achievement illustrates the practical implementation of the strategy proposed in this chapter. In March 2025, it was reported by the Navy Press Office that the USNS *Wally Schirra* (T-AKE 8), a Lewis and Clark-class cargo ship operated by Military Sealift Command (MSC), finished a seven-month depot-level repair period at Hanwha Ocean's shipyard in Gyeongsangnam-do, South Korea. This project marked the first time a South Korean private shipyard secured and executed a major depot-level repair contract for an MSC vessel (Fontana, 2025).

The extensive maintenance included:

- A dry docking
- Hull corrosion maintenance, to include more than 300 work items
- A full rudder replacement (Fontana, 2025)

Most impressively, when faced with the challenge of a damaged rudder without available blueprints, Hanwha engineers reverse-engineered and completely replaced the unit, demonstrating the technical ingenuity and problem-solving capabilities of South Korean shipyards (Fontana, 2025).

As Rear Admiral Neil Koprowski, Commander of U.S. Naval Forces Korea, observed: “The Republic of Korea’s ability to conduct large-scale maintenance to USNS ships within the Indo-Pacific theater demonstrates the strong strategic partnership between the Republic of Korea and the United States. Maintenance in theater reduces downtime and costs, while enhancing operational readiness” (Fontana, 2025). Commander Patrick J. Moore, commanding officer of MSC Office-Korea, further noted that “the addition of ROH (Regular Overhaul) capability for MSC ships in the Republic of Korea’s shipping industry adds additional means to deliver repair of military logistics vessels in order to sustain the readiness necessary to support fleet operations” (Fontana, 2025).

As previously mentioned, the Department of Defense introduced the Regional Sustainment Framework (RSF) to harness the regional MRO capabilities of allies for U.S. military assets. Then Undersecretary of Defense for Acquisition and Sustainment, Dr. William LaPlante, stated, “The RSF leverages our strong partnerships throughout the global defense ecosystem to deliver enhanced sustainment capabilities in theater. Doing so will create a distributed network of MRO facilities that is global in scale” (U.S. Department of Defense, 2024). Including South Korea in this framework would align perfectly with the RSF’s intent to build a distributed, allied-based maintenance network in the Indo-Pacific.

With South Korea’s shipbuilding industry recognized for both quality and efficiency, leveraging their repair capabilities alongside Japan’s creates a powerful combined capacity that can significantly address the U.S. Navy’s maintenance backlog while ships remain forward-deployed in the Indo-Pacific theater.

Together, Japan and South Korea’s maritime industrial base represent the optimal solution for addressing the Navy’s maintenance crisis. Their geographic proximity to each other and to potential Indo-Pacific contingencies, their proven technical capabilities with similar naval vessels, their cost efficiencies, and their strong alliance relationships with the

United States make them the logical partners for expanding naval maintenance capacity in the near term.

D. IMPLEMENTATION CHALLENGES

While the strategic and operational case for leveraging Japanese and South Korean ship repair capabilities is compelling, significant barriers exist that must be addressed for this strategy to succeed. These challenges include legal restrictions, political resistance, and economic concerns that could prevent implementation if not properly addressed.

1. Legal and Regulatory Barriers

a. Title 10 USC Section 8680 Restrictions

Title 10 USC Section 8680 presents a potential "showstopper" to the proposed maintenance solution if legal relief cannot be obtained. As mentioned in Chapter III, this law restricts foreign maintenance of naval vessels in three key ways:

1. Vessels with U.S. or Guam homeports may not be maintained in shipyards outside the United States or Guam with exceptions for voyage repairs, damage from hostile actions, and certain Littoral Combat Ship maintenance.

2. For vessels changing homeports to the U.S., the Navy cannot begin work exceeding six months during the 15-month period before the planned reassignment.

3. For vessels changing homeports from the U.S. to foreign locations, any maintenance scheduled for more than six months must be performed in the U.S. during the 15-month period before reassignment (10 U.S.C. § 8680, 2025).

These restrictions present challenges to any strategy proposing the use of Japanese and South Korean shipyards for the maintenance of CONUS-based vessels. Without addressing this legal barrier, even the most promising arrangements with allied maritime partners would be impossible for most of the Navy's fleet.

b. Pathways to Overcoming Legal Barriers

To address these legal challenges, several potential pathways exist:

- **Legislative Amendment**: The most direct approach would be to pursue targeted modification of Title 10 USC Section 8680, creating specific exceptions for allied nations with established security partnerships, particularly those in the Indo-Pacific region.
- **Executive Authorities**: Certain executive authorities might provide interim waiver mechanisms while legislative solutions are pursued. The Secretary of Defense may possess limited national security waiver provisions that could potentially be applied to critical readiness requirements.
- **Expanding Existing Frameworks**: The SRF-JRMC already conducts maintenance on forward-deployed naval vessels without conflicting with Title 10 USC Section 8680. This existing framework could potentially be expanded by examining the legal basis for current SRF-JRMC operations to identify applicable exceptions.
- **Homeporting Arrangements**: Since the statute specifically addresses vessels with U.S. homeports, temporary modifications to homeporting arrangements could create pathways for maintenance activities. This might include temporarily reassigning select vessels to Japanese homeports to enable maintenance under existing authorities.

The current Trump administration seems aware of the legal restrictions associated with building and/or repairing ships overseas in Japan and South Korea. In comments about his Executive Order, “Restoring America’s Maritime Dominance,” President Trump stated, “We may have to look to foreign companies... We’ll probably have to go to Congress for that, but we’re not going to have a problem” (Altman, 2025).

2. Political and Economic Challenges

Utilizing allied nations' ship repair capabilities will face significant political resistance. The recommendation to repair ships overseas in Japan and Korea will likely be viewed by some as outsourcing American jobs in the strategic shipbuilding and repair industrial base. This perception will generate opposition from the domestic shipbuilding and repair industry, including individual corporations and trade associations such as the Shipbuilders Council of America (SCA), as well as union and non-union workforces and their legislative representatives.

To address these concerns, a carefully crafted strategic communication plan is essential, emphasizing several key points:

1. The initiative is temporary and designed to address an immediate readiness crisis while domestic capacity is rebuilt
2. The focus is on ships already operating in the Pacific, emphasizing operational efficiency
3. The long-term goal is expanding, not contracting, the domestic industrial base
4. The plan leverages the unique capabilities of close allies while protecting core U.S. interests
5. The alternative, continued maintenance delays, directly threatens national security and naval readiness

It is imperative to communicate clearly that the utilization of Japanese and South Korean ship repair industries is intended only to resolve current ship maintenance backlogs and complete timely surface combatant maintenance that domestic shipyards are unable to accomplish due to capacity restraints. Allied ship repair capacity would be used only for ship repairs that the CONUS-based ship repair industry cannot accomplish due to infrastructure and workforce challenges.

Employing our allies' ship repair industries in the Western Pacific/Indo-Pacific region for voyage repairs and potential battle damage during wartime would also make strategic sense. In the end, the recommendation to use Japanese and Korean ship repair capacity to maintain our ships is part of a much larger, comprehensive effort to rebuild the domestic, CONUS-based shipbuilding and repair industrial base while simultaneously providing the Navy the ship repair capacity it needs.

3. Economic Considerations

There are also economic considerations to address when implementing this approach. While leveraging allied capabilities offers immediate relief, care must be taken to ensure it does not undermine domestic industrial base initiatives in the long term.

The Department of Defense's Regional Sustainment Framework provides a strategic foundation for pursuing the necessary changes. This framework recognizes the need to create "A distributed MRO network that will support the joint and combined force" (Office of the Assistant Secretary of Defense for Sustainment, 2024, p. 2). Achieving this vision requires addressing both the legal constraints and political concerns through a comprehensive approach.

During his opening remarks at the first meeting of the Defense Industrial Cooperation, Acquisition and Sustainment (DICAS) forum, Ambassador Emanuel stated the "real goal is to execute a plan that would leverage each other's capacity to enhance each other's collective deterrence... the time saved repairing and maintaining ships in Japan would be essential in the event of a kinetic situation or an armed conflict" (Wilson, 2024). In subsequent comments, Ambassador Emanuel stated, "It's our hope that American shipyards and workers stay focused on building new surface ships and make repairing USN ships in Japanese shipyards more of a permanent part of our process" (Senju & Kobayashi, 2024).

This approach creates a strategic advantage for both nations. As Professor Go Ito of Meiji University summarized, "It makes complete political and strategic sense for standard repairs and upgrades to be carried out at Japanese docks instead of sending these ships all the way across the Pacific." He added that "there will be great interest from

Japanese shipyards in a long-term commercial relationship," noting that "it is good for the U.S. as it can cut costs for these ships to be maintained by Japanese workers." In his view, "it's a win-win with no downsides for both governments and keeps Japanese shipyards happy" (McFadden, 2024).

Resolving these implementation challenges represents a critical path for successfully leveraging Japanese and South Korean maintenance capabilities. While diplomatic, operational, and technical arrangements with allied partners can proceed in parallel, full implementation cannot occur without addressing these statutory restrictions and developing a persuasive narrative that aligns the initiative with both national security imperatives and the long-term health of the domestic industrial base.

E. ADDITIONAL FACTORS CONTRIBUTING TO THE MAINTENANCE CRISIS

While lack of maintenance capacity represents the primary challenge facing the Navy, several additional factors have been identified that contribute to the maintenance crisis. Addressing these factors is necessary for a comprehensive solution, but does not diminish the urgent need to leverage allied maintenance capabilities in the near term.

1. Private Sector Perspectives and Challenges

Matthew Paxton, the president of the Shipbuilders Council of America, offered testimony to the House Armed Services Committee that provides insight into the private shipbuilding and repair industry's perspective. He stated that shifting support for the shipbuilding and repair industry from republican and democratic administrations, along with other countries' subsidization and financing of their industries, was responsible for "market distortions" and the reason "US shipyard capacity is not what it once was" (Paxton, 2025, p. 2).

Paxton further testified that factors beyond capacity contribute to maintenance delays, including:

- Shifting maintenance plans
- Excessive government oversight and reporting requirements

- Excessive focus on competition rather than partnership with industry
- Budgets that are neither predictable nor stable
- Inefficient use of current ship repair capacity (Paxton, 2025, p. 3).

These perspectives align with the economic goals and business strategies of the shipbuilding and repair industry. In his article "Shareholders Interests Are at Odds with Navy Needs" Martin Bollinger (2025) remarks that industry objectives often include minimizing risk, avoiding overinvestment in defense, not increasing capacity to meet "market surges," and focusing on generating cash returns for shareholders (Bollinger, 2025, p. 2). Figure 12 illustrates that over the past six years, only about a quarter of net cash generated from operations at two of the largest shipbuilding and repair companies has been reinvested in capital spending (Bollinger, 2025, p. 3).

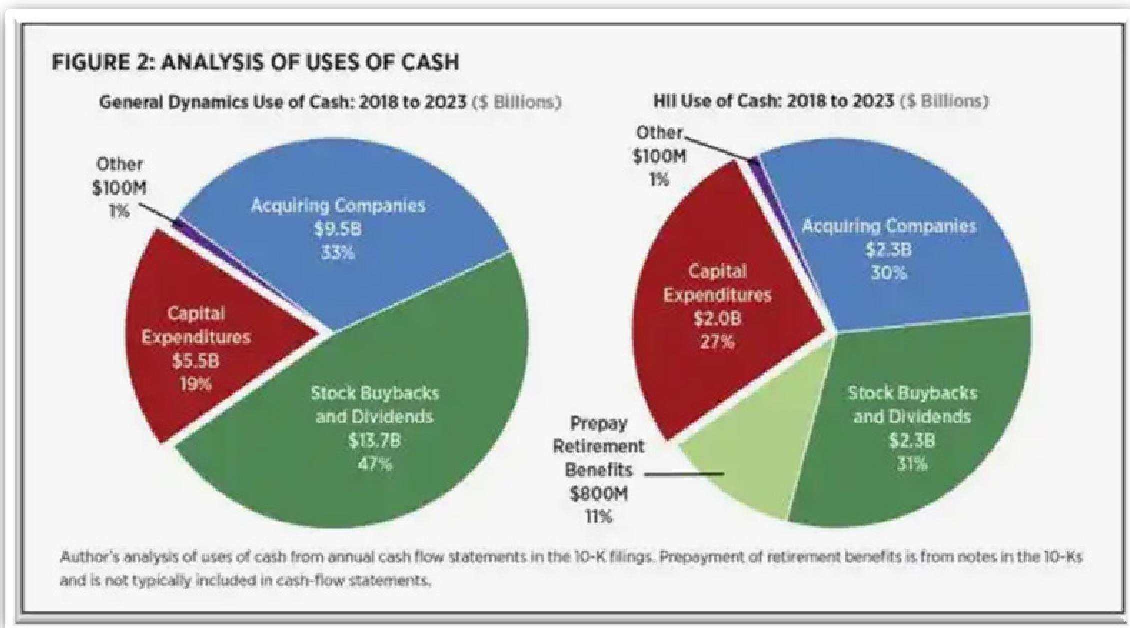

Figure 12. General Dynamics and Huntington Ingalls Industries uses of cash from 2018 to 2023. Source: Bollinger (2025).

He states that this business model creates a fundamental tension with the Navy's ship repair goals (Bollinger, 2025). While the private sector prioritizes financial returns, the Navy needs increased ship repair capacity, on-time maintenance completion, on-budget delivery, high-quality work, workforce development, and active supply chain management. Reconciling these divergent priorities will take time and skill, further supporting the need for supplementary maintenance capacity in the interim.

2. Government Initiatives and Policy Developments

The U.S. government has recently taken steps to address the shipbuilding and repair industry's concerns. In her article for USNI News, Mallory Shelbourne notes that President Trump recently announced his administration's intent to draft an executive order creating a "Maritime Industrial Base Office" within the White House's National Security Council (Shelbourne, 2025, p. 2). This reverses a 1980s Reagan administration decision to end government support and subsidies for the private shipbuilding and repair industry.

She further explains that the executive order aims to "resurrect the American shipbuilding and repair industry" and includes the creation of a "maritime security trust fund" for financial incentives and the establishment of "maritime opportunity zones" to promote shipbuilding and repair investments (Shelbourne, 2025, p. 3).

Building on this trend, John Hampstead (2025) reports that Congress has introduced bipartisan legislation entitled "Ships for America Act." This legislation will encourage shipyard development through 25% tax incentives, "streamlined permitting processes," and other incentives (Hampstead, 2025, p. 4). Industry experts have described these initiatives as the most attention the industry has received from the government in over 50 years (Shelbourne, 2025, p. 6).

While these developments are positive, federal tax incentives, maritime opportunity zones, and streamlined government oversight will not create ship repair capacity overnight. Increased ship repair capacity is needed now, particularly in the Pacific theater, where the U.S. and the Pacific Fleet are engaged in strategic competition with the PRC/PLAN.

3. Navy Process Improvements

The Navy has acknowledged its role in maintenance challenges and is working to be a better customer by implementing industry best practices. Over the past five years, Naval Sea Systems Command (NAVSEA) has utilized data analytics to improve surface ship maintenance availability planning, award contracts, procure government-furnished material, and integrate surface ship schedules (Naval Sea Systems Command Office of Corporate Communications, 2024).

Former Navy acquisitions chief Nikolas Guertin noted that "the Navy has been treating the private shipyards like their corner garage instead of making investments that will make maintenance periods predictable and as short as possible" (Myers, 2025a). In response, NAVSEA has implemented a new maintenance strategy involving shorter maintenance periods with "caps on growth work" that limit extending a depot-level maintenance period to 12% of the originally scheduled maintenance period. Based on data showing that scheduled year-long depot-level maintenance availabilities were four times as likely to be delayed than shorter ones, NAVSEA now schedules shorter 100–150 day in-dock periods rather than year-long availabilities (Myers, 2025b).

These efforts have yielded some progress. For FY24, the Navy is projecting a 65% on-time maintenance completion rate 29% improvement from two years ago (Naval Sea Systems Command Office of Corporate Communications, 2024). While this improvement is welcome, a 65% on-time completion rate still means 35% of ships encounter maintenance delays. This improvement, while significant, does not invalidate the overwhelming GAO and USN data documenting a capacity shortfall in the domestic shipbuilding and repair industry.

4. The Strategic Imperative

Given the historical data, current assessment of maintenance delays, future shipbuilding plans with associated increased maintenance requirements, and the strategic necessity of having battle damage repair capability positioned within the Indo-Pacific region, it is in our national strategic interest to continue efforts to increase domestic ship repair capacity while supplementing it with Japanese and South Korean ship repair industries.

The recommendation to utilize Japan and South Korea's maritime industrial capabilities addresses immediate needs while providing time for domestic initiatives to mature and for these additional factors to be resolved. It is not an either/or proposition but a complementary approach that creates space for all stakeholders- the Navy, Congress, and Industry- to implement the necessary changes to rebuild domestic capacity for the long term.

Without the shipbuilding and repair capacity our Japanese and ROK allies have to offer, our public and private shipyards will have to focus more effort on current operations and ship repairs rather than industrial base modernization. Leveraging allied capabilities is the only approach that addresses both immediate readiness concerns and long-term industrial base health.

F. CONCLUSION

The U.S. Navy faces a critical maintenance capacity shortfall that threatens fleet readiness and operational capabilities in the Indo-Pacific region. By leveraging the robust maritime industrial bases of Japan and South Korea, the Navy can address immediate maintenance requirements while providing the necessary time for domestic initiatives to mature. This approach recognizes the reality of current capacity limitations while creating a pathway to rebuild domestic capabilities for the long term.

Japan and South Korea represent a possible solution for addressing the Navy's maintenance crisis for several compelling reasons:

1. Existing infrastructure and proven capabilities, particularly at SRF-JRMC facilities in Yokosuka and Sasebo.

2. Technical compatibility, with both nations building and maintaining vessels similar to U.S. Navy surface combatants.

3. Cost efficiencies, especially evident in South Korea's ability to build comparable vessels at a fraction of U.S. costs.

4. Geographic proximity to potential Indo-Pacific contingencies, enabling faster turnaround times and reducing transit requirements.

5. Established, trusted alliance relationships with mutual security interests.

6. Cost-sharing arrangements, particularly with Japan, that provide exceptional value.

The increased repair capacity associated with utilizing Japanese and Korean ship repair industries will also provide the Navy and the domestic maritime repair sector with an opportunity to evaluate other underlying pressures fueling the maintenance crisis. While domestic capacity development must continue, the reality is that SIOP and other initiatives will take decades to fully implement, and the fleet cannot wait that long. Japanese and South Korean MRO capabilities offer an immediate solution that enhances readiness today while creating the space needed for long-term domestic industrial base revitalization.

This strategic approach offers the best path forward to ensure both immediate fleet readiness and long-term industrial capacity, strengthening not only our naval capabilities but also our alliance relationships in a critical region.

V. CONCLUSION

This thesis has examined the U.S. Pacific Fleet's maintenance crisis, identifying insufficient repair capacity as the primary driver of persistent delays and operational impacts. Through comprehensive analysis of historical data, facility assessments, and expert testimony, this research has established that current domestic shipbuilding and repair capacity cannot meet the Navy's maintenance requirements, resulting in significant readiness challenges. The proposed solution, leveraging Japanese and South Korean ship repair capabilities, offers a strategically sound approach to address immediate maintenance backlogs while creating space for domestic industrial base revitalization.

A. SUMMARY OF FINDINGS

The scope and severity of PACFLT's maintenance crisis cannot be overstated. Analysis in Chapter III revealed that approximately 75% of maintenance periods consistently run behind schedule, with delays reaching 28,238 total days between 2014 and 2020, effectively removing 15 ships per year from operational availability (GAO, 2020a, p. 5). These delays have created a $1.8 billion deferred maintenance backlog, with $1.7 billion concentrated in surface ships (GAO, 2022c, p. 29).

The direct connection between these delays and insufficient maintenance capacity has been established through multiple lines of evidence:

1. Physical Infrastructure Limitations: Public naval shipyards operate with facilities averaging 76 years in age, with condition ratings well below Navy standards. The 17 certified dry docks in public naval shipyards lack sufficient capability to complete one-third of required maintenance periods through 2040 (GAO, 2022a, p. 4,10)

2. Workforce Constraints: The current shipbuilding and repair workforce of approximately 30,000 represents just one-third of historical capacity. Critical skill gaps and high turnover rates further limit maintenance throughput (Di Mascio, 2024).

3. Leadership Recognition: Naval leadership, including the Vice Chief of Naval Operations and the Commander of Navy Regional Maintenance Centers, has consistently identified capacity shortfalls as the primary maintenance challenge.

4. Case Study Evidence: The USS Bonhomme Richard and USS Boxer cases demonstrate how capacity constraints force suboptimal maintenance decisions, including decommissioning vessels that could otherwise be repaired.

This research confirms that inadequate maintenance capacity directly threatens PACFLT's operational capabilities and strategic posture in the Indo-Pacific region. While initiatives like the Shipyard Infrastructure Optimization Program (SIOP) represent positive steps toward rebuilding domestic capacity, these efforts will require decades to fully mature. Meanwhile, PACFLT faces immediate readiness challenges that require near-term solutions.

B. KEY RECOMMENDATIONS

The central recommendation of this thesis is to leverage the ship repair capabilities of Japan and South Korea to supplement domestic maintenance capacity. This approach addresses the immediate maintenance crisis while providing time for domestic industrial base initiatives to mature. Specific recommendations include:

1. Expand SRF-JRMC Operations: Build upon the proven capabilities of the Ship Repair Facility and Japan Regional Maintenance Center in Yokosuka and Sasebo. These facilities already possess comparable capacity to CONUS regional maintenance centers and benefit from cost-sharing arrangements with the Japanese government.

2. Engage Japanese Private Industry: Partner with Japan's comprehensive maritime industrial base, including major corporations like Mitsubishi Heavy Industries, Japan Marine United Corporation, Kawasaki Heavy Industries, and Sumitomo Heavy Industries. The technical compatibility

between JMSDF and USN vessels creates natural synergies for maintenance operations.

3. Leverage South Korean Shipbuilding Expertise: Utilize South Korea's world-class shipbuilding capabilities, demonstrated by their ability to build comparable vessels at significantly lower costs than U.S. shipyards. The recent successful completion of the USNS Wally Schirra's regular overhaul at Hanwha Ocean proves the viability of this approach.

4. Address Legal and Regulatory Barriers: Pursue targeted modifications to Title 10 USC Section 8680 to create specific exceptions for allied nations with established security partnerships. Explore executive authorities, existing frameworks, and homeporting arrangements to enable implementation.

C. STRATEGIC IMPLICATIONS

The recommended approach offers several strategic advantages beyond addressing immediate maintenance requirements:

1. Enhanced Regional Deterrence

Maintaining PACFLT vessels in Japan and South Korea reduces transit times to maintenance facilities and maximizes forward presence in the Indo-Pacific region. This increased presence strengthens the Navy's deterrence posture against potential adversaries and reassures regional allies of U.S. commitment to their security.

2. Strengthened Alliance Relationships

Expanded maintenance partnerships create deeper technical and operational integration with key allies. These enhanced relationships build mutual trust and interoperability that extend beyond maintenance activities to overall alliance cohesion.

3. Industrial Base Resilience

The development of a distributed network of maintenance facilities creates strategic resilience against both peacetime capacity limitations and potential wartime disruptions. This approach aligns with the Department of Defense's Regional Sustainment Framework, which seeks to "Establish a distributed MRO ecosystem that remains viable in peacetime and meets surge requirements during crises and conflicts" (Office of the Assistant Secretary of Defense for Sustainment, 2024, p. 2).

4. Domestic Industrial Base Revitalization

Perhaps counterintuitively, leveraging allied maintenance capabilities creates the best conditions for domestic industrial base revitalization. By relieving immediate pressure on U.S. shipyards, this approach provides the time and space needed for initiatives like SIOP to succeed.

Without the shipbuilding and repair capacity our Japanese and South Korean allies have to offer, our public and private shipyards will have to focus more effort on current operations and ship repairs rather than industrial base modernization. This insight captures the fundamental logic of the recommendation: creating breathing room for long-term domestic capacity development while maintaining current readiness.

D. FUTURE RESEARCH OPPORTUNITIES

This research has identified several areas for future investigation that could further enhance understanding of naval maintenance challenges and solutions:

1. Legal Framework Development: Further research should examine in detail the most viable pathways for modifying Title 10 USC Section 8680 to enable expanded allied maintenance operations. This could include comparative analysis of previous national security exceptions to similar restrictions.

2. Additional Partner Nation Assessment: While this thesis focused on Japan and South Korea, future research should evaluate the potential contributions of other allied and partner nations in the Indo-Pacific region.

Countries such as the Philippines, Singapore, and India may offer complementary capabilities that could further enhance the distributed maintenance network concept.

3. Technology Transfer Protocols: Developing appropriate protocols for technology transfer and security would enhance implementation of expanded maintenance partnerships while protecting sensitive systems and information.

These research directions would complement the findings of this thesis and provide additional detail to support implementation of the recommended approach.

E. FINAL THOUGHTS

The U.S. Pacific Fleet faces a critical inflection point. The maintenance capacity crisis threatens to undermine America's naval posture in the Indo-Pacific precisely when strategic competition demands maximum readiness and forward presence. Traditional approaches focused exclusively on domestic capacity development cannot address the immediate maintenance backlog, while continuing on the current path risks further deterioration of fleet readiness.

The recommended approach, leveraging Japanese and South Korean maintenance capabilities, represents a pragmatic and strategically sound solution to this challenge. By addressing immediate maintenance requirements while supporting long-term domestic capacity development, this approach creates a pathway to both near-term readiness and long-term industrial base health.

As this research has demonstrated, the capabilities, expertise, and geographic advantages of Japan and South Korea make them ideal partners for this initiative. Their technical compatibility with U.S. Navy vessels, established alliance relationships, and demonstrated maintenance capabilities create natural synergies that can be rapidly expanded to address PACFLT's maintenance challenges.

Implementing this recommendation will require addressing legal, political, and organizational challenges. However, the strategic imperative of maintaining PACFLT readiness in an increasingly contested Indo-Pacific region demands creative solutions that transcend traditional approaches. By embracing the complementary capabilities of our closest regional allies, the U.S. Navy can enhance current readiness while creating the conditions for long-term industrial base revitalization.

Throughout naval history, shipbuilding has often captured the imagination and resources of nations, with new construction representing the visible manifestation of naval power. However, this research demonstrates that maintenance capacity is equally vital to strategic effectiveness. Building new ships without adequate maintenance capability is like buying a new car but not being able to change its oil. The car's performance will decline and eventually you will have to get rid of it earlier than expected. While shipbuilding expands the fleet's size, maintenance sustains its combat power. The U.S. Navy's ambitious shipbuilding plans for 381 battle force ships will be undermined if maintenance capacity remains insufficient to sustain current vessels. By addressing the critical challenge of ship repair capacity through allied partnerships, the recommended approach would not only maintain current combat power but create the foundation for future fleet expansion. In this way, the solution presented in this thesis supports both immediate readiness and long-term naval power in the Indo-Pacific region during a period of intensifying great power competition.

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