Destructive Behaviors in Naval Shipyards: A STAMP and System Dynamics Analysis

by

Braden C. Brower

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Authored by: Braden C. Brower
MIT System Design and Management Program, and the Department of Mechanical Engineering
May 16, 2025

Certified by: Nancy G. Leveson
Jerome C. Hunsaker Professor in Aeronautics and Astronautics
Thesis Supervisor

Accepted by: Nicolas Hadjiconstantinou
Chairman, Department Committee on Graduate Theses
Department of Mechanical Engineering

Accepted by: Joan Rubin
Executive Director
MIT System Design and Management Program

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Abstract

United States Navy Refueling and Complex Overhauls (RCOHs), and other extended maintenance availabilities, present uniquely demanding environments where Sailors face elevated risks for destructive behaviors, including suicide and substance abuse. Prolonged exposure to harsh industrial conditions, significantly degraded Quality of Service, demanding workloads, and critical manning shortfalls create cumulative stress distinct from operational duty. These destructive behaviors severely impact personnel's well-being, erode force readiness through attrition and morale issues, and indicate systemic contributing factors as highlighted by recent investigations into carrier suicides during shipyard periods.

This thesis utilizes Causal Analysis based on Systems Theory (CAST), grounded in systems thinking, to analyze the USS *George Washington* RCOH events and identify the underlying safety control structure flaws that contributed to this hazardous environment. Insights from the CAST analysis were then integrated with a qualitative System Dynamics model to better understand the feedback loops and dynamic interactions driving system behavior, particularly revealing a capability trap dynamic exacerbated by resource constraints and personnel pressures.

The analysis identified critical, interacting systemic flaws across multiple organizational levels that contributed to the accident: (a) inadequate strategic resourcing and manning prioritization for RCOH personnel support, (b) deficient planning, risk management, and oversight processes that were ineffective at protecting Sailor well-being amidst budget and schedule pressures, (c) ineffective feedback mechanisms that prevented critical information from reaching decision-makers, (d) and reliance on flawed assumptions regarding the RCOH environment, Sailor resilience, and standard process adequacy. Based on these findings, the thesis provides actionable, systemically focused recommendations aimed at strengthening the Navy's safety control structure by improving decision makers' mental models, enhancing feedback and oversight, enforcing well-being constraints, and fostering organizational learning. Combined, these recommendations empower leaders to proactively manage risks, reduce destructive behaviors, and ensure a safer, more resilient environment during future RCOHs.

Thesis Supervisor: Dr. Nancy G. Leveson
Title: Jerome C. Hunsaker Professor in Aeronautics and Astronautics

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Acknowledgments

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Chapter 1 Introduction

1.1 Motivation

The United States Navy relies on its Sailors as the mainbrace of its operational success and maintaining freedom of the seas. Each Sailor's health and well-being directly impact the unit's cohesion, morale, and ability to perform during the most complex missions under ever-increasing and demanding conditions. While typical engineering aspects such as hardware, machinery, and naval platforms (i.e., aircraft carriers, destroyers, and cruisers) draw significant safety engineering focus, none of these assets can function effectively without Sailors who are both physically and mentally ready to meet the Navy's operational requirements. Therefore, system safety analysis needs to be conducted with these factors in mind to ensure peak system functionality. Consequently, prioritizing Sailors' welfare is not a purely psychological or humanitarian concern but also a strategic engineering imperative directly linked to ensuring sea superiority and advancing U.S. national interests.

Despite robust and ever-expanding programs and policies designed to assist Sailors in combatting destructive behaviors, from mental health initiatives and substance abuse prevention to family support services, the Navy has seen an upward trend in incidents. Alarmingly, the suicide rate reached a four-year high in 2023, with 70 Sailors taking their own lives [1]. This continued upward trend in incidents signals potential shortcomings in existing prevention frameworks and control methods and highlights the urgent necessity of identifying and underlying systemic control breakdowns instead of focusing on the symptoms. Beyond the horrendous personal impacts on Sailors and their families, such destructive behaviors negatively affect the culture of the Navy as a whole. They can contribute to lower retention and recruitment and undermine unit readiness, as leadership must compensate for personnel unable to fulfill their roles due to mental health crises, disciplinary actions, or other related effects [2]. Furthermore, destructive behaviors are insidious amongst peer groups, particularly the younger enlisted Sailors, and occurrences often expand further within the unit [3].

When destructive behaviors occur within extended yard periods or Chief of Naval Operations (CNO) availabilities, the effects on the system become even more accentuated. Current naval maintenance timelines already present significant challenges, with a recent Government Accountability Office (GAO) report discovering that 75 percent of maintenance availabilities for nuclear-powered vessels were completed late, totaling 7,424 days of delays [4]. One key driver of these protracted timelines is a shortage of qualified shipyard and crew personnel. This situation is aggravated when Sailors are lost or sidelined due to destructive behaviors. The implications of such delays have a cascading effect throughout the fleet, where a vessel overdue for maintenance prevents its return to operational status, further bottlenecking the shipyard schedule for other ships and eroding overall fleet readiness. Additionally, from the same GAO report, the second most significant reason for delays with naval vessels leaving the shipyards is growth or undiscovered work caused by those vessels remaining operational far beyond their scheduled maintenance period [4].

From a strategic perspective, prioritizing Sailors' health and comfort is central to sustaining a potent, resilient naval force. Naval leaders, national legislators, and federal regulators must recognize that destructive behaviors are not merely personal issues but have powerful organizational, operational, cultural, and national security ramifications. By utilizing a systems theory methodology and CAST as an accident analysis technique, it is possible to clarify gaps

within the current control structures and develop solutions such as enhancing mental health resources, refining policies to focus on Sailor well-being, and ensuring robust support systems. These steps could mitigate the onset and effect of destructive behaviors, support the retention of experienced personnel, increase recruitment pipelines, and foster a resilient, mission-ready surface fleet. By doing so, the Navy improves the quality of life for its Sailors and bolsters its forces' operational capability and lethality, safeguarding global interests.

1.2 Thesis Objective

The objective of this thesis is to utilize and apply CAST and a qualitative System Dynamics model to clarify how the control structure works and to examine how destructive behaviors (including suicide, drug use, alcohol-related incidents, and domestic violence) emerge within Naval Surface Vessels at a shipyard. By identifying scenarios in which such behaviors may occur due to unsafe or flawed control actions or improperly conflicting controllers, this thesis aims to provide actionable recommendations for improving the Naval organizational structure, programs, and requirements. Therefore, this research empowers improved design decisions that mitigate destructive behaviors and strengthen surface vessel readiness and safety.

1.3 Thesis Structure

The structure of this thesis is the following: Chapter 2 addresses and clarifies relevant background information about destructive behaviors, naval statistics, shipyard environments, surface ship lifecycle, and naval programs targeting destructive behaviors. Additionally, a section explains system theory and the CAST framework for organizations. In Chapter 3, this thesis conducts a CAST analysis on the current system in the context of the USS *George Washington* in a midlife nuclear refueling at Huntington Ingalls Newport News Shipyard (HII-NNS). It homes in on the environment, culture, and organizational degradations, which led to three Sailors taking their lives in just a few months. The lessons from these events highlight the similar systemic control issues for nearly all other shipyards. This chapter highlights key lessons learned from this case study and utilizes those to enhance the system dynamics analysis within Chapter 4. In Chapter 4, a qualitative System Dynamics model is developed, focusing on the ramifications of quality-of-life degradations on multiple assets of naval readiness. This chapter highlights key lessons learned and control breakdowns related to destructive behaviors within the fleet. The final qualitative portion of the thesis, Chapter 5, is the conclusion and clarifies the critical recommendations for improving the current naval organizational system. Chapter 6 contains all references.

Chapter 2 Literature Review

2.1 Naval Shipyards

Naval shipyard availabilities are dynamic, complex, and brutally challenging. To accomplish these availabilities, Naval shipyards are 24-hour, 7-day-per-week industrial sites with constant quality-of-life degradations like loss of ventilation, heating, hot water, and noise pollution from needle gunning and ship announcements, all of which compound upon each other (pg. 42) [5]. Living facilities are frequently severely degraded as Sailors live aboard ships that are effectively long-term construction zones or in onshore facilities such as barges or aging barracks that fail to meet established Navy standards for habitability [6], [7]. Work schedules are arduous and erratic, often involving long hours and rotating shifts within a physically demanding industrial setting [6], [7]. Leadership faces unique hurdles in maintaining morale and effective oversight due to reduced crew sizes and shortages of experienced supervisory personnel, particularly during protracted maintenance periods. Moreover, the nature of the work itself, focused on industrial maintenance rather than operational duties, can foster feelings of monotony or disconnection from core naval roles and motivations for service [7].

Shipyards require continuous effort across multiple industries, domains, and organizations to ensure timely completion and return to operational status. Unfortunately, the Navy does not adequately prioritize and enforce the Quality of Service (QoS=quality-of-life combined with Quality of Work) across all vessels, particularly those in the shipyards. This QoS is often degraded due to Sailors essentially eating, working, sleeping, and ultimately living in an industrial environment for years.

Current shipyards, particularly Huntington Ingalls Industries Newport News Shipyard (HII-NNS), which conducts RCOHs and some of the other more complex shipyard availabilities, lack the infrastructure, facilities, and QoS facilities for our Nation's Sailors to be able to live comfortably (pg. 22) [7]. Addressing these deficiencies is not just to make life easier for these Sailors. Instead, addressing the control breakdowns of these issues ultimately impacts the operational readiness of the entire fleet.

2.1.1 Effects of Maintenance Delays on the Optimized Fleet Response Plan (OFRP)

The Optimized Fleet Response Plan (OFRP) is a planned readiness cycle that balances maintenance, training, and deployment requirements. In particular, the maintenance phase occurs when a ship enters the shipyards for a scheduled availability, as shown in Figure 1. During this period, the vessel undergoes necessary repairs, overhauls, and system upgrades that are critical for sustaining its long-term operational readiness and hull lifetime. The maintenance phase restores the vessel to its required material condition and modernizes its capabilities to meet evolving mission demands. Once maintenance and modernization tasks are completed, the ship transitions to follow-on phases, ensuring the vessel and its crew are fully prepared for future deployments.

GAO analyses have repeatedly shown that the Navy faces substantial maintenance delays affecting most of its maintenance periods, with ships spending thousands of days more in maintenance than planned [4], [8]. These delays disrupt OFRP and compress vital training periods, impacting the fleet's ability to deploy ready forces on schedule.

Figure 1: Depiction of Naval Optimized Fleet Response Plan (OFRP), which is the phase of a ship's lifecycle [9].

2.1.2 Mid-Life Refueling and Complex Overhaul (RCOH)

Mid-Life Refueling and Complex Overhaul (RCOH), which are only performed for nuclear-powered vessels, are four-year endeavors that compound the level of dynamic complexity due to the nuclear system and the sheer size of the engineering plants involved [7], [10]. Aircraft carriers go through RCOH about halfway through the 50-year hull life to conduct major inspections, repairs, and, most importantly, nuclear refueling so that the ship can meet the expected operational lifetime [7].

2.1.2.1 RCOH Phases

A ship goes through several distinct phases when it enters RCOH. These phases are preparation for entering, overhaul (where the majority of the work happens), testing phase (where all the work is verified completed within specifications and the ship is confirmed to be ready for sea again), and returning the vessel to the sea (pg. 24) [7].

Specifically, the planned milestones between those phases significantly affect ship habitability and result in frequent transitions of the ship's crew on and offboard. Initially, during the "*Complete Offload Portion of Ship Consolidated Offload Outfitting"* phase, equipment not required for the overhaul is removed, and temporary systems are installed, rendering the ship uninhabitable. As a result, most offices are relocated to a floating accommodation facility (barge) or nearby buildings, and approximately 800 junior Sailors ineligible for housing allowance are moved to barracks or other shore-based housing [7].

Subsequently, the "*Enter Drydock"* phase marks the start of extensive depot-level work, including nuclear fuel replacement, during which the ship becomes a large industrial work area with ongoing disruptive activities such as grinding, smoke, cutting, and welding. Temporary systems are run throughout the system to address the systems related to ventilation, heating, potable water, lighting, and electricity. The phase lasts approximately 18 months [7].

Later, during the "*Crew Move Aboard*" phase, the crew begins reoccupying the ship. This involves refurbishing and preparing living and working spaces (such as berthing compartments, offices, and common areas) while balancing routine duties, strategically using areas aft of frame 180 to maintain operational continuity. Junior Sailors without BAH move on board during this phase. Additionally, this phase typically lasts for four months and occurs approximately nine months before the final delivery of the ship to the Navy [7].

Following this, "*Fast Cruise and Sea Trial*s" are conducted to test the ship's operational systems before the final milestone, "*Redelivery*," when the ship is formally returned to the Navy.

2.1.2.2 Destructive Behaviors Prevalence in Extended Availabilities and RCOH

Overall, suicide rates within the Navy have exhibited an upward trend over the past decade and a half, although specific rates fluctuate from year to year. In the calendar year 2023, the active component suicide rate was reported at 21.0 per 100,000 Sailors [11]. This rate is significantly higher than those observed in the late 2000s (e.g., 10.9 per 100k in 2007) and notably higher than the 2021 rate of 17.0 per 100k [12]. For comparison, the demographically adjusted civilian suicide rate for males aged 17-60 in 2021 was 28.6 per 100,000, though direct comparisons are not perfect due to differing population characteristics and stressors. Demographically, young enlisted males consistently represent the most significant number of suicide deaths across the Department of Defense, a pattern generally reflected in Navy-specific analyses [12], [13].

The following is an exact quote from Commander Naval Air Forces Atlantic (CNAL), who is the Type Commander (TYCOM) overseeing aircraft carriers in RCOH, highlighting the rise in destructive behaviors, particularly suicide:

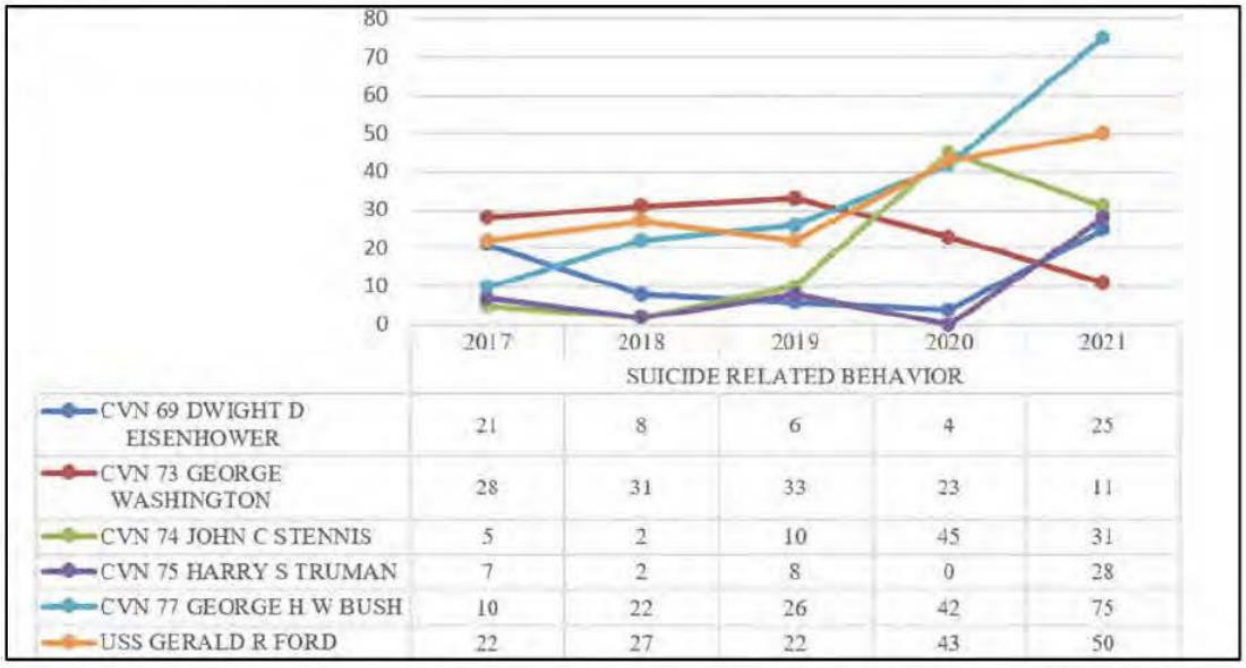
> "Although the report is inconclusive, there appears to be an increased risk of suicide for Sailors in the shipyard. The at-risk population for suicides is our youngest demographic, which continues to support my recommendation that no first-term Sailor be assigned to a ship going through RCOH for the entirety of their initial obligation. This data, when compared temporally over the life of our CVNs, and in particularly the time they spend in the shipyard, as well as when data is weighted to account for actual crew size at the time of the event, shows a significantly higher incidence of suicide in a shipyard. For example, rough math would indicate that a CVN spends roughly 1/3 of its life in a shipyard, and 57% of CVN suicides occurred in shipyards over the last 5 years, as shown in Figure 3. Without accounting for the reduced crew size, that represents an approximately two times (2X) higher likelihood of suicide onboard a CVN in a shipyard. When crew size is factored into the equation (i.e., RCOH at 75% manning, operational at 90%), the likelihood increases to at least three times (3X) ~ however, resourcing of mental health providers nor supervisory manning does not reflect this elevated risk (pg. 24) [7]."

Additionally, COMNAVAIRFORINST 6000.1B specifically identifies the elevated risks of suicidal ideations when in an extended yard period: "The incidence of psychiatric patients with

suicidal ideation, stress, and occupational problems also tends to increase significantly (pg. 15) [14]."

Both points suggest that prolonged exposure to industrial environments, along with organizational instability, uncertainty, poor leadership, and degraded living or working conditions, especially outside typical operational areas or combat zones, shows elevated risk profiles for destructive behaviors like suicide. This is further evidenced by the tragic cluster of suicides aboard USS *George Washington* between 2017 and 2022, including at least nine deaths by suicide during the RCOH period, with three occurring within a single week in April 2022 and three SSailors that took their lives in three months during 2022 that happened on USS Theodore Roosevelt [15].

Figure 2, Figure 3 illustrate the proportion of destructive behaviors amongst the different aircraft carriers and the number of suicide-related behaviors that occurred.



	2017	2018	2019	2020	2021
CVN 69 DWIGHT D EISENHOWER	21	8	6	4	25
CVN 73 GEORGE WASHINGTON	28	31	33	23	11
CVN 74 JOHN C STENNIS	5	2	10	45	31
CVN 75 HARRY S TRUMAN	7	2	8	0	28
CVN 77 GEORGE H W BUSH	10	22	26	42	75
USS GERALD R FORD	22	27	22	43	50

Figure 2: Depicts the data for suicide-related behavior for the aircraft carriers on the East Coast. Taken from [7].

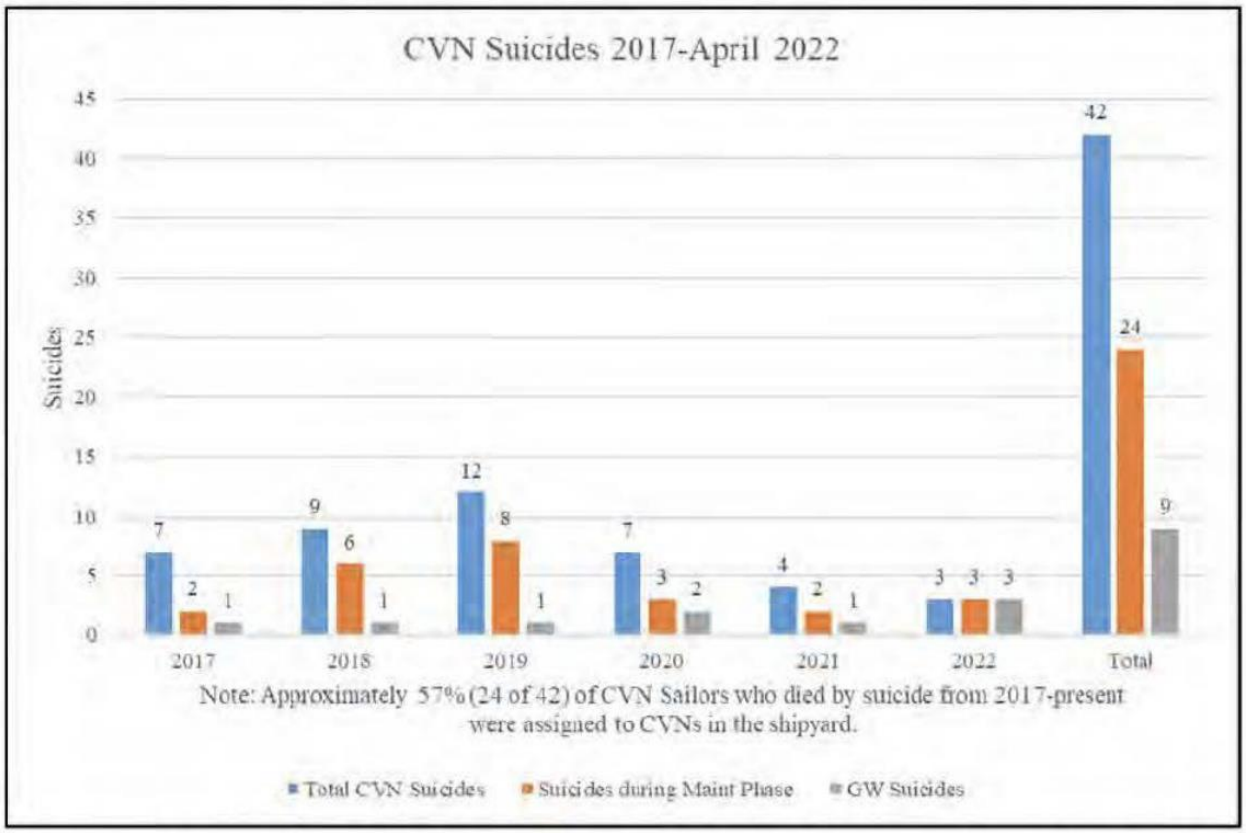


Figure 3: Taken from [7]. Totals of all CVN suicides; however, the note is of particular importance as it highlights the higher percentage of Sailors who take their lives when in the shipyards.

Substance abuse, particularly involving alcohol, remains a significant and persistent concern within the Navy. Alcohol Use Disorder (AUD) is identified as the most common addiction among veterans, and numerous studies indicate high rates of binge drinking and hazardous alcohol consumption among active-duty Sailors, sometimes exceeding the rates observed in comparable civilian populations [16]. Alcohol is often reportedly used by service members to cope with stress, boredom, loneliness, or social anxiety, and its consumption is deeply ingrained in aspects of military culture and social interaction [17].

The misuse of prescription drugs, especially opioids and sedatives, is another area of concern within the Navy. This misuse is often linked to treating physical injuries sustained during service or demanding training. While the Navy has implemented stricter prescribing guidelines in recent years to combat over-prescription, addiction remains a challenge for those who developed dependence, often on medications initially provided for legitimate medical reasons. Self-reported rates of illicit drug use, including prescriptions, among active-duty personnel are generally low, a finding likely influenced by the Navy's strict zero-tolerance policy and comprehensive random drug testing programs [16].

There is a high rate of co-occurrence between substance use disorders (SUDs) and other mental health conditions. Research consistently shows that a vast majority of recent veterans diagnosed with an SUD also have a co-occurring mental health disorder, most commonly Post-Traumatic Stress Disorder (PTSD), depression, or anxiety. Studies indicate that 82-93% of recent veterans with an SUD have a co-occurring mental health diagnosis, and about 63% of

those with SUD also meet the criteria for PTSD [13], [16], [17]. This strong correlation suggests that substance use could function as an attempt for Sailors to self-medicate underlying psychological distress or manage the symptoms of untreated or undertreated mental health conditions. Shipyard-specific stressors contribute to the development or exacerbation of SUDs.

2.1.3 How Destructive Behavior Occurrence in the Shipyards Affects Operational Effectiveness

As stated previously, one of the core aspects of this thesis is that destructive behaviors significantly influence and are potentially exacerbated by the unique stressors inherent in the shipyard environment, which ultimately restrict and limit the Navy's operational readiness. This degradation occurs across multiple critical dimensions. Personnel readiness is eroded through increased attrition, including administrative separations potentially linked to behavioral issues, difficulties in achieving and maintaining adequate manning levels, diminished morale, and challenges in retaining skilled and experienced Sailors [4], [8], [16], [18], [19].

The commander utilizes administrative separations to remove Sailors from active duty under circumstances below those that would meet the threshold for severe measures like a court-martial or a punitive discharge. The goal is to uphold good order and discipline by addressing misconduct, medical or psychological unfitness, or substandard performance to maintain or improve operational capabilities [20].

For carriers in the shipyards, there has been a rise in early contract terminations due to administrative separations. A study conducted by CNAL determined that 84 administrative separations occurred over six months, resulting in 218 years of cumulative service at 2.6 years per Sailor (pg. 25) [7]. Specifically,

> "99.7 percent of all recommended administrative separations of carrier Sailors over the past 5 years relate to a behavioral health issue. Across the aircraft carrier force, the average number of Sailors recommended for administrative separation for a behavioral health condition increased by 146 percent during the COVID-19 pandemic. Following the initial vaccination rollout and lessening of COVID-19 restrictions, the average number of Sailors recommended for administrative separation for a behavioral health condition increased by 120 percent over the prevaccination average (pg. 117) [7]."

For some Sailor specialties and ratings, it costs tens of thousands of dollars (~$84,000) and over a year of school and training before they even report to their first duty station [21]. Therefore, it is imperative to address these destructive behaviors because losing Sailors to them results in millions of dollars of wasted training costs and lost shipyard productivity.

Beyond the personnel readiness aspects, material readiness also suffers. Problems stemming from personnel shortfalls, critical skill gaps, and the direct or indirect impact of behavioral health issues can significantly delay complex shipyard maintenance schedules. These factors can also increase the volume of deferred maintenance, inflate operational and support costs, reduce overall ship availability, and ultimately compromise the Navy's ability to fulfill its global operational commitments. Numerous reports from congressional oversight bodies, including the Government Accountability Office (GAO) and the Congressional Budget Office (CBO), have consistently documented these persistent challenges in naval maintenance and readiness, frequently linking them to personnel factors and the demanding conditions within shipyards [4], [7], [8], [22].

2.1.4 Aspects of Shipyard Living that Contribute to the Onset of Destructive Behaviors

Several conditions contribute to the onset of destructive behaviors, including habitability and industrial hygiene inspections, berthing and offshore living facilities, transportation, shipyard workload, manning and skill gaps, and the type of work.

2.1.4.1 Habitability Inspections and Industrial Hygiene Inspections

Industrial Hygiene Inspections are required to be conducted by the ship every three years (pg. 41) [23]. The purpose of these surveys is as follows:

> "To assess potential health risks to Navy personnel by differentiating between acceptable and unacceptable exposures with the goal to prevent or control unacceptable exposures." "To establish and document a historical record of exposure levels for Navy personnel and to communicate exposure monitoring results." "To ensure and demonstrate compliance with safety and health exposure criteria." "To provide a basis for exposure medical surveillance examinations" (pg. 38) [23].

If the ship cannot meet the scheduled periodicity, the TYCOM (CNAL) can approve a waiver to extend the periodicity requirement (pg. 41) [23].

The inspections should catch and monitor the quality of life the Sailors live, which is plagued with a continuous barrage of physical hazards. Hearing studies would monitor for the constant noise from grinding, welding, heavy machinery operation, and other industrial processes, necessitating consistent use of hearing protection [3]. Air quality is frequently degraded due to airborne dust and debris, particularly within the confined spaces of ships undergoing repair. Additionally, during the construction of older ships, there is an increased risk of exposure to asbestos, which for Sailors who live and work aboard these vessels during overhaul, poses long-term health risks, including mesothelioma and other cancers [24]. Junior Sailors face a heightened risk compared to shipyard workers as they live onsite 24/7, rendering standard 8-hour exposure limits inadequate protection. These conditions mirror stressors in other high-risk industries like mining and construction, where hazardous exposures are well-documented contributors to adverse health outcomes and increased risk profiles.

2.1.4.2 Berthing and Off-Ship Living Facilities

The military and Navy, during shipyard periods, have a documented history of neglecting to upgrade military housing facilities. These poor living facilities are often significant sources of stress, particularly for the most Junior Sailors who are attempting to adapt to Naval life [25]. Studies focusing on ship habitability concerns noted in section 2.1.4 confirm that factors like noise, temperature, and ambient light levels significantly disrupt sleep patterns and negatively impact overall well-being [26].

Off-ship government-provided housing is also often substandard. Specifically, for RCOH, the barracks at HII-NNS, Huntington Hall, which were used during the USS *George Washington*'s RCOH, were documented as severely substandard. It was overcrowded, with Sailors living with significantly less space, about 85 sq ft per person for E1-E4 than required by Navy standards. Additionally, the Sailors had shared facilities like restrooms; overall, the

building was in a general state of disrepair and was identified as being past its "useful economic life" years before the USS *George Washington*'s arrival, yet its use continued [7]. The Navy required waivers from DOD policy to assign personnel to housing under these conditions for extended durations, sometimes forcing moves between facilities to accommodate arriving crews [6].

2.1.4.3 Transportation

Just getting to the ship adds another layer of stress, as Sailors who were lucky enough to live off-ship face lengthy daily commutes to and from the shipyard. Due to limited parking near the ships, Sailors had to drive personal vehicles to remote satellite parking lots and then rely on shuttle bus systems to take them to the ship. This process often added hours to a long workday, particularly when factoring in significant traffic congestion, such as through tunnels like the Monitor Merrimac near Newport News. Sailors reported up to three-hour commutes during USS *George Washington*'s RCOH [6], [7]. Parking issues at Newport News were identified as a problem as far back as 2005, but were not adequately addressed until after the cluster of suicides in 2022 drew significant attention [6]. This additional, unnecessary lost time directly reduces personal time, limits opportunities for rest and recovery, and potentially affects sleep duration. The daily frustrations stemming from long transportation times can exacerbate negative mood states and contribute significantly to burnout.

2.1.4.4 Shipyard Workload

The workload within a shipyard, particularly during major availabilities, can be intense. Sailors frequently work long shifts, often 12 hours or more per day, sometimes coupled with rotating watch schedules that severely disrupt natural circadian rhythms and sleep patterns. Unlike sea duty, where port calls offer periods of respite and patrols come to an end, shipyard work can continue relentlessly for months or years, often with limited opportunities for extended time off. The demanding pace, combined with the physically taxing nature of industrial work and the challenging environmental conditions, contributes to significant fatigue and widespread sleep deprivation among the crew [6], [7], [8].

Fatigue is a well-documented and critical human factor that degrades cognitive function, impairs judgment and decision-making, reduces overall performance, and substantially increases safety risks in complex operational environments [27], [28]. While the Navy has implemented fatigue management policies to mitigate these risks, their application and enforcement can be inconsistent, particularly within high-demand, schedule-driven environments like shipyards. The detrimental impact of long hours and shift work on fatigue, performance, and safety is extensively documented not only in military settings but also across various demanding civilian industrial environments, such as offshore oil platforms and heavy manufacturing, where it is strongly linked to increased accident rates and adverse health outcomes [29]. There is a distinct tension between a need to manage chronic fatigue while still maintaining the availability schedule so that the crew can be removed from the industrial environment in the first place. However, not enforcing fatigue management practices undermines the overall Navy safety culture, normalizing risk tolerance among the crew, which creates a situation where Sailors feel compelled to work despite dangerous fatigue levels.

2.1.4.5 Manning and Skill Gaps

Manning shortages across the fleet exacerbate workload issues within shipyards. The Navy struggles to fill all required billets on ships, with recent data showing significant shortfalls across various ship classes [4], [8], [18]. Even personnel who are officially assigned may be unavailable for duty due to temporary assignments elsewhere (TAD), illness, training, or other requirements, further reducing the number of personnel available for work. Additionally, crew sizes are intentionally reduced during maintenance periods, particularly RCOH, placing an even greater burden on the remaining personnel, with the billet priorities shown in Figure 4.

Compounding the issue of sufficient manning is the skillset of those onboard; Sailors, particularly in maintenance-intensive ratings such as Engineering, Combat Systems, and Reactor
shipyard environment [8]. While initial skills training during a Sailor's accession process is comprehensive, it is not tailored to the maintenance-heavy evolutions they will encounter, which often necessitates extensive on-the-job training. Extensive on-the-job training requires significant time and supervision from already taxed, experienced personnel [7], [8].

Undermanning and skill gaps create a detrimental cycle where fewer, potentially less experienced Sailors must handle demanding workloads under stressful conditions. This increases stress, fatigue, and a higher potential for errors or accidents. The consequences include deferred maintenance accumulating, further project delays, and heightened levels of burnout among the crew, impacting both material readiness and personnel well-being [8], [29], [30]. This environment may also increase the likelihood of personnel resorting to destructive coping mechanisms.

Billet Priority	Units
1	• Strategic nuclear forces • Special operations forces • Strategic nuclear forces (support) • Special operations forces (support)
2	• Forward-deployed naval forces (sea/shore type duty code 4)
3	• Overseas remote land-based sea duty (sea/shore type duty code 3)
4	• Optimized Fleet Response Plan (OFRP) deployers (continental United States (CONUS)) • Additional sea duty units o CVN 78-class o DDG 1000-class o CG/LSD modernization (caretaker crews) o Maritime prepositioning ships squadron (MPSRON) 2 and 3 o In-port emergency team direct support activities o Surveillance towed-array sensor system (SURTASS) ships o Expeditionary Sea Base (ESB) ships o Submarine tenders
5	• All other sea duty

Figure 4: Depicts fill priorities for naval forces based on the CNO's Navigation Plan. Of note is that RCOH falls under priority 5, which includes all other sea duty. Taken directly from [7].

2.1.4.6 Type of Work

Very few Sailors join the Navy to sit in an industrial environment. Most are attracted by the desire to serve their country, sail around the world, and experience the freedom an operational Naval vessel offers. However, for many Sailors, particularly those in operational ratings (e.g., navigation, combat systems, aviation), the work performed during long shipyard availabilities differs from their primary military roles and responsibilities [7], [31]. The focus shifts abruptly from seamanship, operational tasks, and warfighting functions to extensive industrial maintenance, labor, and standing security watches within a noisy, dirty construction environment. Extended removal from aspects that are core to their ratings and the requirement to perform monotonous, potentially unfulfilling, or irrelevant duties can significantly and negatively impact job satisfaction, motivation, and overall morale [7].

2.1.5 Comparison of Destructive Behaviors between Shipyards and Operational Assets

Research by Brooks and Greenberg highlights some of the issues with typical stressors common to the Navy while operational and in the shipyards. They include isolation from home, fatigue due to demanding schedules, long work hours, and physically challenging environments [32]. However, the investigations and evidence suggest that these stressors may be amplified or compounded by the specific factors unique to the shipyard context discussed in Section 2.1.4 [7].

Regarding fully operational vessels, one study by Thomsen et al. suggests that deployment periods are associated with increases in certain behaviors (e.g., substance use, risky recreational activities), but primarily for individuals with a pre-existing history of engaging in such behaviors before deployment [33]. This correlation differs from the shipyard environment, where the stress appears more chronic, pervasive, and fundamentally tied to QoS issues (housing, commutes, work environment), impacting a broader percentage of the ship's crew regardless of their prior behavioral history. While stressful due to mission demands, potential danger, and separation from home, operational deployments often involve a clearer sense of purpose, strong unit cohesion focused on operational tasks, and defined periods of activity, which may be lacking during prolonged, monotonous industrial work periods [3], [34]. When a ship is operational, homeport periods involve routine duties, training cycles, and local operations, generally offering greater stability. Additionally, Sailors have more time for recovery, family and community support networks, and significantly less exposure to industrial hazards and severely degraded living conditions characteristic of shipyards. GAO reports also highlight different types of readiness challenges across the Navy. Notably, a report reveals that ships homeported overseas, which are in the highest operational status, often suffer from degraded material conditions due to consistently deferred maintenance cycles [35].

2.1.6 Funding for Shipyard Availabilities

There are several intricacies with the Navy budget, particularly towards funding maintenance availabilities. There are two different allocations of money that can be utilized for these availabilities. The first and most prominent is the Shipbuilding and Conversion (SCN) budgetary line item, which is used for new ship constructions and major overhauls like RCOH (pg. 217) [36]. The purpose of this SCN fund, which is allocated for five years, is to ease the burden of the acquisition process and ensure continuity of funding. Since it is a budgetary line item, it is

approved once Congress finalizes the defense budget, and that money can only be utilized towards RCOH. Therefore, all the quality-of-life factors, such as "berthing, messing, barge operations, towing, and crew transportation," fall under this line item (pg. 129) [7] (pg. 223) [36].

The second portion of the budget associated with maintenance availabilities is the Operation and Maintenance, Navy (OMN) line item. OMN appropriations are used primarily for routine maintenance, repair, and upkeep necessary to keep ships operational and all maintenance availabilities except RCOH or new ship construction. Because these availabilities occur cyclically, the O&M funds ensure that the fleet can remain mission-ready between extended maintenance periods. Like SCN, Congress approves this budgetary line item; however, it is more discretionary as it expires after a year [36].

2.1.7 Effects of Destructive Behaviors on Deferred Maintenance and Operational Readiness

A direct consequence of maintenance delays and resource constraints described in the previous sections is the accumulation of massive, deferred maintenance backlogs, particularly impacting the surface fleet. In the past decade, surface ships accounted for nearly $1.7 billion of the Navy's estimated $1.8 billion total deferred depot maintenance backlog [37]. This backlog of unmet maintenance requirements degrades the material condition of ships over time. In some cases, the accumulated deferred maintenance and the projected correction cost have contributed to Navy leadership's decision to decommission ships years earlier than their originally planned service life, resulting in a smaller fleet and lost operational capability. For instance, nine ships proposed for early decommissioning in FY2022 had a combined deferred maintenance backlog of $1.2 billion [37].

As deferred work grows, it also significantly inflates costs. Operating and support (O&S) costs for ships have increased substantially, including maintenance costs, even as some classes of ships' operational tempo have lowered [38]. Increased maintenance costs have often offset savings from reduced crew sizes [38]. Furthermore, accurately capturing the full cost implications is challenging; for example, DOD could not fully account for how much it spent on housing allowances for service members who couldn't live in barracks due to poor conditions or lack of space [25], nor the full costs associated with practices like cannibalizing parts or local procurement due to supply shortages [8].

2.2 Naval Programs to Address Destructive Behaviors

2.2.1 "Get Real, Get Better"

"Get Real, Get Better" is a Chief of Naval Operations (CNO)-led initiative emphasizing candid self-assessment, accountability, and continuous improvement across all levels of the Navy. The program seeks to instill a culture where Sailors and leaders confront challenges head-on, identify areas for growth, and apply proven problem-solving practices to enhance readiness. Primarily championed by Admiral Mike Gilday, this initiative further builds on Navy traditions of innovation and rigorous self-evaluation [39].

One key theme is fostering ownership throughout the ranks, prompting every Sailor, regardless of rank, to take responsibility for identifying and resolving problems. This shared accountability emphasizes open communication to reduce the risk of suppressed concerns. Beyond increasing a sense of ownership, the Navy also utilizes data-driven assessments and

measurable metrics with transparent reporting to evaluate performance, correct shortfalls, and monitor progress.

The six core standards that guide this initiative are as follows:

> "First, aligning on standards and goals to ensure everyone is working toward the same objectives; second, finding and embracing the "red", meaning acknowledging and confronting difficult issues head-on; third, using Navy problem-solving methods to identify and address root causes, not just symptoms; fourth, fixing or elevating barriers that impede progress, ensuring that obstacles are either resolved or removed; fifth, encouraging learning through trust and respect, which creates an environment where people are empowered to grow and share knowledge without fear of judgment; and finally, specifying ownership, ensuring accountability and clarity in roles and responsibilities [39]."

2.2.2 Culture of Excellence

The U.S. Navy's "Culture of Excellence" (COE) is another initiative that aims to transition Naval culture from one of strict compliance, which is still important, to one more focused on proactive excellence. Launched in late 2019, COE was envisioned as an "overarching movement" uniting various programs to cultivate toughness, resilience, trust, and connectedness throughout the Naval fleet [40]. The initiating point for COE was when Naval leadership recognized that to combat the onset of destructive behaviors, such as mental health crises, misconduct, and accidents, changing the Navy's culture would require revamping "from the deck plates to the most senior levels [40]." In other words, rather than reacting to problems after they have already occurred, the program established a "rudder correction" to foster a positive, resilient environment where issues are prevented before they impact readiness [41].

COE 2.0 explicitly focuses on building "Great People, Great Leaders, and Great Teams" as the key to victory in combat, innovation, and prevention of harmful behaviors. This approach simplifies and aligns existing Navy programs with new concepts, closing the gap between the Navy's highest and lowest-performing units [40] [41]. It is a **"**radical simplification**"** that integrates and aligns many traditional programs, like suicide prevention, sexual assault prevention, and response, with newer initiatives focused on mental health resilience efforts [40].

2.2.2.1 Command Resilience Team

The Command Resilience Team (CRT) is the central fulcrum of the Culture of Excellence onboard naval vessels [41], [42]. They are the voices and advocates of the crew to the Command Triad. The various required members are shown in Figure 5, as well as how they integrate into the overall Culture of Excellence Program.

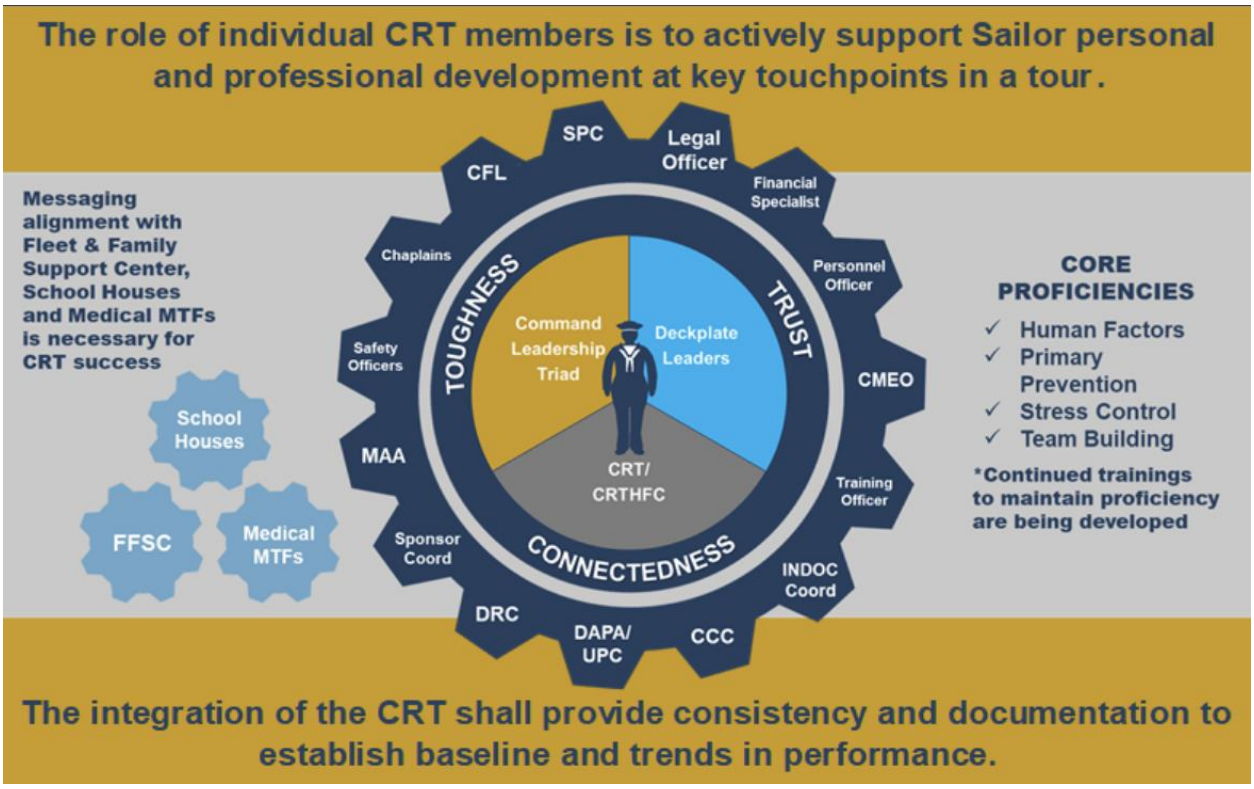


Figure 5: Depiction of the resources and responsibilities of the CRT. Taken directly from [41].

Off-ship entities include base chaplains, MWR Programs, the Navy Family Advocacy Program, alcohol and drug officers, and suicide prevention managers.
The CRT must meet quarterly, be designated in writing, and be focused on analyzing and addressing destructive behaviors, trends, organizational concerns, or other factors that may negatively affect the command climate [7].

2.2.2.2 Command Resilience Team Human Factors Council

The Command Resilience Team Human Factors Council (CRTHFC) focuses on specific cases and assigns resources to Sailors identified as struggling with current conditions or engaging in destructive behaviors. The CRTHFC maintains many of the same responsibilities as the CRT and is considered a subset, but it maintains a "need to know" status regarding the individual Sailors [7]. The goal of the CRTHFC is to meet immediately once an issue is identified or at least develop a systemic and holistic plan to aid a struggling Sailor. Engaged Deckplate Leadership conducts monthly human factors reviews with all Sailors at forward cases considered at risk to the CRTHFC, where the case is considered at least monthly. In the meantime, the EDL comes up with an immediate plan to contain the situation until the CRTHFC responds with a more comprehensive solution [42].

Mandatory members of the CRTHFC include the Commanding Officer, Executive Officer, Command Master Chief, Judge Advocate General or Legal Officer, Medical Officer, Command Climate Specialist (CCS), Chaplain, and the Sailor's Department Head [7].

CRTHFC is new to the surface fleet, so the intrusive leadership required often results in pushback. That is where the training from the CRT is so important to hone in on the culture that the Navy is trying to establish.

2.2.2.3 Expanded Operational Stress Control

The Expanded Operational Stress Control (EOSC) program is a key initiative within the U.S. Navy's broader effort to foster a COE and improve psychological resilience among Sailors. This peer-driven initiative blends conventional operational stress management techniques, psychological resilience practices, and mindfulness training into a synchronized method to strengthen individual Sailors and Navy units against various personal and professional stressors. Specifically, EOSC targets how Sailors perceive and respond to significant life challenges, including relationship problems, career transitions, disciplinary actions, performance pressures, and financial hardships [7], [43].

As part of the EOSC framework, each Navy command appoints an EOSC Team Lead, typically an E-7 or above, and an assistant team lead. These individuals are CRT members and undergo specialized training to facilitate EOSC at their respective commands [7].

This proactive, preventive approach aims to align with the Navy's broader COE goals while specifically addressing human factors and systemic interactions contributing to destructive behaviors. By doing so, EOSC should support overall mission readiness and safety aboard naval vessels.

2.2.2.4 Warrior Toughness

Another program associated with the COE is Warrior Toughness**.** This program integrates mental, physical, and spiritual resilience training into the earliest stages of a Sailor's professional development. Since 2019, Recruit Training Command (boot camp) has taught new Sailor techniques for toughness like stress management, mindfulness, and fostering a growth mindset in the face of adversity. The goal is to condition Sailors to take a hit and recover quickly through healthy stress management methods, rather than internalization, which was common in the past. By institutionalizing resilience training, the Navy is attempting to normalize help-seeking and emotional strength as part of operational excellence, which is drastically needed. A tougher and more resilient force will translate into better warfighting performance and reduced incidence of destructive behaviors since Sailors are better equipped to handle stress when they face it [44].

2.2.2.5 Command Indoctrination and Sponsor Program

Naval Command Indoctrination is one of the more important Navy programs designed to facilitate a smooth transition and effective integration of Sailors into new commands. Upon arrival at a new command, Sailors are assigned to orientation sessions to familiarize them with the command's mission, operational expectations, and organizational culture. The indoctrination process helps Sailors understand the command's policies, procedures, and available resources, providing a foundation for reducing stress and enhancing psychological resilience during potentially challenging periods of their careers, like the shipyards. To enforce attendance, many commands prevent Sailors from working at their rate until indoctrination is completed to ensure EDL enforcement of attendance. Effective indoctrination not only informs but also develops cohesive teams, clarifies expectations, and proactively mitigates issues that could otherwise

escalate into destructive behaviors, such as suicide, substance abuse, or disciplinary problems [7], [45].

2.2.2.6 Drug and Alcohol Deterrence Program

The Drug and Alcohol Deterrence Program is an essential element of the Navy's broader strategy to prevent addiction-related destructive behaviors among Sailors. Given the inherently stressful conditions of extended shipyard availabilities, periods which have historically heightened the risk of substance abuse, the program emphasizes proactive education, detection, and support measures. Specifically, the initiative educates Sailors on the dangers and operational impacts associated with drug and alcohol misuse, emphasizing healthy coping mechanisms and personal accountability. Structured into the program are routine deterrence measures, including random urinalysis testing, strict enforcement of zero-tolerance policies, safety stand-downs, and periodic training. Additionally, the program provides rehabilitation support and counseling services to restore Sailors to full duty status following incidents related to drug or alcohol abuse. By systematically focusing on the conditions that encourage substance misuse, the DAPA program supports Navy efforts to enhance crew morale, safety, and operational readiness during shipyards' complex, prolonged maintenance periods [46].

A key tenet of the program is Sailor self-reporting, with the premise that the commanding officer cannot punish those who have been referred or refer themselves without an incident. The various treatment levels are "0.5 (Early Intervention and Education Program), I (Outpatient Treatment), II (Intensive Outpatient or Partial Hospitalization), and III (Residential) (pg. 100) [46]."

On board the ship, the program is led by the Drug and Alcohol Program Advisor (DAPA), a CRT member. Supporting the DAPA are two Substance Abuse Rehabilitation Program (SARP) counselors who are also assigned to the medical department and support them onboard aircraft carriers. They focus on evaluating patients, recommending treatment, and then executing the treatment plan under the guidance of the professional psychologist onboard [7].

2.2.2.7 Enlisted Retention and Career Development Program

The Navy's Enlisted Retention and Career Development Program is designed to proactively support Sailors in their professional growth while addressing retention challenges by fostering career satisfaction and personal development. A key program component is Career Development Boards (CDBs), which are regular sessions held at career milestones that provide structured mentorship, personalized guidance, and a clear articulation of career advancement opportunities. Command Career Counselors (CCC) assist Sailors in navigating career decisions, which can alleviate stress, uncertainty, and dissatisfaction that may arise during extended shipyard periods. By actively engaging Sailors through targeted professional development and structured mentorship, the program can reduce feelings of isolation and career stagnation. Consequently, this approach promotes Sailors' well-being and supports shipyard operational timelines and readiness for the Navy by ensuring a motivated, composed, and focused ship's force. Typically, there is one overall program command career counselor. However, some coordinators are specifically trained throughout the command with a target representation of no more than 30 Sailors [47].

2.2.2.8 Command Financial Specialist Program

The Command Financial Specialist (CFS) Program is an initiative from the broader Personal Financial Management (PFM) framework, specifically designed to support Sailors through financial stressors. Recognizing that prolonged shipyard availabilities often exacerbate financial pressures (since the junior Sailors are at home and not deployed, contributing to destructive behaviors such as substance abuse and suicide. Every ship must designate a Command Financial Specialist in writing; however, the position is a collateral duty that requires volunteers.

CFS personnel, typically enlisted Sailors, require specialized training to provide education, personalized financial counseling, and immediate referral services to the crew members. They proactively address financial difficulties before they escalate into severe personal or disciplinary issues. By equipping Sailors with essential financial management skills and guidance early on in their time onboard, the program enhances resilience and mitigates financially rooted stress-induced behaviors, ultimately improving morale, readiness, and crew stability during high-stress shipyard periods. The proactive financial support provided through this program is essential for reducing conditions that contribute to destructive behaviors, which promotes a healthier command environment and improves operational effectiveness [48].

2.2.2.9 Suicide Prevention Coordinator

The Suicide Prevention Program is designed to reduce the risk of suicide by providing early intervention, targeted/frequent education, and support systems, especially during prolonged shipyard availabilities. As discussed previously, these periods of extended maintenance in industrial environments expose Sailors to conditions that can contribute to destructive behaviors, including suicide.

The program emphasizes proactive mental health strategies. Onboard the program is headed by the Suicide Prevention Coordinator (SPC), who heads the integration of suicide intervention training, like safeTALK, into command indoctrination, divisional training, frequent inspections, regular operations, and active involvement in the CRT. Specially trained personnel within each command are focused on recognizing early warning signs of psychological distress and facilitating timely crisis intervention with the crew. By embedding these measures within the Navy's broader culture of resilience, the program not only aims to prevent suicides but also supports overall crew morale and operational readiness [49].

This systematic approach reflects the Navy's transition and growth to attempt to attack the underlying systemic issues of suicidal ideation and safeguard its Sailors in high-stress environments, ensuring that even during challenging shipyard availabilities, they should have access to multiple mental health resources and support services.

2.3 Introduction to CAST

2.3.1 Systemic Thinking

Causal Analysis Based on System Theory (CAST) is a powerful method aimed at utilizing a systems thinking approach to conduct a holistic, robust analysis when an accident has occurred to prevent the same accident from happening again. There is a historical trend to narrow in on a singular root cause or address just the symptoms of a problem. CAST empowers the investigator to conduct a complete systemic approach to understand why the accident occurred, hopefully resulting in some learning from the accident and preventing it from happening again. Notably,

the losses that CAST analysis focuses on do not necessarily need to be those associated with a typical safety analysis (i.e., loss of life) but rather any that would result in a degradation to the system's mission (pg. 7) [50].

A powerful link exists between utilizing CAST to learn from an accident that has already occurred and incorporating those lessons into a new system early in the design process through STPA. Implementing those lessons learned into STPA assists the designer in "identifying plausible scenarios that need to be eliminated or controlled to prevent further losses" (pg. 8) [50].

Since it is oriented towards a total systemic analysis, CAST can also be incorporated in the context of this thesis, which is a socio-technical system. Particularly, Leveson highlights that Chapter 5 addresses this process in social systems, which may have had an accident through disruption of the social processes or even some of the typical engineering system losses, such as loss of life.

Jerome Lederer summarizes the methodology of Systems Safety and why it is so applicable to the topic of this thesis.

> "Systems safety covers the total spectrum of risk management. It goes beyond the hardware and associated procedures of systems safety engineering. It involves attitudes and motivation of designers and production people, employee/management rapport, the relation of industrial associations among themselves and with government, human factors in supervision and quality control, documentation on the interfaces of industrial and public safety with design and operations, the interest and attitude of top management, the effects of the legal system on accident investigations and exchange of information, the certification of critical workers, political considerations, resources, public sentiment and many other non-technical but vital influences on the attainment of an acceptable level of risk control. These non-technical aspects of system safety cannot be ignored. [51]"

2.3.2 Definitions Required to Work with CAST

To properly utilize CAST, a series of definitions must be clarified to understand the process. Within the CAST methodology, an accident is an "undesired, unacceptable, and unplanned event that results in a loss (pg. 9) [50]". A key differentiator between CAST and other accident models is that losses do not have to be intentional. The power of CAST is that it provides a robust method of addressing losses of multiple types and still determining why the loss occurred.

Another couple of definitions are system goals and system constraints. Per Leveson, system goals emerge from the fundamental reason the system was designed in the first place, and system constraints are limits on the acceptable pathways to accomplish those goals (pg. 8)[50].

CAST analysis and System Safety design also highlight the key differences between reliability and safety. Many conflate the two terms as synonymous, but that is not the case. Under the above definitions, a system that could reliably perform its goals/mission within the previously assumed safety-designed constraints, but be unsafe.

Another two definitions are incident/near-miss and hazard/vulnerability. An incident or near miss is a situation in which an unexpected, unacceptable, or unplanned incident could have resulted in a loss of the system if it was in a different condition or environment (pg. 10) [50]. A hazard or vulnerability is one why if a specific set of states or conditions are met, while also in specified environmental conditions, could lead to an accident (pg. 10) [50]. However, when designing a system to prevent a hazard, the designer needs to ensure that they are considering the

environmental conditions in which the system will be operating, for the specific parameters within that environment are what is necessary to empower the hazard to lead to a loss. To summarize, a hazardous system state is needed to trigger an accident/loss when combined with a particular environment.

The critical final definition is a controller. Within System Theory and CAST, a controller is incorporated into the system to control the actions and receive feedback on the system's emergent properties between components (pg. 28) [50]. Control can take any form, such as social, physical, or design implementations.

2.3.3 Inhibitions with Current Methods of Accident Analysis

Five key issues with current accident analysis inhibit the ability to learn from and make the necessary changes so they don't happen again. CAST is designed to learn from accidents without falling into those traps. While not all-inclusive, they are potent issues across most industries and specialties. The five limitations of the human psyche and current accident investigation techniques are focusing on blaming an individual, superficial treatment of human error, hindsight bias, root cause seduction, and improper causality models that do not fit today's world (pg. 12) [50].

2.3.3.1 Root Cause Seduction and Oversimplification of Causality

In our effort and desire to make it seem like we are acting towards addressing a loss once it occurs, we, as humans, often focus on a few easily addressable and implementable solutions. This phenomenon is seen across all industries, specialties, and walks of life. However, root cause seduction is especially prevalent within the Navy as we are trained to be decisive and act rapidly because we have a fiduciary responsibility to address problems quickly when they occur to restore operational capability and prevent National Security implications should we not effectively do so [52]. Unfortunately, we often fail to find the real mark indeed. We are constantly engaging fires when they arise instead of stopping, analyzing, and identifying why those fires are starting in the first place. With the fast-paced and rapidly changing Naval environment, the allure of quickly solving the problem would free leaders to focus on what they deem as more important (pg. 12) [50].

Why does the Navy often struggle to effectively address the root causes of the accidents that occur? Rear Admiral McKnight highlights one possible reason: when losses or accidents occur, the investigative committees do not include personnel from all levels of the organization who experienced the environment that led to the accident, as happens within the industry [52]. Furthermore, within the Navy, senior personnel are expected to have the expertise and know-how to rapidly identify why problems are arising when a systems-oriented approach analyzes all possibilities and constantly asks "why" until it can no longer be answered. Starting with what happened and then working backward toward a specific trigger for the accident is a recipe for narrowing in on something to assign blame instead of addressing the holistic root cause that caused that thing to be a trigger in the first place [50], [52].

2.3.3.2 Hindsight Bias

Hindsight bias is the phenomenon in which accident investigators, despite having all the facts after an accident or loss has occurred, cannot fathom how someone could not have seen that accident coming (pg. 14) [50]. As a result, accident reports often fault operators with statements

like “they should have,” “they could have,” or “failure of the operators to do__” implying that obvious warning signs were ignored, mishandled, or should have been recognized. These language choices highlight an incorrect assumption that the loss would not have occurred if operators had followed best practices and their training. However, this assumption neglects that the so-called “easily identifiable symptoms,” which seem glaring after the fact, were not necessarily evident in real-time and do not consider the various other environmental factors.

This bias is prevalent and rampant throughout almost all Naval accident reports. Like root cause seduction, there is an insidious inclination within the military to assign blame to someone or something. Part of the source of this inclination is rooted in the Chief of Naval Operations (CNO) core attributes of integrity, accountability, initiative, and toughness. Accountability is one of the core attributes because it is supposed to build a sense of ownership within the operators and empower them to own every aspect of whatever piece of equipment, program, or personnel they may be responsible for. However, accountability is often the root of hindsight bias during accident investigations.

An example is accidents that frequently lead to the firing of the ship’s commander due to a “loss of confidence” in their ability to lead, when often the commander was not actually able to impact the accident in the first place significantly. An example is the USS *Fitzgerald* collision in which the captain was asleep in the stateroom when the crash occurred and nearly lost their life in the process. Yet, they were still held accountable with statements like “the commander should have remained on the bridge,” even though they were sleep deprived.

2.3.3.3 Unrealistic Views of Human Error

During accident investigations, there is a pervasive focus to home in on the human element when an accident occurs. This correlates to an older viewpoint known as the “bad apple theory,” which hypothesizes that deficiencies with human operators are behind the majority (two-thirds) of all accidents [50], [53], [54]. Additionally, robust and complex systems would be free of accidents without the error-prone operators being the catalyst for the accident in the first place [54]. This leads to safety engineers needing to design the system to control or prevent the uncertainties triggered in the environmental conditions by human actions. However, some humans intentionally undermine, disregard, or flat-out disagree with the safety culture or systems set in place by management [53], [54]. The old view addressed the “bad apples” by removing them from the system, adding more procedural requirements, and/or increasing the level of system autonomy, all of which led to an opposite effect of what the designers intended [54]. However, additional procedural restrictions and automation increase the complexity within the system and can lead to the emergence of errors beyond what is easily identifiable.

Believing, embracing, and designing systems around protecting against “bad apples” is one way to prevent the development and embrace of a safety-minded culture. Punishing people and having an unrealistic view of human error leads to more hiding of the evidence when near misses or mistakes occur. Most accidents have tell-tales or near misses leading up to the fact that they are either not reported or misreported. Operators fail to report if they believe it will either result in punishment of the same kind or if they do not know that a reporting system exists. They misreport when they see the reporting system exists, but it is either unwieldy, difficult to use, or just quicker to report verbally to someone believed to be able to do something about it [50].

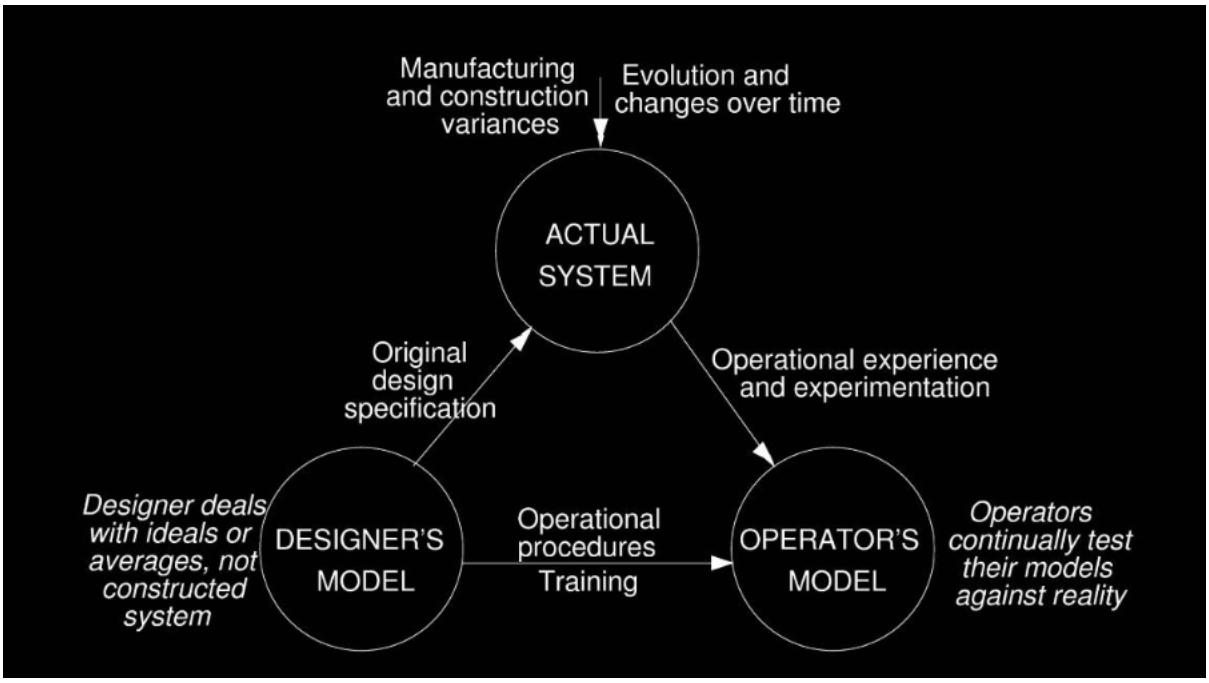


Figure 6: The mental model dilemma (pg. 17) [50].

Figure 6 depicts an interesting dilemma in which multiple mental models exist for the system's operation at any given point. The designer deals with the system in an artificial design world. Whereas the operator deals with the system and how it functions under normal operating conditions in the real world. These two are often different yet overlap at the same time. Operators must strike a balance where they adhere strictly to procedures that may not fully match the situation and risk being blamed if an accident occurs, deviate (even with the best intentions), and risk being blamed for violating written rules. Merely telling people to "follow procedures" does not guarantee safety, especially in complex socio-technical systems like the destructive behaviors within the naval surface fleet, which this thesis focuses on. The real issue may lie in how procedures, organizational structure, and reporting systems are designed, whether they account for real-world conditions, and how operators are supported in adapting to unforeseen circumstances. Human "error" typically reflects more profound system-level flaws, such as poor human-centered design or confusion caused by operating systems and stimuli, rather than incompetence or negligence. Therefore, a systems-based approach to accident causation recognizes that human errors are symptoms of a system needing redesign, not root causes in themselves. Accident investigations should highlight and correct underlying design issues rather than blame Sailors.

Relating all that back to the context of this thesis. Destructive behaviors are often one of the factors affecting workforce productivity, resulting in the significant delays that most naval vessels experience when exiting the yards on time. The destructive behaviors are another symptom of the underlying engineering of the organizational system of a naval shipyard. The system's deficiencies need to be investigated and mitigated so that Sailors no longer feel the need to turn to destructive behaviors to escape or dull what is affecting them.

2.3.3.4 Blame is the Enemy of Safety

When trying to understand why an accident occurs, mainly if it is severe enough that lives are lost, the natural first step that many investigations take is to find someone or something to blame [50], [52]. Part of the reason for this factor is that many accidents often have a legal requirement to find someone who needs to be blamed, so that they can be held accountable in a court of law. However, for the purpose of engineering the system, accident investigations should focus on the why, not the who.

A key indicator that blame is being assigned is the word "failure." Leveson highlights failure, particularly when transferred to individuals or organizations (pg. 21) [50]. Taking an accusatory stance and assigning blame diminishes the learning opportunities from an accident and correction to the system. Accident reports can generate valuable insights and recommendations by focusing on these systemic issues rather than merely attributing fault to individuals. This blame-free approach encourages a thorough investigation into the underlying causes, such as requirements flaws or ineffective safety-related systems, to improve future safety and prevent repeated losses.

A similar systems-oriented perspective is crucial in the context of naval shipyards and destructive behaviors among Sailors. Rather than blaming individual Sailors for exhibiting destructive behaviors, whether through substance abuse, self-harm, or interpersonal violence, a systems approach would investigate why Sailors might feel compelled to deviate from established norms or procedures. For example, if current policies or procedures are misaligned with the real-world conditions of a shipyard or if support structures are inadequate, Sailors may engage in harmful behaviors as a rational response to an unsafe, unsupportive, or unwelcoming environment.

2.3.3.5 Use of Inappropriate Accident Causality Models

There are several causality models that investigators, either knowingly or not, utilize when analyzing accidents after they occur. The most common is the chain of events model, depicted in Figure 7. Essentially, an accident is caused by a domino effect in which one failure leads to another, ultimately resulting in an accident. Another way to depict the chain of event model is through the "Swiss cheese" diagram displayed in Figure 8, where it takes a perfect coalescing of multiple failure modes and bypassing of safety systems to result in an accident or loss.

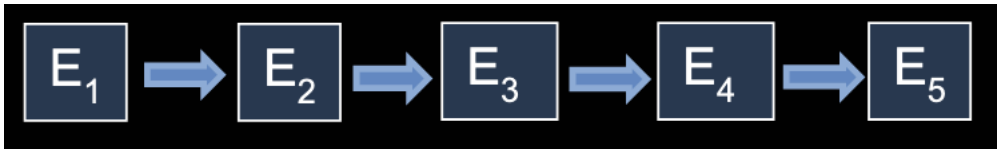


Figure 7: Depicts a chain of event model (pg. 23)[50].

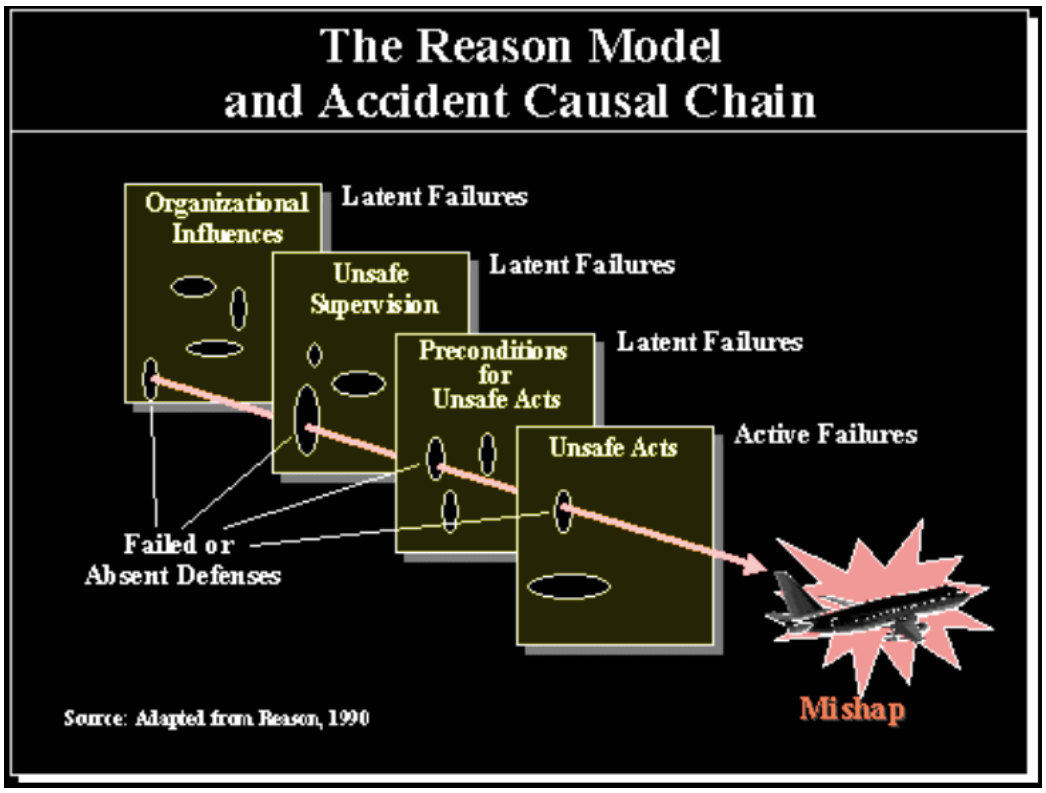


Figure 8: Depicts Reason's "Swiss cheese model" (pg. 24) [50].

Interestingly, when utilizing these models, the operator's actions that contributed to the accident are often further along the chain of unsafe acts. Yet, they still carry most of the blame (pg. 25) [50], [54]. The "Chaining" to find the root cause seems to stop once sufficient blame can be associated with one of the more straightforward, unsafe actions to address. In reality, accidents are much more complicated than a single unsafe act, so investigators should continue to ask why to find the underlying issues. A chain of events cannot be utilized to identify a singular root cause during complex accidents. Accidents are not linear in occurrence and require a congruence of multiple different entities, fields, and mistakes. This congruence is created by systemic flaws that frequently impact all the events [50].

Similarly, in a naval shipyard environment where destructive behaviors emerge, the chain-of-events approach fails to account for the multifaceted, indirect influences on the system. Many systemic factors, such as organizational culture, inadequate support systems, unrealistic maintenance demands, or uninhabitable living conditions, contribute to these behaviors in ways that do not fit into a causal chain yet still affect every chain link. Rather than viewing events as isolated links, seeing them as complex interfaces of interconnected factors collectively influencing outcomes is a more effective approach. This broader, systems-based perspective is crucial for understanding and addressing the systemic factors influencing the onset of destructive behaviors among Sailors. Again, it focuses on the underlying conditions and organizational system design issues that aggravate such behaviors, leading to more comprehensive and proactive safety corrections.

2.4 System-Theoretic-Accident-Model and Process (STAMP)

So, how do STAMP and CAST compare to historical accident analysis methods? The major difference is that they approach the accident from a holistic and system-oriented viewpoint. Instead of decomposing down to the elements of the system, analyzing them, and then reconstructing the system based on those results, systems theory looks at the system as a whole. This process focuses more on the emergent properties and interactions from and between the elements than the elements themselves. Of note, due to the rising integration and complexity of today's socio-technical systems, emergent properties are increasingly impacted by the social and organizational factors of the system and should thus be (pg. 27) [50]. Figure 9 shows a visual representation of the thought process and modeling of System Theory, particularly focusing on the emergent properties of the system.

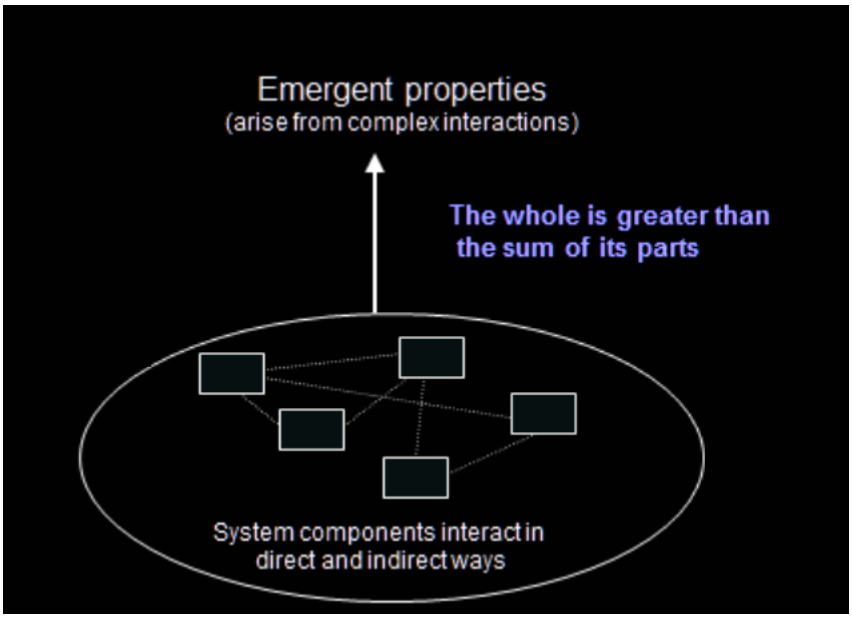


Figure 9: Depiction of System Theory (pg. 28) [50].

2.4.1 Controllers

The controllers are then placed into a hierarchical safety control structure whose purpose is to model and thus enforce the safety constraints at each controller level and the system. When there is a missing control or feedback loop, the unsafe control actions can result in a loss or accident. For this thesis, control is not a rigid, infallible process like what would be expected for a physical engineering system. Instead, the socio-technical system's culture, social, and organizational factors majorly influence the control loops. A visual representation of the controller is shown in Figure 10, where a key differentiator is the difference between responsibility, accountability, and authority.

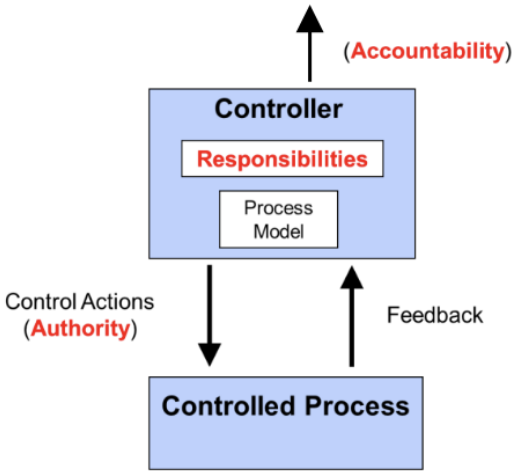


Figure 10: Basic controller structure (pg. 31) [50].

The controller is responsible for maintaining the overall system safety by ensuring that the system safety constraints at its level are implemented and maintaining a mental model of the actual state of the controlled process, not just what it thinks the system is doing. It accomplishes this through the control actions, which are the authority that the controller must utilize to enforce the safety constraint (i.e., conduct health and wellness interviews with their Sailors based on the responsibility to ensure that their Sailors are healthy, safe, and able to execute their duties responsibly) (pg. 32) [50]. The feedback in the previous example would be the responses from the Sailors themselves that would empower the controller to recognize and adjust their response to maintain the safety constraint. The controllers are then accountable to the controller higher within the control structure to maintain system safety.

Missing feedback is often a key source for the breakdown of the safety control structure and, thus, the emergence of accidents or losses. Without the feedback, there is no way for the controller to modify their system model and take appropriate controlling actions to enforce the safety constraints. Additionally, the controller may actually apply the wrong controlling actions, resulting in unsafe conditions and increased risks of violating a safety constraint (pg. 32) [50]. Take the previous example of onsetting destructive behaviors within a division; if the divisional leadership is not receiving feedback from their Sailors, they will believe that everything is fine and thus make no changes, compounding the internal festering within the Sailors affected.

In Chapter 3, the physical steps of a CAST are executed, and the description of the process is included.

Chapter 3: Application of CAST to the Naval Accident Reports on USS *George Washington*

3.1 Introduction

There are five steps when utilizing CAST to analyze an accident, as shown in Figure 11. However, just because it is a step-based analysis does not mean investigators can or should not review the previous steps as they proceed. Instead, it is a good system theory and practice to consider the process as a living document/process and adjust it as it is discovered.

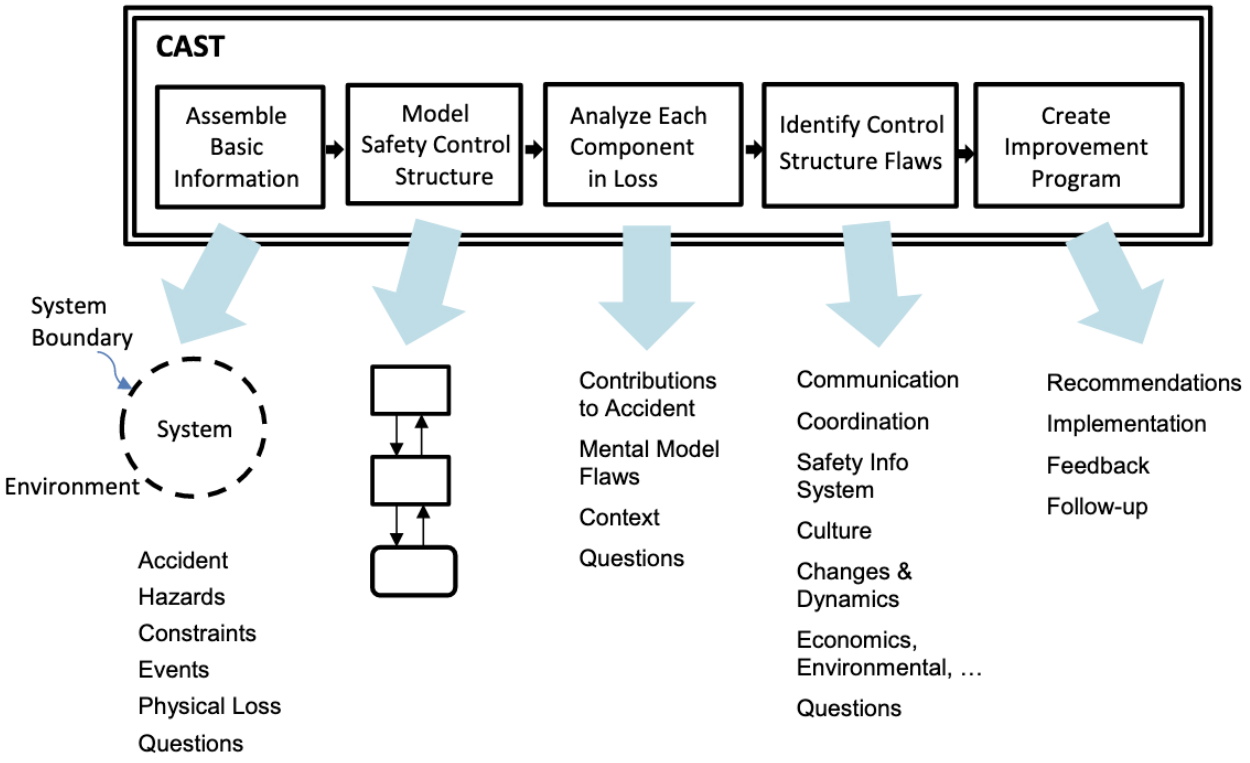


Figure 11: Model of the CAST process taken directly from [50].

3.2 Step 1 of CAST, Assemble Basic Information (System Boundary Identification)

The first step of any CAST analysis is to gather the basic information to understand the goals and processes and ultimately model the system. The model will be based on controllers enforcing safety constraints to prevent accidents or losses. All information for this CAST analysis came from two publicly available Navy reports [5], [7]. To properly understand why the three Sailors onboard decided to take their lives will require expanding the boundaries of the system beyond just those immediately close to the Sailors (i.e., the Division). Therefore, for this analysis, the system analyzed will be the entirety of the United States Navy control structure pertaining to aircraft carriers undergoing RCOH at Huntington Ingalls-Newport News Naval Shipyard, to

include all organizational factors onboard (i.e., divisional leadership, MWR, mental health resources), on-base command entities and support units (i.e., housing, MWR, parking), and detailing/recruiting entities. While the public investigation reports provide names and highly detailed descriptions of the Sailor's personal lives, this analysis will instead focus on the systemic factors outside of whatever they may have been struggling with personally to form a more cohesive and applicable result for future destructive behaviors. The loss that these accident reports focused on was the suicides of the three Sailors and the systemic factors that may have influenced them.

System Hazard 1: The Sailor engages in destructive behavior (i.e., suicide, suicide related behaviors, drug/alcohol-related incidents, self-harm, etc.).

Safety Constraints:

1. Sailors must not engage in destructive behavior.
2. Measures must be in place to rapidly address, protect, and place the Sailor into a safe environment should they engage in destructive behavior.

System Hazard 2: The Sailor is exposed to prolonged living in an industrial environment.

Safety Constraints:

1. Sailors must not be allowed to live in an industrial environment.
2. Measures must be in place to rapidly move Sailors to another environment should their living quarters become unhabitable/industrial.
3. Means must be in place to fund Sailors' housing outside of an industrial environment for their availability.
4. Industrial environments, habitability, and quality of life degradations must be codified appropriately to act as a guide and be enforceable.

System Hazard 3: The Sailor loses trust in the services provided by and leadership within the command.

Safety Constraints:

1. Leadership must be engaged and actively involved in their Sailor's lives.
2. All controllers must be properly trained on what engaged leadership means and why it matters to the mission of the Navy.
3. Programs must be funded, advocated, and encouraged to attend.
4. Programs must provide value to a Sailor.

System Hazard 4: Medically unqualified Sailors enter active-duty service.

Safety Constraints:

1. Medically unqualified Sailors must be prevented from being exposed to the difficulties of Naval service at the pre-joining screening checkpoints.
2. Measures must be put in place to rapidly address those Sailors who are medically unqualified and get them the help they need.
3. A streamlined process should be implemented for Sailors who are medically unqualified to expeditiously remove them from adverse environmental conditions that could exacerbate their conditions.

System Hazard 5: Insufficient mental health medical services are available to the Sailors.

Safety Constraints:

1. Funding should be allocated appropriately to ensure there are sufficient medical services.
2. Medical services must be flexible and surge to where there is the greatest need.

System Hazard 6: The Navy prioritizes production over quality-of-life onboard vessels in the shipyards.

Safety Constraints:

1. The Navy must prioritize its Sailors' quality of life.
2. Means must be implemented to ensure that degradations in quality of life are rapidly corrected.
3. Quality-of-life must be sufficiently defined, clarified, and documented.
4. To ensure rapid assessment, measures must be implemented to evaluate continuous quality-of-life degradations.

System Hazard 7: Lack of sufficient production for the availability schedule.

Safety Constraints:

1. Sufficient resources must be allocated towards availabilities to be completed on time.
2. Should an availability run past schedule, means must be in place to rapidly surge supporting personnel and facilities to address the schedule deviance immediately.

Following the identification of the system boundaries, hazards, and safety constraints, the next step is to compile a timeline of proximal events pertaining to the major losses. For this accident analysis, there are six total event tables. The first three tables pertain to aspects specific to each Sailor's environment and case. The following Tables 1- 6 are delineated into groups based on the organizational and cultural components leading up to the loss. The events are identified directly from [5], [7]. Identifying what happened first enables the investigator to have a broader understanding of the system and environmental factors that led to the loss, so they can identify why it occurred. Contributing to this understanding of the why, based on each pertinent event, questions are determined to aid in the identification of systemic faults.

Table 1: Proximal events pertaining to Sailor 1 (S1) leading up to destructive behavior (suicide) loss.

ID	Date	Event	Questions Raised
S1:1	10 June, 2020	S1 enlists in the Navy.	
S1:2	2020-2022	While working as barber, felt unrecognized by the Navy. Spouse was active duty as well. While S1 was in RCOH, spouse deployed frequently and lived separately adding to marital stressors.	Was the leadership engaged with the Sailor? By what metric did the Sailor think they were underappreciated (evaluations)? When it became apparent that the situation was adding extraneous stress to S1, why is there not a method to remove one of the two deployable Sailors from their command?
S1:3	April, 2022	Selected to attend top barber school, and meritoriously advanced to third class.	
S1:4	09 April, 2022	Committed suicide while at a private residence using a personal firearm at the age of 23. Was not assigned to USS *George Washington* but rather on TAD	Did the leadership know that the Sailor tended to binge drink? Was the Sailor referred to the DAPA

		orders to Joint Expeditionary Base Little Creek for barber school. Was binge drinking heavily the night of his death (was also known to be violent when doing so) and believed that their actions had permanent negative consequences for their family, and career after getting into a physical altercation with spouse and police. After the police left, S1 called spouse while brandishing a firearm in their personal vehicle. The spouse attempted to contact S1's mother; however, S1 had already taken their own life.	for ways to cope with stressors and how to drink responsibly? Was the division conducting briefings and trainings about drinking responsibly?

Table 2: Proximal events pertaining to S2 leading up to destructive behavior (suicide) loss.

ID	Date	Event	Questions Raised
S2:1	11 July, 2018	S2 enlists in the Navy. S2 had received mental health care from the age of 14 for anxiety and yet there is no waiver in their record for previous mental health related issues (pg. 53) [5].	What is the mental and resilience screening process like prior to enlistment? Was the recruiting, and screening personnel honest with the current mental health status of S2? Is there an automated method of screening previous medical records prior to joining the military or is it just volunteered information? Why were they allowed to join the military and be sent to a ship with additional stressors like those in the yards?
S2:2	November, 2018	S2 had 9 visits for mental health consultation during initial recruit training. Additionally, despite still being at the initial training pipeline, S2 was admitted and treated at the emergency department for "extreme depression," and was referred to additional psychiatric care to include anti-depressants and therapy. No waiver was provided, and they were permitted to join the fleet (pg. 53) [5].	Is there a rapid separation process should Sailors show mental health deterioration prior to joining the fleet? Why was S2 allowed to join the fleet despite 9 visits for mental health concerns? If S2 was cleared and it was

		- "Per reference (c), receiving treatment for depression within 36 months (such as prescription Zoloft), outpatient care including counseling required for longer than 12 cumulative months, and any history of self-mutilation are a disqualifiers from entry into the military service unless an individual receives a waiver (pg. 53) [5]." - "Per MILPERSMAN 1910-308 she should have been separated via "Entry Level Separation" due to not being qualified to become active duty (pg. 79) [7]."	deemed an extraneous event, why was a waiver at least not filed into the record for consistent tracking?
S2:3	2018-2020	While on active duty S2 had 34 mental health consultations consisting of administration of medication and therapy.	Is there a limit for mental health related consultations that would trigger administrative separation? Was the command engaged enough to identify the issues that his Sailor was having with Naval service?
S2:4	Summer 2020	S2 had a confirmed suicide attempt (pg. 32) [5]. The suicide attempt was not reported in Defense Information Service System (DISS) which should have immediately triggered additional mental health actions. (pg. 26) [5].	Why was the event no reported in DISS? What are the additional mental health actions? How many mental health related issues does there need to be until a Sailor is sent to long term help?
S2:5	2018-2020	Despite being a Combat Department rate, S2 was assigned to the Air Department. This most likely meant that they were a part of a tiger team attacking non-skid repair, needle gunning, or painting of the flight deck (pg. 51) [5].	Why does the Navy repeatedly send the most Junior Sailors to these types of work and why is it not offloaded to shipyard personnel? Was the air departmental divisional leadership fully invested in the well-being of S2?
S2:6	December, 2020	S2 was admitted to the psychiatric ward with concerns for mental stability (pg. 52) [5].	

S2:7	2021	Began seeing a civilian doctor, whom they paid out of pocket, and received treatments not normally administered by Navy doctors including weekly Ketamine shots.	Was her onboard provider aware that S2 was seeing a civilian doctor? Why was their record not automatically updating within the US Navy system since she was a TRICARE Sailor? What are the effects of combining treatments between doctors?
S2:8	November, 2021	S2 started seeing another Naval Psychiatrist at NMCP after being assigned to Limited Duty (LIMDU) by the SMO for persistent mental health issues. The NMCP Psychiatrist disagreed with the SMO's medical diagnosis, which causes flip-flopping of separation from the Navy. Ultimately, S2 did not trust the treatment from NMCP Psych which led to a lack of medical care and coverage (pg. 54) [5].	Why did the new provider disagree with SMOs diagnosis? Through all these visits was S2 consistent with their own message and struggles?
S2:9	December, 2021	Moved off *USS George Washington* and was living in a separate barracks (Huntington Hall at HII-NSS) due to their diagnosis and medication for mental health issues. The SMO onboard began to administer care (pg. 52) [5].	Why was there so many provider swaps? Would this not increase the likelihood that the Sailor will think that their care is not being prioritized and increase distrust in the care providers?
S2:10	25 January, 2022	Commenced Disability Evaluation System (DES), which takes anywhere from half a year to a year to complete (pg. 53). This was after being formally diagnosed with bipolar disorder and prescribed Zoloft, both of which prevent further service on a naval vessel (pg. 53) [5].	What is the timeline for separation once a medical condition is confirmed? Does the Sailor receive continued treatment from the VA following separation for continued medical care?
S2:11	February, 2022	S2 severs care with the NMCP Psychiatrist and does not get further in person care (pg. 55) [5].	Why did they sever care? Why was dual care continued for three months?
S2:12	28 March, 2022	Prescription for Seroquel was refilled, which combined with the unknown Ketamine shots, and other medications affected their decision-making capabilities.	Why did the SMO refill the Seroquel prescription? Was it just a periodic refill or was S2 actively taking the prescription?

			Why was no one in medical department aware that S2 was seeing a civilian doctor?
S2:13	08 April, 2022	S2 was administered a ketamine shot. In the days leading up they were reported to have "returned to their old self" which was happy and bubbly (pg. 57) [5].	Were the Ketamine shots working? Should they have remained on Ketamine and not the Seroquel?
S2:14	09 April, 2022	S2 was drinking heavily with friends, which combined with the Ketamine, and Seroquel which altered their decision-making capabilities. -as stated by the SMO" that it is never a good idea to combine them." (pg. 58) [5]	Was the people S2 with aware of all the other prescriptions they were on? Did no one advise the Sailor against drinking with the prescriptions they were on?
S2:15	10 April, 2022	Committed suicide in private residence by hanging at 24 years old. Was drinking heavily the night of their death which, possibly, combined with her medications, altered her decision-making ability.	

Table 3: Proximal events pertaining to S3 leading up to destructive behavior (suicide) loss.

ID	Date	Event	Questions Raised
S3:1	24 August, 2021	S3 enlisted in the Navy.	
S3:2	January, 2022	S3 reported to USS *George Washington*.	
S3:3	2021-2022	For the three months that S3 was onboard they struggled to handle the arduous lifestyle of a US Navy vessel within the yards. There are constant quality of life and habitability concerns, including lack of heating, constant noise from the industrial environment, and lack of hot water (pg. 33) [5], which was confirmed by other Sailors who were also in those same conditions.	
S3:4	January, 2022	S3 was assigned to Charlie Section watch which was on duty from 1700-0500 which compounded their fatigue and inability to get the required rest during the day in shipyard availability when work was ongoing.	Why was S3 not assigned to a different watch section once it became apparent, they were struggling to adapt to life onboard? Why was a Sailor, who needed to sleep during the

			day, permitted to remain living onboard even if they wished to do so?
S3:5	January, 2022	S3 told parents that the supervisors "don't give a shit, they don't give a fuck." (pg. 63) [5]	Was this the actual way that the division leadership felt? Were they ignoring S3's reports of habitability concerns? Were they engaged enough to see how much the Sailor was struggling? Did they have the bandwidth to adequately monitor, train, and mentor S3?
S3:6	2021-2022	Due to the difficulties with habitability within the berthing and privacy concerns, S3 spent most of their time, when not onboard, in their car calling family and friends or sleeping. S3 had multiple opportunities to move off the ship but elected not to. These options included a new berthing, family residence nearby, and an empty bedroom in a coworker's house on base. Eventually, S3 lived alone in the berthing as all other Sailors elected to move out further isolating them (pg. 64) [5]. Senior divisional leadership were aware and had counseled S3 about living in their vehicle but never actually investigated it further.	Why did more senior Sailors not take S3 under their wing and encourage them to move out for safety/habitability reasons? Was S3 assigned a mentor onboard? What is the requirement for habitability within the shipyards? When is a berthing re-classified as uninhabitable? Why did leadership just not force S3 to move out of the berthing that was uninhabitable?
S3:7	February, 2022	S3's parents contacted the ship to express their concerns about the living conditions onboard.	How did this phone call not trigger an additional review of the living conditions onboard?
S3:8	February, 2022	Due to lagging in shipboard qualifications, S3 was unable to apply for Public Private Venture (PPV) off-base housing.	Why were their shipboard qualifications lagging? Did anyone take notice of the lagging qualifications and try to determine the reason? What are other possibilities that affects when a Sailor can apply for PPV?
S3:9	November, 2021	Missed a required scheduled meeting with the CMC because of their intense homesickness and desire to return home	How did missing a required meeting with a member of the triad not

		(pg. 68) [5]. The division did not put him on report for the UA status.	trigger an immediate recording wrongdoing? What were the methods that the division utilized to monitor the actions of their Sailors? Why did missing this meeting not trigger an immediate intervention into what was affecting the Sailor?
S3:10	22 February, 2022	Division counseled S3 due to repeated violations of shipboard leave policy (must remain within 300 nm of the ship, otherwise they must submit a leave chit) to visit their sick grandmother. This was the only written counseling even though S3 had also committed other disciplinary infractions including UA, leave and travel violations, leaving a post without being relieved, and other various COVID restrictions.	Was the division aware of why S3 continuously violated the leave radius? If they were aware, why did the division not help the Sailor seek other alternatives to help with visiting the ailing grandmother? Was the division aware that every time S3 visited family in Connecticut or significant other in South Carolina they were traveling greater than 350 miles, well outside the leave radius? Was the division keeping track of all the disciplinary infractions S3 had? If the Sailor was ignoring lawful requirements and orders, why was the command not holding them responsible at higher disciplinary proceedings? Why did they not help him find additional therapy options to help cope with the stress onboard? Was the divisional leadership trained on the triad's expectations, and how to properly mentor Sailors?
S3:11	13 April, 2022	Despite having been already counseled, S3 departed USS *George Washington* after a 12-hour shift to Connecticut off	Was the command aware of how sleep deprived S3 was? Why did they not do

		their usual schedule, compounding their sleep deprivation. -"From waking up for his shift on 12 April 2022 until their death on 15 April 2022, (a period of 78 hours, or 3.25 days), it is estimated that S3 received a maximum of 14 hours of sleep of unknown quality, with at least one 30-hour period with no sleep." "S3 would accumulate an average of 13 hours of sleep debt per week, and in the 10-week period prior to their death, they had an approximate sleep debt of 130 hours." (pg. 37) [5]	more to prevent S3 from going on long drives following an overnight shift? Did the command maintain a paper trail of counseling regarding violation of policy? What is the requirement for violations before the divisional leadership advances the case to higher echelons of responsibility?
S3:12	14 April, 2022	S3 took two friends for lunch and paid for it. Claimed that they felt trapped by the Navy and FBI would come after them (pg. 73) [5]. While home, they tore apart their brother's room, grabbed a gun and basically begged to not be allowed back on the ship. On the way back to the ship S3, sent text message to their significant other while having a mental breakdown, stating that they were very upset and wanted out of the Navy. Final message to parents, was an additional text message to the parents including specific instructions on where to be buried.	Is there a policy for a Sailor to separate from the Navy before their contract is finished? Did the family report this incident to the ship or prevent S3 from returning?
S3:13	15 April, 2022	S3 armed themselves for watch, proceeded to the bathroom so that their partner could not follow. S3 video called their father in distress, who in turn called their brother, who called the ship to alert them of S3's mental status. However, it was too late and at the age of 19 S3 took their life with the weapon they were armed with.	Why was S3 permitted to arm themselves despite all the other disciplinary issues they were having? What is the procedure for which the armorer verifies suitability of the watch stander?

Table 4: Proximal events pertaining to quality-of-life (habitability and MWR) issues leading up to destructive behavior (suicide) loss.

ID	Date	Event	Questions Raised
H4:1	2010	Following a Naval Facilities Engineering Command conducted a habitability study of the HII-NNS-provided living accommodations. They determined the following about Huntington Hall and recommended building new facilities, yet none were commenced: - "... reached its useful economic life ... the building shows signs of significant wear. The building contains asbestos, and the presence of lead-based paint and PCBs is likely. There is no central air handling system and Huntington Hall is sub-optimal in meeting anti-terrorism force protection standards." (pg. 82) [7]	Was Huntington Hall scheduled for renovations or replacement? If not, why?
H4:2	15 December, 2015	USS *George Washington* arrives in HII-NNS to prepare for RCOH. Previously it was forward deployed in Yokosuka, Japan for seven years. The transit to Virginia took approximately seven months, including a portion they were deployed within the 7th Fleet Area.	
H4:3	01 July, 2015	Before commencing RCOH, USS *George Washington* commences and completes the Navy Industrial Hygiene survey IAW OPNAVINST 5100.19F (pg. 76) [7].	
H4:4	07 March, 2016	USS *George Washington* requests from CNAL to delay the next IH survey until after the completion of RCOH in 2018.	Why was the IH survey requested to be delayed? What is covered during the IH survey?
H4:5	04 August, 2017	USS *George Washington* commences RCOH with a contract of $4.719 billion, at a deficit of $322 million [7], [10] needed to conduct all required repairs (pg. 130). - "At the USS *George Washington* RCOH Resources and Requirements Review Board in 2016, the delta between requirements and resources was identified, and the board "deferred the final decision on prioritization of unfunded requirements to the fleet." It directed PMS-312 to "pursue cost savings with all suppliers—government and contractors—in order to complete	Why was there a deficit? Would this deficit place pressure on the project management to find ways to cut costs? What was the priority of budgetary funding for the

		the full scope of RCOH modernization within the current CNV-73 RCOH budget." (pg. 130) [7] -Throughout the rest of the RCOH, parking became a large source of pain for the crew. In total, there were 2400 parking spaces for two ships in RCOH.	Navy at the time?
H4:6	2020-2022	CFS reports that many Sailors experienced financial hardship due to paying for parking and housing that the Navy did not adequately provide. Additionally, due to the industrial environment, there were many Sailors who paid out of pocket to live out in town rather than onboard [7].	Why was Sailor QoL upgrades not prioritized by the project management team? When issues like parking, habitability, and paying rent out of pocket became apparent what steps did the command take to address them?
H4:7	06 May, 2020	SUPSHIPNN requested a pre-crew move-aboard habitability inspection from TYCOM "using pre-commissioning habitability inspections as guidance."	Is there a standardized pre-move aboard inspection process? What determines what habitable is? Are the EQOL program cognizant subject matter experts for aircraft carriers in RCOH? Why is there not a standardized

			inspection process?
H4:8	21 August, 2020	Crew originally scheduled to commence moving back onboard the ship.	
H4:9	December 2020	CNAL EQOL scheduled for January.	
H4:10	25 January, 2021	EQOL conducts an inspection that includes the ship's force, SUPSHIPNN, and other contractors; further inspections are scheduled. In total, nine were conducted. Discrepancies were forwarded to SUPSHIPNN for tracking and completion throughout the remainder of RCOH (pg. 73) [7].	Were there major habitability issues documented during this inspection?
H4:11	April. 2021	USS *George Washington* requests an additional CNAL inspection to verify ship's readiness prior to the pre-planned crew move aboard (pg. 73) [7]. CO attempted to delay move-aboard; however, was informed by PMS-312 that funding assigned for Sailor housing would be used up by summer 2021 which added extra pressure to move the crew aboard. PMS-312 rejected the request to extend housing because current projections showed the RCOH was going to exceed its budget, therefore they could not approve the request when there was insufficient money to do so (pg. 130) [7].	Was the command asking for another inspection because they were aware of ongoing habitability issues?
H4:12	16 April, 2021	Crew move-aboard process commenced IAW with RCOH Key Events Schedule -There was pressure to make room for the next vessel entering RCOH John Stennis. They needed to get the Sailors off the barge so that it could be repaired prior to them pulling in, and "boost morale by achieving a milestone and take back ownership of the ship", and "USS *George Washington* needed a victory". (pg. 41) [5]	Was there a requirement to move onboard? Were the berthing's in a habitable state? Did the ship pass the CNAL inspection?
H4:13	04 May, 2021	Crew completely vacated the floating accommodation barge.	Were they fully moved onboard at this point?
H4:14	06 May, 2021	USS *John C. Stennis* arrives in HII-NNS to commence RCOH preparations, which resulted in the diversion of resources away from USS *George Washington*. Additionally, crew move aboard for USS *George Washington* needed to be completed	Why would the addition of another carrier direct resources away from

		so that the floating barge was available expediting the move aboard process. Due to pier constraints, there was not an option for an additional barge (pg. 78) [7].	another? Are the contracts not set in such a way that there are sufficient resources for each? If one carrier was so delayed, why did the start another carrier into RCOH and not just wait?
H4:15	June 2021-April 2022	While the crew was living onboard there was frequent losses of various habitability factors that would impact their quality of life. A command policy was placed into effect that somewhat mitigated this effect by moving Sailors out of berthing's where a planned outage was going to occur or an extended unplanned one had. When senior leadership was pressed about these habitability issues, they were not aware of them (pg. 42) [5].	Did the ship move the crew onboard too early? If there was significant maintenance remaining that would affect habitability systems, why did the crew move aboard? Why was most of the maintenance that affects the habitability systems not prioritized earlier within the availability? Is there a missing feedback loop from the Sailors to the upper echelons of command above the division?
H4:16	June 2021-April 2022	In addition to the physical quality of life degradations, there were also missing support entities such as MWR, television, and places to escape the conundrum and relax (pg. 42) [5]	Was the command aware of the degradations to

			stress relieving entities like MWR?
H4:17	08 June, 2021	Crew commences physically moving onboard (pg. 74) [7].	Why was the crew moving aboard without full TYCOM approval?
H4:18	June, 2021	Habitability inspection was originally scheduled for three days; however, apparently, it was conducted in a single day. Additionally, -"Inspectors checked to ensure that toilets were operational, shower heads were functional, water was hot by running the water over their hands, there was power at vanity outlets, and that lights were functional. They checked water fountains by turning them on and ensuring there were no leaks. In the ship's berthing spaces, they checked to ensure that the ship had an appropriate number of racks, that racks and lockers had been welded down, there were egress labels, there was functional lighting, and there were no tripping or other safety hazards. They also checked ventilation systems by placing their hand over the vents" (pg. 74) [7]. -USS *George Washington* habitability coordinator informed TYCOM (CNAL) that inspections were complete. -Former XO, stated that "the quality of the inspectors who certified the ship said it was "not ideal, but that it was ready" and that the inspections should have been more robust" (pg. 74) [7].	Why were they performing a habitability inspection after crew move aboard had already commenced and not before? Why was there not an official process for conducting the inspection? What was the culture like to where it was acceptable to perform an inspection based on what feels right? If the Triad had concerns about the quality of the inspection, why did they not push harder
H4:19	06 July, 2021	USS *George Washington* Triad informed by CNAL that there were no major discrepancies affecting habitability onboard and that crew move aboard may commence.	Was there no thought given to halting crew move aboard until full approval was given? Is there an ongoing process for verifying

			continuity of habitability?
H4:20	20 July, 2021	400 USS *George Washington* Sailors fully moved onboard. There were the most junior Sailors of rank E1-E4. They were prioritized because they did not have BAH, and the Accommodation Barge, and Huntington Hall were needed for Stennis Sailors (pg. 78) [7].	Why do the most at risk, junior Sailors get exposed to the habitability concerns first? Should resources not be allocated to ensure that they have housing away from an industrial environment until the completion of an availability?
H4:21	08 October, 2021	Crew entirely moved back aboard USS *George Washington*. (pg. 42) [5] (pg. 77) [7]. Gym overhauls continued past crew move aboard limiting fitness opportunities available to junior Sailors.	Why were the quality-of-life components of the availability not planned for and addressed earlier?
H4:22	June 2021-2022	Seven complaints were sent to the Inspector General pertaining to USS *George Washington* for "uninhabitable living conditions, safety violations, unfair treatment, mistreatment of Sailors, mishandling of a sexual assault case, BAS, and fraternization" (pg. 70) [7]. A major cause of the issues was that the length of time that the crew lived onboard prior to ship redelivery for each RCOH has been in an upward trend. USS *George Washington* took anywhere from a year to two years more than the other carriers [7].	With the USS *George Washington* availability going well past schedule, why were additional resources not surged to bring it back in schedule?
H4:23	2021-2022	MWR services provided by Naval Weapons Station Yorktown plans 2-3 events per month, and staffs the MWR facilities (gym, etc.) at Huntington Hall. However, CNIC downgraded Huntington Hall from "medium" to "small" facility due to number of personnel physically living there without consideration of the number of Sailors total E1-E6 stationed onboard the carriers, ships, and submarines at HII-NNS. This	What is the process that determines the delineation of size for MWR facilities? Why did CNIC not factor in the total amount of

		reduced the amount of funding, staffing and services provided at the hall (pg. 107) [7].	Sailors serviced by the facility? Is there a process to submit an appeal to reclassify once it became apparent that Huntington Hall could not handle the demand?
H4:24	March, 2022	New Executive Officer checked into USS *George Washington*. They, along with CMC were responsible for and would tour the berthing spaces for inspections (pg. 43) [5].	Did they recognize the Quality-of-Life detractors for those living onboard? What was the process for fixing the issues identified during these inspections?
H4:25	2022	Several Sailors interviewed throughout the course of the investigation added credence to the actions the three Sailors took via suicide by highlighting how depressing it is to work on a RCOH ship (pg. 43)[5]. **Additionally, the more junior Sailors highlighted that they found it difficult to convey the difficulties of living onboard USS *George Washington* in RCOH.** -Additional Sailors beyond S3 preferred sleeping in their cars over onboard (pg. 44) [5].	Why did the Sailors find it difficult to convey the struggles of living onboard? Was it a lack of knowledge of reporting locations, or lack of understanding and care from the leadership side?

Table 5: Proximal events pertaining to Command Resilience Team (programs and members) and manning leading up to destructive behavior (suicide) loss.

ID	Date	Event	Questions Raised
C5:1	2019-Onward	Despite being billeted for two DAPAs, only one of the two was filled. Similarly, only ½ SARP billets were filled. There	Was the command triad aware of the degradations to their key Navy wide

		was only one assistant DAPA when there should have been at least 21 to meet the 100 Sailors/DAPA. The alcohol and drug control officer from CNAL had not done an outside inspection. The wait time to receive treatment was extended. A lack of computers in the shipyards impacted the ability of Sailors to attend group sessions (pg. 100) [7].	programs for addressing destructive behaviors? Were there mitigations in place to address these programmatic degradations?
C5:2	2019-2020	USS *George Washington* did not forward CCA to CNAP, or CNAL for review despite being ISIC and IAW written instruction OPNAVINST 5354.1H (pg. 66) [7]. **This is critical missing feedback loop for a struggling command to get assistance from those who can surge support.**	Why did they not forward the CCA to their ISIC? Was this a level of knowledge issue or procedural compliance issue?
C5:3	2020	Annual DEOCSs results revealed crew awareness of suicidal ideations increased over 50 percent from 31-57 percent (pg. 68) [7]. Command does not act to include this as a target on the POA&M or take any intrusive efforts to address it.	Was the command aware of this dramatic increase, or is this from the benefit of hindsight bias?
C5:6	2021	Two DEOCSs were administered with participation at 12 and 11 percent, which is inadequate to gain any information to make use of for the CCA (pg. 64) [7]. Additionally, Annual DEOCSs 5.0 changed not to promulgate the results of any questions regarding destructive behaviors, particularly any event related to suicide. This, compounded with crew awareness of suicidal ideations increasing over 50 percent from 2019-2020, still led to no action from the command triad because they were unaware of the issues (pg. 65) [7].	Why was the DEOCS changed? Were there other metrics for identifying the increasing awareness of suicidal ideation onboard.
C5:7	2020-2022	The USS *George Washington* CRT missed several critical members that could have highlighted some of the struggles that were ongoing within the command. Regular CRT meetings did not include "the SAPR victim advocate, command financial specialist, suicide prevention coordinator, deployed resiliency counselor, command	Why were these required CRT members not attending the meetings? Were they involved in other ways? Why was the command triad not ensuring they attended? Was the command triad

		indoctrination coordinator, expanded operational stress control (EOSC) team lead, and the ship's clinical psychologist" (pg. 91) [7].	aware that they were required members?
C5:8	2020-2023	Supervisory manning averaged 69 percent throughout this period as critical billets were reassigned to operational ships. The combination of disjointed offices, reduced manning, and plethora of other programs to manage like parking led to reduced effectiveness in EDL (pg. 55) [7]. Additionally, most supervisor ranks did not have the free-time to regularly check in on their junior Sailors, and provide the guidance and mentorship they needed to aid in adapting to the new command [7].	What is the billeting priority for Naval vessels? Why is there not a dedicated team to RCOH ships? Why reduce supervisor manning so low during a heavy maintenance period?
C5:9	2020-2022	CFS reports that many Sailors experienced financial hardship due to paying for parking and housing that the Navy did not adequately provide. Additionally, due to the industrial environment, there were many Sailors who paid out of pocket to live out in town rather than onboard [7].	Why was Sailor QoL upgrades not prioritized by the project management team? When issues like parking, habitability, and paying rent out of pocket became apparent what steps did the command take to address them?
C5:10	November, 2021- May 2022	One division particularly affected by supervisor manning gaps was the personnel division overseeing pay and benefits. There was just one personnel clerk first class (PS1) to oversee thousands of pay issues, requests, and discrepancies which ultimately led to Sailors onboard having pay related issues (pg. 55) [7]. Supervisor manning was reduced to as low as 20 percent, which is complete inadequate to ensure that the division was working correctly. In February 2021, a new LCPO arrived in the department.	Why were additional civilian personnel not added to this department when it became clear that pay issues were rampant throughout the command?
C5:11	June, 2020	For years, SPC reported limited contact with CNAL, who oversees the program onboard. Finally, they were able to schedule an outside inspection.	Why was the TYCOM not monitoring the programs underneath their purview? Was the coordinator at the TYCOM level

			overwhelmed with other responsibilities?
C5:12	January 2021- April 2022	TYCOM billeted additional personnel to USS *George Washington* to include 25 supervisors; however, the command struggled to get those supervisors to "step up and own it." In this case the billeted supervisory were temporary additions, not permanent to the crew(find data about how consultancy is not adequate at developing ownership) (pg. 59) [7].	Why were permanent billets not added? Why were only an additional 25 billeted?
C5:13	March, 2021	USS *George Washington* visited by COMPACFLT, CNAL, and CNAP where they conveyed the importance of completing the RCOH on time and return the ship to operational status. CO expresses the biggest obstacle to successful completion is adequate supervisor (E6 and above) manning onboard (pg. 59) [7].	What was done to address this supervisory manning deficit? Were additional supervisors billeted?
C5:14	2021-2022	Sailors did not have mentors or sponsors when checking in onboard. (pg. 47) [7].	
C5:15	August, 2021	Chaplain assigned to stand up CRTHFC. Less than 50 percent of department heads were willing to support the endeavor as it would take too much time (pg. 94) [7].	Why was there such a large pushback against intrusive leadership and trying to care about your Sailors? Was this a lack of training issue, or cultural?
C5:16	2021	USS *George Washington* combined the CRT and CRTHFC meetings. This led to the CRTHFC losing its holistic viewpoint as it focused on a specific department every month. Therefore, since USS *George Washington* had 20 departments onboard, it resulted in each department and therefore their Sailors only getting analyzed once ever 20 months (pg. 93) [7].	What triggered this change? Were certain departments being focused on, and therefore others were not being covered?
C5:17	08 October, 2021	Command indoctrination occurred in small, cramped, and noisy classrooms, degrading the learning opportunity. Additionally, despite incentives to force attendance, like no in-rate work until complete, there was a 2–3-month delay,	What was the priority, checking the box that the Sailor had attended Command Indoctrination, or have them learn something from it? Were

		and often only 50 percent attended (pg. 97) [7].	there no other spaces available to move the indoctrination too? Were EDL enforcing attendance for Command Indoctrination?
C5:18	November, 2021	Pilot CRTHFC process was heavily resisted by EDL due to intrusiveness into Sailors lives, which could result in a loss of trust (pg. 94) [7]. This was in line with old-school thinking that work and home are separated and if what occurs off the ship does not affect the work onboard then it does not matter.	
C5:19	December, 2021	CNAP visits USS *George Washington* again. Ship's triad conveys the importance of addressing the manning issues to the TYCOM, particularly in Reactor, Engineering, and Combat Systems Departments at the supervisor role and above. To attack the growing maintenance deficit, particularly around technically challenging work packages, needed additional Sailors with those expertise in execution and supervision (pg. 59) [7].	Were additional Sailors billeted to these departments?
C5:20	2022	Despite receiving specialized training, due to low manning, many Sailors are required to work jobs outside of their rates (pg. 43) [5].	How did moving people outside of their specialty affect the culture and mood onboard? Were people excited about additional learning opportunities or frustrated at being unable to put their skills to good use?
C5:21	February, 2022	During the investigation, interviewers discovered that USS *George Washington*'s Executive Officer was unaware that they were the lead of the CRT and had not attended any meetings. Therefore, there was no real drive towards addressing command problem areas (pg. 92) [7].	Why was the XO not aware that they were the head of the CRT? Had the XO received proper training on command culture climate management?
C5:22	May, 2022	During an audit by the TYCOM, they discovered no records of the CRT meetings, meetings were sporadic,	What is the periodicity of the CRT audits? Was the depth of this audit only in

		members were not formally designated, meetings were minimally attended, the Executive Officer (head of the CRT) had not attended any meetings in the first four months onboard, the CRT was not actively engaged with tracking the status of the CCA POA&M, and the CCS was unaware of these basic requirements displaying a lack of required level of knowledge (pg. 62) [7].	response to the loss, or was the TYCOM capable of conducting this audit?

Table 6: Proximal events pertaining to Medical Services leading up to destructive behavior (suicide) loss.

ID	Date	Event	Questions Raised
M6:1	January 2021-November 2021	Volume of patients seen by psychologist and behavioral health technician increased from at most eight patients a day to 20 (pg. 111) [7].	What was the reason behind this surge of patients?
M6:2	April 2021-May 2022	USS *George Washington* was only billeted one Behavioral Health Technician and one psychologist. In conjunction with two Sexual Abuse Rehabilitation Program (SARP) Counselors, BHT, and Psych saw approximately 2600 patients. Due to a significant backlog, many patients had to wait for over a month (32 days) unless it was an emergency (pg. 113) [7]. Psych, and BHT saw up to 20 patients daily (pg. 45,77) [7] to try to drive down the backlog and address the overwhelming patient buildup. Since the backlog was so long, many patients elected to seek mental health assistance off ship which could compound the issues due to the EHRs not communicating between each other (pg. 44, 45) [5]. -"Military treatment facility clinics, including mental health clinics, use a standardized computer-based appointment scheduling system and can therefore precisely track average appointment wait times of their providers. Due to the unique practice environment, as well as information technology system constraints on a Navy warship, shipboard providers do not use the same official appointment system, and therefore wait times are estimated." (pg. 113) [7].	For vessel the size of a small city, why is there so few mental health providers billeted? What was being done to address the growing backlog? Were additional services being provided elsewhere?

M6:3	October 2021-May 2022	Psychologist's average number of monthly patient appointments surged to 205 which was enough to be third highest for aircraft carriers and three times the average of a psychologist at nearby military hospitals where the average was about 70 (pg. 111) [7]. For a mental health clinician to be considered fully booked via DHA standards, that involves 78 patients a day. "To effectively meet this DHA standard for patient encounters per month by a psychologist, USS *George Washington* would have required 2.62 full-time equivalent psychologists."	Were there any notifications or tracking mechanisms for why this surge of patients was occurring? Were senior leaders ignoring or accepting this deterioration with the health of their force onboard?
M6:4	2020	SMO had communicated their concerns with the difficulties USS *George Washington* was having with handling the volume of patients (pg. 45) [5]. -Emergencies were addressed, and immediate concerns were assuaged until the patient could be seen later. If those emergencies occurred at a hospital, the Sailors were then seen onboard USS *George Washington* afterwards. -For every suicide ideation, USS *George Washington* transmitted a Situation Report (SITREP) which would alert senior leaders of the issues. Beyond just sending information off ship, Psych and other medical personnel would immediately inform the triad of the relevant information (pg. 46) [5]. -The report found that some Sailors struggled with reporting their issues or working with Navy Medical because there is a stigma that it will negatively affect their career (pg. 46) [5]. -"Psych Tech stated that "leadership," and specifically Leading Petty Officers (LPOs), "don't have time" to deal with mental health issues of their subordinates and want to refer them to Psych Boss and Psych Tech to deal with, but he did not specify any departments.	Was the command aware of this dramatic increase, or is this from the benefit of hindsight bias?
M6:5	April 25, 2022	TYCOM (CNAL) assigned two additional mental healthcare providers to USS *George Washington* to drive wait times down. -ultimately a survey of USS *George Washington* Sailors conducted by Naval Health Research Center (NHRC) determined that "many Sailors reported discouragement, shame, and stigma for seeking both mental and physical	Why did it take three Sailors taking their own lives to address the massively understaffed mental health department?

		health care aboard USS *George Washington*" (pg. 115) [7]. -Sailors informed some of their providers onboard that some divisional leaders would not allow them to attend appointments as they needed to maximize production. -Over 58 % of survey responses indicated that they do not trust health care providers within the Navy.	

While the identification of proximal events is imperative to gain a systemic understanding of the problem and a timeline of when they occurred during a controlled process, the real goal is to be able to clarify the requirements for hazard mitigation, controls, failures, and unsafe interactions (what actually happened) (pg. 42) [50].

Based on the analysis conducted for this research, the requirements for hazard mitigation were developed and identified as follows:

1. Provide organizational and cultural protection against destructive behaviors (services, training, resources, and community)
2. Protect against destructive behaviors occurring
3. Provide a means to support Sailors such that they do not turn to destructive behaviors
4. Provide resources to help Sailors who are struggling
5. Protect against command culture deterioration when destructive behaviors occur
6. Protect against prolonged availabilities with proper funding and supervisor manning
7. Provide a means to have a safe, comfortable, and higher quality of life living arrangement on board naval vessels
8. Provide indicators for deteriorating Sailor mental readiness
9. Provide indicators of deteriorating command climate
10. Rapidly de-escalate and protect Sailors when they are in a crisis
11. Provide junior Sailors a means of reporting feedback and issues up the chain of command
12. Provide sufficient supervisors to manage their divisions, equipment, and personnel such that RCOH advances on schedule
13. Provide a means to fill the gapped supervisor and provider billets rapidly
14. Provide a means to report the status of all various quality-of-life programs to the triad
15. Provide sufficient funding for quality-of-life improvements
16. Provide a means of surging support to an RCOH ship that lags the schedule

To address these hazards and the corresponding mitigations, the system controls are as follows:

The organizational system controls and corresponding safety systems are primarily oriented around a sequence of inspections, programs, and checkpoints instead of what would be associated with a physical system, like interlocks or physical barriers. This incident had all the required Naval quality-of-life programs, but they were either managed poorly, understaffed, or missing critical feedback.

Process controls related to the USS *George Washington* accident are as follows:

1. Habitability inspections
2. Multiple layers of ownership, forceful backup, and planning amongst various leadership levels
3. Programs oriented towards building resilience, mental health, physical well-being, and command culture
4. Rapid de-escalation and establishing a safe environment once destructive behaviors occur (i.e., medical services, suicide prevention services, etc.)
5. Robust schedule with clear, articulated, and backed with instruction checkpoints
6. Robust budget for the availability
7. Comprehensive quality-of-life enhancements (MWR, housing, etc.)
8. Billeting of personnel
9. Pay, subsidies, and bonuses
10. Comprehensive and robust physicals before joining the Navy
11. Rapid separation process
12. Quality training on personnel management, intrusive leadership, and prioritization of Sailors' well-being

The final portion of step 1 summarizes what failures, breakdowns, and unsafe interactions occurred, which led to the hazard. Effectively, this analyzes what happened, saving the why to a later point in the CAST process. Ultimately, missing or inadequate control processes might have prevented this accident.

Physical Failures: Keeping with the spirit of CAST and "blame is the enemy of safety," failures pertain only to physical components within the system. Since the system under study is organizational, no physical failures led to the hazard.

3.3 Step 2 of CAST, Model Safety Control Structure

Fundamentally, CAST views safety and loss prevention as a control issue. There are two parts to this step. The first is visually modeling the system, and the second is a breakdown of each controller and their responsibilities for preventing the hazard. Modeling the control structure of the system visually empowers the identification of where controlling actions have broken down, are missing, or lack feedback. Identifying the problem with the system's control helps further recommend corrections to those controls and the system's structure.

3.3.1 RCOH Control Structure

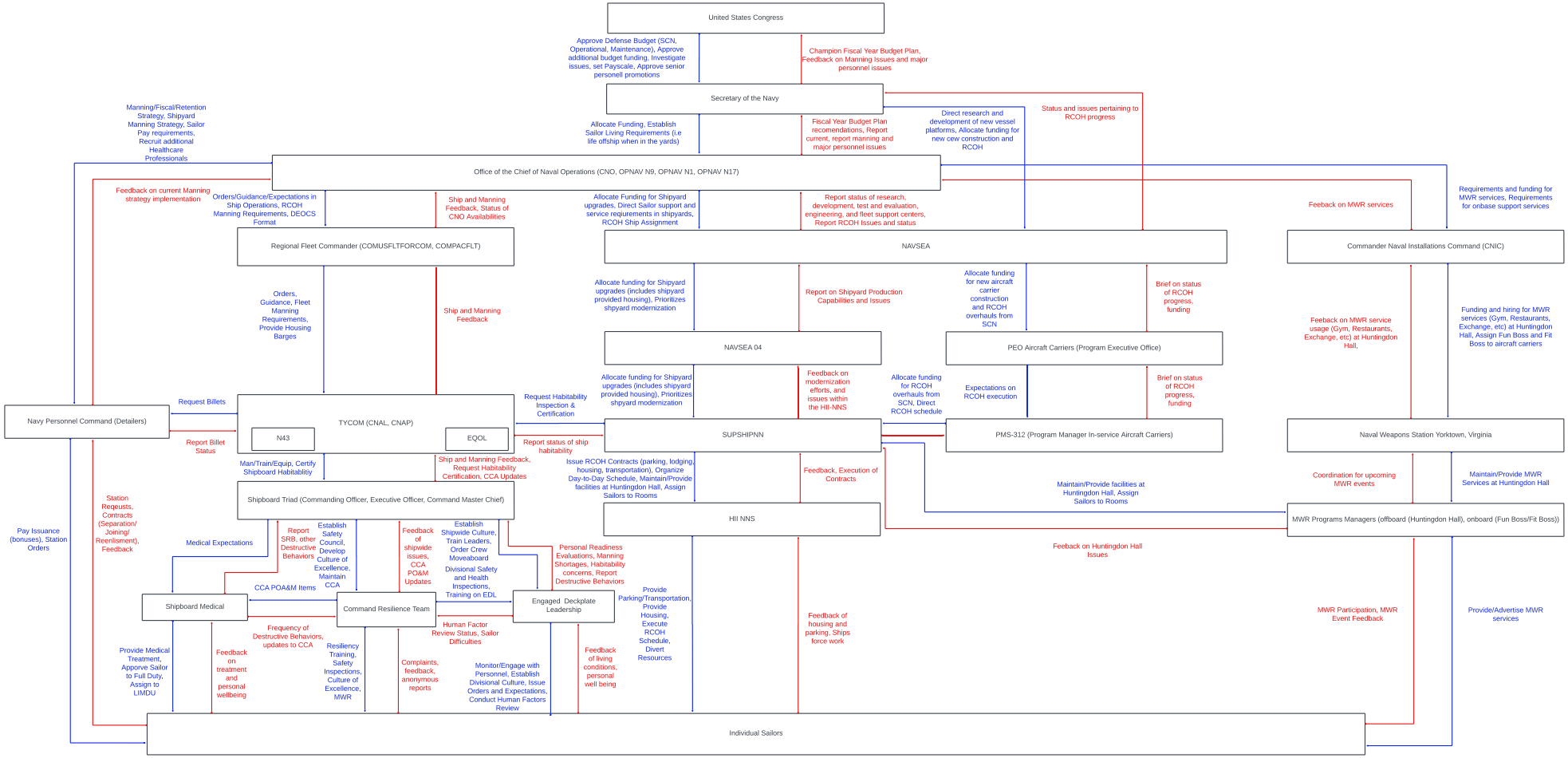


Figure 12: CAST control structure and Naval Shipyard safety management system model at HII-NNS.

The safety control structure for a vessel in RCOH, as shown in Figure 12, is enormous in scope. To properly view, zoom in to over 200%. The organizational aspects encompass controllers from the administrative and operational chains of command, the shipyard Commands, shore installations, and personnel detailing. All control actions and arrows are colored in blue, while the necessary feedback is colored in red.

3.4 Step 3 of CAST: Analyze Each Component in Loss

With the system controllers and their responsibilities identified, the next logical step is to analyze what went wrong with the control structure and why it did not prevent the accident. Accomplishing this requires examining the role of each controller within the system and how their actions may have affected the accident. The goal is to identify the control or mental model deficiencies that resulted in them taking the actions that they did. The behaviors of each controller that influenced the hazardous state leading to the accident are often responsibilities that were not fulfilled (pg. 56) [50]. Here, the analysis moves from "what happened" to "why did it happen," and "why did the controller act the way they did?"

Keep in mind the power of hindsight bias when answering the "why" factor in the "why at that time" component (pg. 57) [50].

3.4.1 Controller Responsibilities: Contribution to the Hazardous State

3.4.1.1 United States Congress (USC)

Applicable Safety Related Responsibilities (Developed with [5], [7]):

- Approve the overall defense budget (SCN, OMN).
- Provide funding for quality-of-life improvements across the fleet (specifically for industrial environments).
- Investigate degradations and deficiencies of shipyard productivity and Navy personnel support systems.
- Set the Sailor pay scale and benefits.
- Approve senior personnel promotions.
- Conduct specific oversight of long-term Navy maintenance availabilities (like RCOH) regarding cost, schedule, and personnel well-being.

USC Unsafe Control Actions Contributing to Hazardous State:

- USC-UCA-1: Approved Navy budget requests for RCOH (using SCN funding) that were insufficient for the required scope and duration.
- USC-UCA-2: Approved Navy budget allocations (using OMN, MILCON funding) where designated funding for quality-of-life infrastructure and programs was insufficient for shipyard environments.
- USC-UCA-3: Did not develop an independent verification mechanism regarding habitability and QoL conditions in shipyard environments.
- USC-UCA-4: Did not provide adequate budget flexibility mechanisms or timely supplemental appropriations for emergent RCOH cost growth and associated quality-of-life needs.
- USC-UCA-5: Exercised oversight of Navy RCOH program execution in a manner that allowed known systemic problems related to cost, schedule, and personnel well-being to persist without driving sufficient corrective action.
- USC-UCA-6: Established pay and allowance structures (e.g., BAH) that did not fund housing for junior Sailors in RCOH conditions without adequate housing.

- USC-UCA-7: Did not initiate targeted investigations or hearings specifically focused on personnel well-being within Navy shipyards prior to major public incidents.

USC Process Model Flaws:

- USC-PMF-1: Congress may have operated under the assumption that budget requests and testimony from senior Navy leadership accurately represented program risks (cost, schedule) and resource needs, potentially under-weighting conflicting historical data or initial deficit warnings. [USC-UCA-1, 5].
- USC-PMF-2: Congress may have assumed Navy budget submissions inherently included adequate funding for required quality-of-life standards, operating without a specific focus or verification process to confirm sufficiency for unique, high-stress environments like extended RCOHs. [USC-UCA-2].
- USC-PMF-3: Congress's model for assessing Navy needs relies heavily on information filtered through senior leadership which lacks processes to effectively incorporate or validate real-time, ground-level feedback on issues like quality-of-life or morale [USC-UCA-3].
- USC-PMF-4: Congress may have believed that senior naval leadership inputs accurately reflected current challenges and evolving conditions faced by Sailors, without sufficiently validating or cross-referencing these inputs through independent verification or lower-echelon sources [USC-UCA-4].
- USC-PMF-5: Congress may assume existing allowance structures (BAH, BAS) are generally sufficient for Sailors, potentially not fully accounting for the unique financial burdens imposed by unsuitable conditions during prolonged industrial availabilities in RCOH [USC-UCA-6].

USC Contextual Factors:

- USC-CF-1: Congress budgeting approvals depend almost primarily upon the inputs of senior naval defense officials, such as the SECNAV and CNO. Therefore, they lack access to deck plate-level quality-of-life issues unless explicitly accessed via investigations or direct questioning during testimonial [USC-UCA-1,2].
- USC-CF-2: Federal appropriations law imposes strict controls on funding that limit the ability of both the Navy and Congress to quickly reprogram funds across accounts or years to address emergent issues without specific, often lengthy, legislative action. [USC-UCA-4].
- USC-CF-3: The initial USS *George Washington* RCOH contract budget request, approved by Congress, reflected an identified $322 million deficit relative to requirements, contributing to subsequent schedule delays and pressure on program managers to cut costs [USC-UCA-1].
- USC-CF-4: The Navy lacked standardized, enforceable habitability/suitability definitions specifically for RCOH environments, making it difficult for Congress to mandate reporting against clear criteria or effectively oversee quality-of-life conditions based on Navy inputs [USC-UCA-3].
- USC-CF-5: The USS *George Washington* RCOH experienced multiple schedule extensions and contract revisions, ultimately lasting over 6 years, highlighting significant cost growth and emergent issues that inflexible annual budget appropriations struggled to accommodate [USC-UCA-4].

- USC-CF-6: Known systemic problems included historical Navy maintenance cost/schedule overruns documented in GAO reports, and recurring quality-of-life deficiencies in shipyard environments [USC-UCA-5].
- USC-CF-7: During the GW RCOH, some Sailors reported paying out-of-pocket for housing or parking due to unsuitable onboard conditions or inadequate allowances/provisions, indicating a potential misalignment between allowance structures and requirements [USC-UCA-6].
- USC-CF-8: Competing national priorities and overall federal budget constraints create pressure on total defense spending, potentially impacting the allocations [USC-UCA-1, 2, 6].
- USC-CF-11: The technical complexity, classified aspects, and long duration of major defense acquisition and maintenance programs like RCOH make detailed, effective oversight by Congressional committees and staff inherently challenging. [USC-UCA-5, 7].
- USC-CF-12: Congressional oversight committees face numerous competing demands, and initiating targeted investigations typically requires substantial staff resources, and often a distinct triggering visible event [USC-UCA-7].

Questions Raised:

- Why did Congress decide on funding allocations that affect the most Junior Sailors without factoring in their input?
- Why was Congress aware of the deplorable living conditions onboard RCOH vessels prior to making budget approvals that restricted its funding?
- Why is there such inflexibility when it comes to budgeting for critical defense budgets, and adjustment for real time data?
- How does Congress view the data pertinent to budget requests?
- Despite historical rising destructive behavior rates, and RCOH overruns on both schedule and budget, why did Congress accept Navy leadership assurances without further investigation?

3.4.1.2 Secretary of the Navy (SECNAV)

Applicable Safety Related Responsibilities (developed from the following sources [5], [7], [55], [56]):

- Establish Sailor off-ship housing and living requirements, ensuring they are suitable and enforced for shipyard availabilities.
- Champion annual budget requirements to Congress.
- Allocate and prioritize funding for critical shipbuilding and maintenance projects, particularly RCOH, balancing the requirements for operational capabilities and quality-of-life facilities.
- Report significant manning and personal issues to Congress, including mental health trends and quality-of-life deficiencies.
- Set clear policy prioritizing Sailors' safety and well-being alongside schedules and costs during extended availabilities.

- Direct review and reform of policies related to mental health screening, waivers, and separations.
- Ensure Navy-wide implementation of effective, interoperable Electronic Health Record (EHR) systems.
- Ultimately responsible for the Department of the Navy Safety Program.
- Exercise final departmental oversight responsibility for major acquisition and maintenance programs.

SECNAV Unsafe Control Actions Contributing to Hazardous State:

- SECNAV-UCA-1: Approved budget recommendations to Congress for RCOH (SCN funding) that reflected insufficient funding levels for the required scope and duration.
- SECNAV-UCA-2: Proposed budget recommendations that underprioritized quality-of-life improvements and off-ship housing enhancements.
- SECNAV-UCA-3: Submitted budget recommendations and potentially influenced policy decisions based primarily on aggregated data and assessments from senior naval leadership.
- SECNAV-UCA-4: Did not ensure the enforcement of housing standards regarding suitability and well-being during extended availabilities like RCOH.
- SECNAV-UCA-5: Provided policy guidance balancing readiness, schedule, cost, and well-being which may not have included provisions prioritizing Sailor well-being under budget/schedule pressure during RCOH.
- SECNAV-UCA-6: Did not direct sufficiently timely or comprehensive reviews of mental health screening, waiver, or separation policies relative to indicators of potential systemic issues.
- SECNAV-UCA-7: Did not provide sufficient oversight of EHR implementation ensuring interoperability between shore-side and shipboard providers.

SECNAV Process Model Flaws:

- SECNAV-PMF-1 SECNAV may have operated under the assumption that RCOH was realistically accomplishable within the budget levels recommended to Congress, potentially under-weighting historical evidence of maintenance overruns and schedule delays. [SECNAV-UCA-1].
- SECNAV-PMF-2: SECNAV may have been unaware or inadequately informed about the true living and habitability conditions onboard aircraft carriers undergoing RCOH. [SECNAV-UCA-2, 4].
- SECNAV-PMF-3: SECNAV budgetary projections and recommendations assumed that historical data of RCOH performance and past funding levels were reliable predictors for current and future maintenance, quality-of-life needs, and associated costs [SECNAV-UCA-3].
- SECNAV-PMF-4: SECNAV underestimated or failed to appreciate fully the significant negative impact that prolonged RCOH schedules and delays had on Sailor morale, well-being, and retention, particularly amongst junior enlisted Sailors [SECNAV-UCA-4]

- SECNAV-PMF-5: The process for setting or reviewing Navy suitability standards may not adequately differentiate requirements for short-term operational deployments versus long-term industrial RCOH environments [SECNAV-UCA-2, 4, 5].
- SECNAV-PMF-6: The model for reporting Navy-wide personnel issues to Congress may aggregate data in ways that obscure the severity of localized or systemic problems within specific communities, like RCOH crews [SECNAV-UCA-3].
- SECNAV-PMF-7: Policy development models may prioritize quantifiable metrics like cost and schedule adherence over less easily measured factors like Sailor well-being, especially under external pressure [SECNAV-UCA-5].
- SECNAV-PMF-8: The process for triggering reviews of personnel policies may depend on lagging indicators or high-level trend analysis, potentially delaying response to emergent, localized problems [SECNAV-UCA-6].
- SECNAV-PMF-9: SECNAV may assume that major IT implementation projects like EHR interoperability are progressing adequately based on program office reports potentially missing out on issues with the actual user experience [SECNAV-UCA-7].
- SECNAV-PMF-10: SECNAV may operate under the assumption that established safety programs and reporting mechanisms are functioning effectively across all naval environments unless major incidents or negative trends are explicitly reported up the chain of command [SECNAV-UCA-8].

SECNAV Contextual Factors:

- SECNAV-CF-1: Political and strategic pressures from senior Defense Department leaders, Congress, and broader governmental constraints often drive prioritization toward operational capabilities and immediate warfighting readiness, potentially underfunding and lower prioritization of less tangible, quality-of-life-related initiatives [SECNAV-UCA-1, 2, 5].
- SECNAV-CF-2: SECNAV depends heavily on reports, analyses, and recommendations provided by senior naval leadership (e.g. CNO, Fleet Commanders, PEOs), which reflect aggregated data which lessons the representation of issues from lower-level command structures [SECNAV-UCA-3].
- SECNAV-CF-3: SECNAV may lack a source of direct access to data, surveys, and individual Sailor experiences within the naval control structure, constraining a clear understanding of actual conditions faced by Sailors in shipyards, especially in prolonged maintenance availabilities [SECNAV-UCA- 2, 3].
- SECNAV-CF-4: The Navy's budget recommendation for RCOH, championed by SECNAV, did not fully account for the known $322 million initial deficit and historical precedent for RCOH cost and schedule growth [SECNAV-UCA-1].
- SECNAV-CF-5: Indicators of potential systemic issues with mental health screening, waivers, or separations existed like S2's entry and retention despite extensive mental health history and lack of waivers prior to any directed SECNAV-level review [SECNAV-UCA-6].
- SECNAV-CF-6: Achieving true interoperability between EHR systems (military MTFs, shipboard systems, civilian providers) presents significant technical and bureaucratic challenges common to large IT projects [SECNAV-UCA-7].

- SECNAV-CF-7: There is no specific, enforceable suitability standards for long-term RCOH berthing inhibiting SECNAV-level enforcement or oversight regarding housing standards [SECNAV-UCA-4].
- SECNAV-CF-8: The vast scope and complexity of Department of the Navy activities limits the feasibility of detailed SECNAV-level oversight of specific program implementations (like safety in RCOH) without reliance on established reporting chains and program reviews [SECNAV-UCA-3].
- SECNAV-CF-9: Reporting requirements to Congress often necessitate summarizing fleet-wide data, which obscures localized problems or the full impact on specific groups like RCOH Sailors [SECNAV-UCA-5].
- SECNAV-CF-10: SECNAV exercises overall authority and control over all Department of Navy affairs, including policy formulation, program oversight, and resource allocation, as established by statute (10 U.S.C. § 8013) [SECNAV-UCA-1-7].
- SECNAV-CF-11: SECNAV is assigned ultimate responsibility for the Department of the Navy Safety Program (e.g., per SECNAVINST 5100.10 series) [SECNAV-UCA-5, 6].

Questions Raised:

- Why did SECNAV send budget recommendations to Congress that not only restrict critical maintenance (RCOH) funding but also underprioritize quality-of-life improvements, especially when emerging data from shipboard environments indicate deteriorating living conditions that directly affect the most junior Sailors?
- Does SECNAV have direct access to comprehensive, real-time data from the lowest levels of the naval organizational control structure, or is there an inherent filtering or information-loss issue preventing accurate situational awareness and appropriate responses?

3.4.1.3 Office of the Chief of Naval Operations (OCNO)

Applicable Safety Related Responsibilities (developed from the following sources [5], [7], [23], [41], [49], [57], [58], [59], [60], [61], [62]):

- Provide overall strategic guidance (NAVPLAN) and prioritization to subordinate commanders, ensuring that RCOH is adequately resourced.
- Develop the requirements and guidance for all Culture of Excellence program managers.
- Disseminate best practices, training, and resources to all commands about suicide prevention and destructive behaviors.
- Allocate funding and budget plans to subordinate controllers.
- Provide recommended budget requirements to SECNAV.
- Develop strategic manning and retention strategy and requirements.
- Establish specialty billet requirements and manning strategy (i.e., medical professionals).
- Incorporate feedback from sub-controllers into future program planning and policy.
- Develop, modify, and enforce the usage of the standardized DEOCS format.
- Develop and maintain a database of suicide-related data/incidents for trend analysis.
- Establish requirements for on-base support services.

- Develop and implement strategic policies addressing fleet-wide fatigue management due to long work hours and disruptive sleep schedules.
- Oversee the effectiveness of initial enlistment and commissioning screening and the required waiver process.

OCNO Unsafe Control Actions Contributing to Hazardous State:

- OCNO-UCA-1: Provided a budget plan to the SECNAV that contained RCOH funding below that which was required to accomplish all required maintenance.
- OCNO-UCA-2: Assigned RCOH vessels to the lowest strategic priority for billeting and manning, causing subordinate controllers to prioritize operational assets.
- OCNO-UCA-3: Did not adequately monitor or respond to surging suicide and destructive behavior incidents fleet wide associated with ships in extended availabilities.
- OCNO-UCA-4: Revised the annual DEOCSs 5.0 to not promulgate the results of any questions regarding destructive behaviors, particularly any event related to suicide, reducing visibility to the growing mental health issues onboard.
- OCNO-UCA-5: Did not verify that recruiting, accession, and retention commands were following their processes IAW with instruction, particularly pertaining historical mental health issues.
- OCNO-UCA-6: Provided strategic guidance that emphasized operational readiness, and other major accession projects (e.g. Ford class carrier, Columbia class submarine) over that of RCOH completion, indirectly leading subordinate controllers to deprioritize RCOH-related manpower and funding requests.
- OCNO-UCA-7: Established medical and mental health billet requirements and manning strategies which resulted in insufficient staffing levels during high-demand RCOH periods.
- OCNO-UCA-8: Did not implement Navy-wide policies or guidance sufficiently effective for managing cumulative fatigue during extended industrial availabilities.
- OCNO-UCA-9: Mechanisms for incorporating feedback from lower echelons regarding RCOH challenges into strategic planning, budgeting, or policy revision operated with delays or limitations.

OCNO Process Model Flaws:

- OCNO-PMF-1: OCNO did not recognize or underestimated the long-term systemic reinforcing feedback loops created by insufficient manning, destructive behaviors and repeated schedule overruns for vessels in extended availabilities, particularly RCOH on Sailor resilience [OCNO-UCA-1, 2].
- OCNO-PMF-2: OCNO may have had insufficient feedback from lower controllers regarding the actual onboard living conditions and habitability challenges for RCOH carriers [OCNO-UCA-1].
- OCNO-PMF-3: Despite collecting fleet wide suicide and destructive-behavior-related data, OCNO may be experiencing delays or inefficiencies in translating this information into timely actionable insights [OCNO-UCA-3].
- OCNO-PMF-4: OCNO did not foresee that eliminating visibility into destructive behaviors with the new DEOCS 5.0 format would limit lower controllers' (e.g. the

Command Triad's) visibility, reducing their ability to monitor, identify, and respond to deteriorating mental health concerns onboard [OCNO-UCA-4].

- OCNO-PMF-5: OCNO may have inaccurately believed that the existing Navy policies and controls, such as mental health screenings, medical waiver processes, and rapid separation procedures, were enforced across all commands (e.g., Sailor S2's enlistment and medical waiver issues, and incomplete DISS reporting after a suicide attempt) [OCNO-UCA-5].
- OCNO-PMF-6: OCNO may have assumed that current incentives, and resources were sufficient to recruit and retain expert medical care providers [OCNO-UCA-6].
- OCNO-PMF-7: OCNO's strategic guidance development process may prioritize immediate operational demands and new platform acquisition over the resources required for sustaining and maintaining existing capital assets through long industrial periods [OCNO-UCA-6].
- OCNO-PMF-8: Existing plans for fatigue management primarily focus on operational tempos and out to sea watch stations, potentially not capturing the debilitating, cumulative effects of shipyard shift work hours, disrupted schedules, and poor habitability [OCNO-UCA-8].

OCNO Contextual Factors:

- OCNO-CF-1: CNO performs duties under the authority, direction, and control of the SECNAV (10 USC § 8033(c)), meaning OCNO's strategic guidance and budget recommendations are developed within the policy framework and subject to approval by the Secretariat [OCNO-UCA-1, 2, 6].
- OCNO-CF-2: The CNO's statutory responsibility for organizing, training, and equipping Naval forces (Title 10 USC) involves the development of manning strategies, resource allocation, and readiness programs relevant to personnel support during RCOH [OCNO-UCA-1, 2, 7].
- OCNO-CF-3: The CNO's Navigation Plan (NAVPLAN) and implementing Navy manpower policies (e.g., OPNAVINST 1000.16) placed RCOH vessels in the lowest manning priority category ("all other sea duty"), directly influencing manning allocations by subordinate commands as shown with USS *George Washington* 69 percent supervisor manning during RCOH [OCNO-UCA-2, 6].
- OCNO-CF-4: US Shipyards and maintenance projects (particularly those for nuclear vessels) have a historical precedence of cost and schedule overruns as revealed in the GAO reports [OCNO-UCA-1].
- OCNO-CF-5: The OCNO is under significant political and strategic pressures from lawmakers, and operational commanders to provide vessels for the defense of our country's assets. Several of these programs are significantly delayed, over budget, or not being produced at the levels for which they are contracted for (i.e. DDG 100, LCS, Columbia Class Submarine, Virginia Class Submarines, Ford Class Aircraft Carriers). Therefore, budget allocation favors accelerating the deficiencies of these critical assets over Sailor quality of life enhancements [OCNO-UCA-1, 2].
- OCNO-CF-6: The OCNO may still be operating under an older cultural emphasis on mission readiness over Sailor well-being which has been a longstanding cultural focus within the Navy. Mission accomplishment and operational capabilities can bias leadership toward underprioritizing quality-of-life enhancements and support services,

even when deteriorating conditions are evident onboard RCOH vessels [OCNO-UCA-1].

- OCNO-CF-7: The OCNO must balance recruitment and retention against external economic and labor market strength and pressures. Low unemployment rates and a competitive civilian job market, result in difficulties with recruiting new Sailors which causes a shift towards retention and exerts a pressure on the Navy to control costs [OCNO-CF-1].
- OCNO-CF-8: OCNO must balance recruitment and retention against a strong external civilian labor market. Economic strength, historically low unemployment rates, and competitive civilian employment opportunities strain recruitment efforts and exert fiscal pressures to control costs and reduce spending on non-operational programs, including manning and Sailor quality-of-life initiatives [OCNO-UCA-1].
- OCNO-CF-9: Potential lingering cultural emphasis on "mission first" readiness metrics over Sailor well-being, although evolving, could influence resource allocation and policy decisions under pressure [OCNO-UCA-1, 2].
- OCNO-CF-10: Navy Command Climate assessment policy (e.g., OPNAVINST 5354.1 series) outlines the DEOCS process. The specific revision in DEOCS 5.0, an OCNO-level policy decision occurring around 2021, limited command-level visibility into destructive behavior trends [ONCO-UCA-4].
- OCNO-CF-11: Specific cases, like Sailor S2 joining despite significant pre-existing mental health history and multiple mental health emergency events during training without appropriate waiver or separation documentation, provide evidence that screening/waiver policy execution was inconsistent [OCNO-UCA-5].
- OCNO-CF-12: Medical billeting levels coinciding from OCNO's manning strategy led to documented shortfalls on GW during RCOH (e.g., 1 psychologist + 1 BHT for ~2600 encounters, long wait times) significantly below DHA standards [OCNO-UCA-7].
- OCNO-CF-13: The Navy Safety Program (e.g., OPNAVINST 5100 series) outlines safety practices [OCNO-UCA-8].
- OCNO-CF-14: Sailors in RCOH, like S3, experienced significant documented cumulative sleep debt (approximately 130 hours over 10 weeks), indicating potential gaps in the effectiveness of fatigue management policies in the shipyard environment [OCNO-UCA-8].
- OCNO-CF-15: Navy policies addressing fatigue (potentially within SOH, ORM, or medical instructions) may not have adequately accounted for the combination of influences contributing to chronic fatigue in RCOH (e.g., shift work, noise, poor berthing, long commutes) [OCNO-UCA-8].
- OCNO-CF-16: Navy Regulations explicitly task the CNO with leadership in maintaining Sailor morale, motivation, and well-being (Navy Regs 0404.3c) [OCNO-UCA-2].
- OCNO-CF-17: CNO-driven cultural initiatives (e.g., Culture of Excellence, Warrior Toughness) aim to build resilience [OCNO-UCA-3, 8, 9].

Questions Raised:

- Why did the OCNO change the DEOCS format to exclude reporting of destructive related behaviors statistics?

- Why is the Navy struggling to recruit adequate medical providers?
- Why is there such a prevalence on operational accomplishment over the care of our Sailors?
- Why are RCOH vessels, at the lowest priority despite the rigors of this phase in the ship's lifecycle?
- Why are US shipyards, and other naval shipbuilding programs significantly behind schedule?
- Why is feedback on the effects on the Sailors at the deck plate level not reaching the CNO?

3.4.1.4 Regional Fleet Commander (RFC)

Applicable Safety Related Responsibilities (Developed with [5], [7], [60], [61], [63], [64], [65]):

- Establish fleet manning requirements for the TYCOMs to fill.
- Advertise the highest priority billets to the Navy Personnel Command to fill them first.
- Directs billeting of unplanned losses and needed emergent manning fills.
- Maintain operational and administrative control over RCOH vessels.
- Provide oversight to ensure that TYCOMs are adequately resourced and monitor ships undergoing extended maintenance availabilities.

RFC Unsafe Control Actions Contributing to Hazardous State:

- RFC-UCA-1: Established fleet manning priorities and requirements prioritizing operational assets.
- RFC-UCA-2: Did not adequately advertise the highest priority billets, particularly supervisory and EDL positions, to Navy Personnel Command (NPC) for assignment to USS *George Washington* during RCOH.
- RFC-UCA-3: Did not effectively respond to feedback from subordinate commanders like the USS *George Washington* Command Triad regarding the adverse effect that reduced manning was having onboard for schedule progression, and Sailor morale.
- RFC-UCA-4: Through their oversight role RFC did not ensure adequate TYCOM monitoring or rapid intervention regarding the escalating personnel support challenges (manning, quality-of-life, medical access indicators) on USS *George Washington* during RCOH.

RFC Process Model Flaws:

- RCF-PMF-1: RFC may not adequately recognize the reinforcing loop created by prioritizing operational asset manning over RCOH ships. This results in operational ships remaining at sea longer without required maintenance, increasing maintenance packages and duration when they enter the shipyard, thus further stressing personnel manning strategies, and shipyard schedules [RFC-UCA-1, 2].
- RCF-PMF-2: RFC may have underestimated the importance of consistent deck plate supervision (E6 and above) for Sailor mentorship, mental health monitoring, retention, and well-being, especially during prolonged and stressful industrial availabilities like RCOH [RFC-UCA-1, 2].

- RCF-PMF-3: RFC's prioritization strategy, while IAW with OCNO's guidance, may have been based on traditional manning assumptions which considered extended RCOH periods as lower-risk environments compared to operational deployments, thereby failing to recognize heightened mental health and destructive behavior risks [RFC-UCA-1 ,2].
- RCF-PMF-4: RFC may have relied on aggregated or filtered feedback from higher-commanders, without adequate integration of detailed feedback from subordinate commanders (USS *George Washington* Triad, TYCOM) regarding deteriorating conditions at deck plate levels [RFC-UCA-3].

RFC Contextual Factors:

- RFC-CF-1: During multiple visits to USS *George Washington*, the Command Triad communicated to TYCOMs and RFC that one of the most critical factors inhibiting schedule performance and impacting Sailor well-being was inadequate supervisor-level manning (E6 and above). RFC may have continued prioritization practices favoring operational units, indicating pressures to sustain immediate operational readiness at the expense of RCOH ships [RFC-UCA-1, 2, 3].
- RFC-CF-2: RFC received strategic directives and manning priorities from OCNO, emphasizing operational readiness for deployment-ready ships, constraining resources available for RCOH vessels [RFC-UCA-1, 2, 3].
- RFC-CF-3: RFC faced competing strategic directives from higher-level controllers (OCNO, SECNAV) to sustain fleet readiness and prioritize deployment-ready ships, thus limiting the resources they could allocate to RCOH vessels such as USS *George Washington* [RFC-UCA-1, 2].
- RFC-CF-4: RFC may have been influenced by traditional Navy cultural emphasis on operational availability and mission accomplishment over Sailor quality-of-life considerations, further biasing decisions towards operational ships at the expense of ships in CNO availabilities [RFC-UCA-1, 2].
- RFC-CF-5: RFC manning priorities within the guidance from the CNOs NAVPLAN contributed to supervisory billet gaps on USS *George Washington* (averaging 69 percent fill), resulting in reduced mentorship and oversight capacity [RFC-UCA-1, 2].
- RFC-CF-6: RFC authority and responsibilities are established within the framework of Title 10 U.S.C. and the Unified Command Plan, with specific duties delegated via SECNAV/CNO instructions. This structure primarily orients RFCs towards operational command and fleet readiness, heavily influencing resource allocation and oversight priorities.

Questions Raised:

- Why, despite repeated expression of manning shortfalls at the supervisor level were additional billets not expedited to USS *George Washington*?
- Is there a process for which to adjust fleet manning prioritization if conditions onboard shipyard vessels deteriorate?
- Were the manning practices audited or reviewed accounting for current Sailor well-being?

- Is there a formal process at the RFC level for adjusting fleet-wide manning prioritization based on documented deteriorating conditions or excessive personnel stress on ships in extended availabilities? If so, why was it not effectively utilized?
- How does RFC balance the CNO's strategic manning priorities (which place RCOH low) against direct feedback (via TYCOM) from subordinate commands about severe negative impacts on personnel and mission readiness within RCOH?
- What specific metrics or indicators does RFC use to monitor the health, welfare, and safety climate of crews on ships undergoing extended maintenance, beyond standard readiness reporting from TYCOM?

3.4.1.5 TYCOM (CNAL/CNAP)

Applicable Safety Related Responsibilities (Developed with [5], [7], [42], [46], [47], [49], [61], [62], [65], [66]):

- Man, train, and equip commands under their purview in preparation for operational deployment.
- Identify critical manning gaps and communicate prioritized billets to the Navy Personnel Command and the Regional Fleet Commanders.
- Perform habitability inspection to determine suitability (N43, EQOL) prior to declaring a ship uninhabitable.
- Ensure industrial hygiene surveys are completed in accordance with instructions.
- Assign teams to perform pre-move aboard habitability inspections utilizing checklists and "qualitative judgment" before re-declaring the habitable vessel. This process must occur before the crew moves aboard (exists for those vessels during initial construction).
- Receive the habitability discrepancy list from assigned inspectors and determine whether the ship is habitable. Also, consider if it is suitable for long-term habitation.
- Declare living accommodations onboard ships in the yard as uninhabitable to trigger alternate ashore housing opportunities.
- Provide oversight, monitoring, and guidance for subordinate command climate issues, including CRT effectiveness, DEOCS follow-up, and CCA submission (if not explicitly identified in the RCOH instruction, it is delineated to CNAP).
    - Programs such as Military Equal Opportunity, which establishes command climate specialists and DEOCS, and Sailor Readiness Programs were not covered under the joint TYCOM instruction.
- Monitor harassment complaints to resolution and advise commanders on the best path forward via the TYCOM Command Climate Specialist.
- Conduct biannual external Command Climate assessments and inspections onboard subordinate commands.
- Train subordinate commands on best command climate practices specifically for extended shipyard availabilities like RCOH.
- Train, inspect, assist, and disseminate suicide-related information and programs to the subordinate commands' suicide prevention coordinators via the suicide prevention program manager.
- For West Coast carriers undergoing Refueling and Complex Overhaul (RCOH) on the East Coast, CNAL is responsible for the maintenance, outfitting, and certification of

these carriers in Newport News, Virginia. CNAL also oversees carrier religious ministries, medical inspections and certifications, logistics support, public affairs, force retention, training, and enlisted matters, among other duties (pg.125).
    - CNAP maintains fiscal responsibility.
    - CNAP N1 maintains manpower and manning authority with CNAL assistance as needed.
    - CNAL N13 assumes manning readiness issues.
    - CNAP maintains Inspector General requirements and responsibilities.
    - CNAL assumes administrative separation authority.
- Manage OMN funding allocations.
- Actively monitor critical billet fill rates.
- Provide and coordinate surge support for critical functions if the ship reports being overwhelmed (e.g., medical, mental health, CRT).
- Establish and enforce TYCOM-level guidance on fatigue management during RCOH.
- Ensure efficient processing of administrative separations.

TYC Unsafe Control Actions Contributing to Hazardous State:

- TYC-UCA-1: Did not assign adequate supervisor manning to ensure RCOH schedule advancement and Sailor mentorship and moral needs.
- TYC-UCA-2: Declared USS *George Washington* habitable pre-maturely authorizing crew move-aboard.
- TYC-UCA-3: Did not develop or implement a follow-on process for monitoring and responding to deteriorating habitability conditions onboard.
- TYC-UCA-4: Did not enforce proper submission, documentation, or debriefing of USS *George Washington*'s Command Climate Assessments (CCA).
- TYC-UCA-5: Did not adequately maintain records or utilize official checklists for habitability inspections.
- TYC-UCA-6: Reduced crew manning onboard to meet RFC operational manning requirements.
- TYC-UCA-7: Provided inadequate oversight, training, and guidance to USS *George Washington* for critical readiness and resilience programs, including suicide prevention.
- TYC-UCA-8: Approved USS *George Washington* to delay follow on industrial hygiene surveys past required periodicity.
- TYC-UCA-9: Provided limited or infrequent guidance and assistance from TYCOM-level experts for critical onboard programs (e.g., suicide prevention, DEOCS).
- TYC-UCA-10: Did not adequately respond to rising indicators of deteriorating mental health, and crew morale by annual DEOCS results.
- TYC-UCA-11: Did not provide or coordinate timely surge support for the medical department despite indicators of shipboard resources being overwhelmed.
- TYC-UCA-12: Did not issue or enforce specific guidance for managing crew fatigue tailored to the unique demands and conditions of the RCOH environment.

TYC Process Model Flaws:

- TYC-PMF-1: TYCOM, constrained by RFC-mandated manning priorities, may have recognized the negative impacts of removing supervisors from USS *George Washington* but lacked adequate control to mitigate the effects [TYC-UCA-1, 6].
- TYC-PMF-2: TYCOM incorrectly assumed habitability inspections were comprehensive, checklist-based, and in line with established guidelines, despite clear deviations in practice [TYC-UCA-2, 5].
- TYC-PMF-3: TYCOM would have needed to ensure timely or systematic feedback loops from USS *George Washington*'s Command Triad regarding worsening habitability conditions [TYC-UCA-3].
- TYC-PMF-4: The division of administrative responsibilities between CNAL and CNAP led to confusion and unclear lines of accountability regarding the submission, documentation, and review of Command Climate Assessments [TYC-UCA-4].
- TYC-PMF-5: TYCOM incorrectly perceived industrial hygiene surveys as non-essential during extended industrial availabilities, overlooking critical health and safety implications for crew habitability [TYC-UCA-3, 8].
- TYC-PMF-6: TYCOM may have incorrectly assumed lower-level controllers (e.g., USS *George Washington* leadership) effectively mitigated risks of living in industrial conditions despite substantial evidence of systemic habitability deficiencies [TYC-UCA-8].
- TYC-PMF-7: TYCOM may not have recognized and incorrectly assumed the significance of DEOCS survey results on the effectiveness of USS George Washinton's senior leadership's ability to intervene at their level [TYC-UCA-10].
- TYC-PMF-8: TYCOM may have had limited real-time visibility or continuous feedback loops regarding the backlog and strain within GW's mental health services (BHT and psychologist averaging 20 patients daily; monthly appointments surged well above DHA standards) or had the inability to billet any support [TYC-UCA-10].
- TYC-PMF-9: TYCOM may assume that existing Navy work hour regulations and command-level management are sufficient for fatigue mitigation, lacking specific RCOH fatigue models or oversight mechanisms [TYC-UCA-12].

TYC Contextual Factors:

- TYC-CF-1: TYCOM authority is assigned from Title 10 U.S. Code with delegation from SECNAV/CNO, requiring TYCOMs to implement Navy-wide programs and policies mandated by OPNAV Instructions. This focuses on administrative control of areas like Manpower (e.g., 1000.16 series), Safety/Industrial Health/Fatigue (e.g., 5100/3500.39 series), Suicide Prevention (e.g., 1720.4 series), and Command Climate/EO (e.g., 5354.1 series) and other relevant SECNAV Instructions.
- TYC-CF-2: CNAP provided limited oversight of Sailor readiness programs aboard USS *George Washington*, while CNAL provided partial oversight, creating gaps in command climate, DEOCS, and suicide prevention oversight [TYC-UCA-7, 9].
- TYC-CF-3: TYCOM requested pre-habitability inspection from EQOL a team not familiar with RCOH vessels as typically focus on ships in Norfolk Naval Shipyard as ships in RCOH are not their main responsibility. This inspection would look at typical locations like berthing, messing, and laundry but also considered support services like potable water [TYC-UCA-2, 5].

- TYC-CF-4: TYCOM did not require inspectors to use standardized checklists, instead allowing qualitative judgments, reducing inspection usefulness and reliability (pg. 72) [7] [TYC-UCA-2].
- TYC-CF-5: TYCOM inspectors did not utilize checklists (even those for pre-commissioning ships), and based the inspection off of what "felt right" (pg. 74) [7] [TYC-UCA-2].
- TYC-CF-6: TYCOM N43, was under the impression that EQOL would conduct in depth training, and certification; whereas EQOL, believed they were supplementary and informal without making a formal declaration of the status of habitability of the ship. SUPSHIPNN, PMS 312, and USS *George Washington* were under the impression that once they had been certified following CNAL EQOL habitability inspections, full crew move aboard could commence (pg. 74) [7] [TYC-UCA-2].
- TYC-CF-7: SPC reported that it was difficult to schedule inspections from TYCOM and drills onboard as they believed "suicide prevention was given a lower training priority" (pg. 104) [7] [TYC-UCA-7, 9].
- TYC-CF-8: CNAL was assigned oversight of MEO programs by omission on aircraft carriers during RCOH, creating ambiguity and lack of cohesive oversight [TYC-UCA-7, 9].
- TYC-CF-9: Commanding officer, USS John C. Stennis, briefed CNAL on his first CCA after commencing RCOH vice CNAP per instruction [TYC-UCA-7, 9].
- TYC-CF-10: While USS *George Washington* forwarded its CCA results to CNAP via CNAL, neither the current nor former commanding officer could confirm they debriefed CNAL or CNAP indicating a gap in formal oversight [TYC-UCA-4].
- TYC-CF-11: There is no governing instruction for how to conduct RCOH habitability inspections or make a determination on suitability. The only guideline is for pre-commissioning vessels [TYC-UCA-2].
- TYC-CF-12: Command Triad formally requested the delay of the Industrial Hygiene survey (required by SOH policy), which TYCOM approved [TYC-UCA-8].
- TYC-CF-13: Indicators of overwhelmed mental health services on USS *George Washington* existed (e.g., surge in patients, high workload, long waits reported by SMO) prior to TYCOM providing surge support post-incidents [TYC-UCA-8].
- TYC-CF-14: Documented critical billet shortfalls persisted on USS *George Washington* (e.g., DAPA/SARP gaps; Supervisory manning at 69 percent; Personnel Division shortage) even with Command Triad advocation for assistance [TYC-UCA-6, 11].
- TYC-CF-15: Large amounts of cumulative sleep debt and fatigue was rampant across the crew and for Sailors like S3 due to RCOH watch schedules and conditions, indicating potential gaps in effective fatigue management guidance or oversight by TYCOM, despite SOH/ORM policies requiring fatigue risk management [TYC-UCA-9].

Questions Raised:

- Why did TYCOM permit habitability inspections to be conducted in such a manner?
- Why did TYCOM allow the crew to remain onboard with an industrial environment for such a prolonged period?

- Was TYCOM able to surge meaningful support to USS *George Washington* following feedback from the Command Triad?
- Why was the administrative chain of command set up where CNAP and CNAL split various responsibilities?
- Is there any feedback between the two TYCOMs to ensure complete coverage for a RCOH vessel?
- Why did TYCOM permit delaying the industrial hygiene surveys?
- Why despite clearly rising indicators of cultural deterioration onboard, did TYCOM not immediately address these issues?
- Why was TYCOM unable to add additional mental health professionals to address the long patient wait time?
- What specific criteria or thresholds does TYCOM use to declare a ship "suitable" vs merely "habitable" for extended RCOH periods?

3.4.1.6 Command Triad

Applicable Safety Related Responsibilities (Developed with [5], [7], [46], [47], [48], [49], [65], [66], [67], [68], [69], [70]):

- Request TYCOM to classify the ship as uninhabitable for moving personnel ashore.
- Request industrial hygiene assistance and inspections during extended availabilities.
- Establish, monitor, and maintain a safety council that runs the safety program onboard (pg. 76) (pg. 32) [23].
- Train EDL on expectations, priorities, stress recognition, resources, and how to manage RCOH challenges.
- Provide a means for self-referral or command-referral, without risk of disciplinary action, for Sailors under their command to get the help they need for destructive behaviors (pg. 100).
- Request pre-move aboard habitability inspection.
- Ensure command monitors, updates, and corrects habitability deficiencies discovered during the inspection.
- Coordinate with and support on-board MWR programs.
- Ensure the effectiveness of command-wide programs, particularly sufficient engagement in command climate assessments like DEOCS.
- Provide messing and berthing for their Sailors in shipyard availabilities when the ship is uninhabitable and in an industrial environment (pg. 122).
- Request and argue for Sailor quality of life improvements to SUPSHINN/TYCOM for additional funding (pg. 129)[36].
- Establish, train, maintain, and utilize a CRT and CRTHFC onboard.
- Ensure CRT and related program managers' functionality, membership, and required attendance at meetings.
- Actively foster a command climate of trust in leadership, where issues can be reported without reprisal.
- Monitor crew fatigue and workload, and watch schedules.
- Enforce standards consistently and correct deviations from standards, instructions, or policy.

- Maintain open communication with the crew about schedule and resource changes and significant command-wide challenges.

CT Unsafe Control Actions Contributing to Hazardous State:

- CT-UCA-1: Commenced and executed crew move-aboard before habitability conditions were suitable for long-term living in an industrial setting.
- CT-UCA-2: Requested TYCOM approval to delay required Industrial Hygiene surveys until the conclusion of RCOH.
- CT-UCA-3: Insufficiently advocated to TYCOM/PMS-312 to delay crew move-aboard and retain off-ship housing.
- CT-UCA-4: Did not ensure an environment of safe, suitable, and stable messing and berthing conditions for crew members living aboard during RCOH.
- CT-UCA-5 Did not enforce attendance for required members of the CRT and CRTHFC.
- CT-UCA-6: Did not effectively advocate for or ensure timely filling of critical onboard support billets (e.g., DAPA, SARP, Personnel Clerks).
- CT-UCA-7: Did not ensure effective feedback mechanisms existed or were utilized for Sailors to report quality-of-life and habitability concerns directly to senior leadership.
- CT-UCA-8: Provided training to EDL which may not have adequately equipped them to mentor Sailors or recognize distress signals particular to the RCOH environment.
- CT-UCA-9: Implemented inadequate measures to effectively monitor or mitigate crew fatigue accumulation resulting from watch schedules, work demands, and poor living conditions during RCOH.
- CT-UCA-10: Did not effectively communicate reasons behind schedule changes, current RCOH challenges, and available support.
- CT-UCA-11: Did not ensure the Safety Council effectively identified, assessed, and recommended mitigation for personnel safety and health hazards associated with prolonged RCOH conditions.
- CT-UCA-12: Did not establish or promote a command climate where Sailors consistently felt safe reporting concerns and issues up the chain of command.
- CT-UCA-13: Directed the combination of CRT and CRTHFC meetings.
- CT-UCA-14: Did not initially establish or ensure the effective function of a dedicated process or team (e.g. CRTHFC) specifically focused on identifying and managing the cases of Sailors deemed high-risk for destructive behaviors.
- CT-UCA-15: Did not ensure adequate command emphasis or action to achieve sufficient DEOCS participation rates.

CT Process Model Flaws:

- CT-PMF-1: Command Triad believed moving the crew aboard was a necessary step ("take back ownership," "a victory") to boost morale and potentially improve RCOH progress, underestimating the negative impact of unsuitable living conditions [CT-UCA- 1, 3].
- CT-PMF-2: Command Triad may have assumed Industrial Hygiene surveys were less critical during RCOH prior to operational startup, while not fully considering long-term exposure risks for the crew living aboard amidst ongoing work [CT-UCA-2].

- CT-PMF-3: Command Triad may have believed they lacked further options for escalating advocacy regarding off-ship housing once informed by PMS-312 of funding expiration [CT-UCA-3].
- CT-PMF-4: Command Triad may have assumed Sailors possessed sufficient resilience, and access to resources to handle temporary inhospitable RCOH conditions, underestimating the cumulative impact on their well-being which compounded as the availability continued to expand past original schedule dates [CT-UCA- 1, 3, 4].
- CT-PMF-5: Command Triad (specifically the XO as CRT lead, per standard instruction) may have been unaware of the extent of CRT dysfunction, the specific membership requirements, or the lack of participation by required members [CT-UCA-5].
- CT-PMF-6: The Command Triad might assume that manning for support billets is solely in the control of higher controllers like TYCOM, potentially resulting in underutilization of command-level advocacy to Navy Personnel Command or internal mitigation strategies [CT-UCA-6].
- CT-PMF-7: The Triad may assume standard communication channels through the chain of command are sufficient for feedback from the individual Sailors [CT-UCA-7].
- CT-PMF-8: The Triad may not have sufficient time to "train the trainers" and ensure sufficiency of EDL in RCOH, especially for a crew of over 2000 [CT-UCA-8].
- CT-PMF-9: The Triad might assume existing watch bills and work-hour limitations sufficiently manage fatigue, lacking awareness or tools to assess cumulative sleep debt and chronic fatigue in the RCOH setting particularly for those with overnight watches [CT-UCA-9].
- CT-PMF-10: The Triad might believe their communications are effective, while schedule uncertainty and lack of structured feedback mechanisms limits the actual transparency perceived by the crew [CT-UCA-10].
- CT-PMF-11: The Triad may assume the Safety Council is functioning effectively based on meetings held, without verifying its focus includes personnel hazards, particularly fatigue, related to environment/well-being in addition to industrial safety [CT-UCA-12].
- CT-PMF-12: The Triad may be unaware of underlying fear of reporting or distrust among junior personnel [CT-UCA-12].
- CT-PMF-13: Command Triad may have viewed combining CRT/CRTHFC as an administrative efficiency or a way to streamline meetings given manning/time constraints [CT-UCA-13].
- CT-PMF-14: Command Triad may have been unaware of the requirements regarding CRTHFC, or believed existing structures (e.g., CoC, medical referrals, standard CRT) were sufficient for identifying/managing high-risk [CT-UCA-14].
- CT-PMF-15: DEOCS participation is voluntary which if not adequately incentivized will diminish participation levels [CT-UCA-15].

CT Contextual Factors:

- CT-CF-1: The Command Triad faced significant pressure from higher headquarters (TYCOM, PMS-312) regarding RCOH schedule adherence and budget constraints. The CO's attempt to delay move-aboard was reportedly rejected by PMS-312 due to

expiring housing funding to meet the budget constraints, and the perceived need for a schedule 'win' onboard [CT-UCA-1, 3].

- CT-CF-2: Persistent and severe manning gaps, especially in critical supervisory billets (E6+ averaged 69 percent fill) and key support roles (DAPA, SARP, PS), limited the Triad's ability to effectively manage workload, provide mentorship, monitor personnel, and execute programs through the chain of command, despite continuous efforts to raise manning concerns [CT-UCA-6, 8, 9].
- CT-CF-3: TYCOM oversight and support for critical programs appeared insufficient. This included ambiguous CNAL/CNAP responsibilities, ineffective habitability inspection processes, lack of CCA follow-up, and limited supports visits from TYCOM program managers. The post-incident TYCOM audit found a significant amount of CRT failures. [CT-UCA-5, 6, 7].
- CT-CF-4: There were significant areas where feedback was lacking or not present onboard USS *George Washington*. For example, individual Sailors reported about the difficulty conveying onboard struggles up the chain of command. The XO was reportedly unaware they led the CRT. DEOCS participation was chronically low, and results indicating rising suicidal ideation awareness were significant. Additionally, DEOCS 5.0 versions obscured critical data that could have helped the triad. This suggests the Triad were most likely not receiving timely and holistic information about the health of the crew [CT-UCA-7, 12].
- CT-CF-5: USS *George Washington*'s crew, and particularly the most junior Sailors, endured documented substandard and hostile living conditions onboard (e.g., lack of heat, hot water, excessive noise, privacy concerns) and inadequate shore support (e.g., extreme commutes, limited MWR, unsuitable lodging which were a major source of stress and dissatisfaction [CT-UCA-1, 4].
- CT-CF-6: The inherent nature of a long, delayed RCOH created an environment of uncertainty, perceived lack of purpose ("underworked, underappreciated, bored, and unfulfilled"), and industrial hazards unique from other availabilities and operational deployments [CT-UCA-All].
- CT-CF-7: Beyond manning, specific resources that could help combat the hazardous state were lacking, such as computers for training and personal use, and adequate mental health staffing leading to long waits [CT-UCA-6].
- CT-CF-8: While overall habitability remained challenging, the command implemented some mitigation policies (e.g., moving Sailors during required habitability system outages) and XO/CMC conducted frequent berthing inspections with the cognizant divisions and provided discrepancies for correction. Simultaneously, managing persistent, systemic problems with inadequate shoreside support, particularly the extremely time-consuming parking situation, which added hours to Sailors' days and consumed significant leadership focus and time, drained resources and focus potentially needed for other personnel well-being initiatives [CT-UCA-All].
- CT-CF-9: The scheduled arrival of USS John C. Stennis for its RCOH created additional logistical and schedule pressure, as the Accommodation Barge occupied by the USS *George Washington* crew needed evacuation for required repair time. This requirement added seemingly hard constraints to the USS *George Washington* crew move-aboard timeline, limiting the Triad's options or leverage in delaying the move

until conditions were fully suitable particularly since PMS-312 was essentially vacating them [CT-UCA-1, 3].

- CT-CF-10: USS *George Washington* combined the CRT and CRTHFC meetings under in the intention of streamlining the administrative processes. This led to the CRTHFC losing its holistic viewpoint as it focused on a specific department every month. Therefore, since USS *George Washington* had 20 departments onboard, it resulted in each department and therefore their Sailors only getting analyzed once ever 20 months (pg. 93) [CT-UCA-14].
- CT-CF-11: DEOCS participation rates on USS *George Washington* in 2021 were extremely low (11-12%), rendering the results statistically inadequate for assessing command climate. Achieving representative participation typically requires strong command emphasis and a climate of trust where Sailors feel safe providing honest feedback and believe it will be used constructively [CT-UCA-15].
- CT-CF-12: The Commanding Officer operates under U.S. Navy Regulations (e.g., Art. 0802, "Responsibility") which assign absolute responsibility and accountability for the safety, well-being, and efficiency of the entire command, including the health, welfare, morale, and discipline of the crew which frames all command decisions and actions [CT-UCA-All].
- CT-CF-13: As the designated authority under the Uniform Code of Military Justice (UCMJ, codified in 10 U.S.C. Chapter 47), the Commanding Officer holds primary responsibility for the administration of discipline and ensuring good order within the command, including the authority for non-judicial punishment.
- CT-CF-14: The Command Triad is responsible for ensuring the proper implementation and effectiveness of numerous Navy-wide personnel support and safety programs (e.g., Safety per SECNAVINST 5100.10 series, Suicide Prevention per OPNAVINST 1720.4 series, Command Climate/CRT per OPNAVINST 5354.1 series, ORM per OPNAVINST 3500.39 series) within their command [CT-UCA-All].

Questions Raised:

- Why did the Triad continue to prioritize moving the crew aboard despite known habitability concerns and the CO's initial attempt to delay?
- Why were feedback mechanisms established for Sailors to report quality-of-life and habitability concerns appear to be so ineffective in alerting the Triad to the full extent of the problems?
- What steps did the Triad take to verify the functionality, attendance, and effectiveness of the CRT, particularly given the XO's leadership role per instruction?
- Why was the XO not aware that they were the leader of the CRT, if Get Real and Get Better are the huge influencing programs, are the XOs trained on them before reporting to the ship?
- How did the Triad attempt to balance the pressure from higher HQs regarding schedule/budget/logistics against advocating for crew welfare needs like off-ship housing or improved conditions?
- What specific RCOH-focused training on stress recognition, mentorship, and resource referral was provided to the EDL?
- What methods, if any, were used by the Triad to monitor or assess cumulative crew fatigue beyond standard watch bill management?

- How did the Triad ensure transparency and manage crew expectations regarding the frequently changing RCOH schedule and resource limitations?
- What specific hazards related to personnel well-being (e.g., from habitability, fatigue, stress) were identified and addressed by the Safety Council prior to briefing the triad?
- How did the Triad actively assess the command climate for psychological safety and trust, beyond relying on potentially filtered upward reporting or DEOCS data?
- What actions did the Triad take to advocate for filling critical vacant billets like DAPA, SARP Coordinator, or Personnel Specialists?
- Why was the CT unaware of the CRTHFC requirements?
- Why were DEOCS participation rates so low onboard?

3.4.1.7 Shipboard Medical

Applicable Safety Related Responsibilities (Developed with [5], [6], [7], [68], [71]):

- Provide medical care to Sailors.
- Execute emergency procedures for Sailors with suicidal ideation.
- Coordinate with divisional command regarding treatment plans while maintaining patient confidentiality.
- Execute Sailor treatment plans.
- Declare a Sailor fit for duty after passing the evaluation.
- Recommend a Sailor to a medical review board.
- Report manning shortages, excessive wait times, patient load trends, and resource needs to the Command Triad and TYCOM.
- Establish clear protocols for managing care transitions and communication with external providers.
- Provide regular training to EDL on recognizing distress and referral procedures.
- Monitor for potential medication interaction issues.
- Advocate for Sailor health needs, including appointment time-offs, even amidst operational and maintenance pressures.

SBM Unsafe Control Actions Contributing to Hazardous State:

- SBM-UCA-1: Provided mental health care with delays due to personnel overload.
- SBM-UCA-2: Did not ensure effective communication or utilize protocols for patient information transfer during care transitions between shipboard and shore-side providers.
- SBM-UCA-3: Did not develop or enforce effective processes to monitor and mitigate risks associated with medication interactions, including with non-disclosed treatments or alcohol use, for some patients.
- SBM-UCA-4: Reporting of critical staffing shortages, excessive wait times, and overwhelming patient loads to the Triad/TYCOM, while occurring, may not have been sufficiently convincing, or persistent enough.

SBM Process Model Flaws:

- SBM-PMF-1: Shipboard medical may have operated under the assumption that they were effectively managing the high patient load within their capabilities by prioritizing emergencies, and integration of group sessions [SBM-UCA-1].
- SBM-PMF-2: Shipboard medical leadership may assume that communicating concerns about workload and resources up the chain of command was sufficient to trigger appropriate action [SBM-UCA-4].
- SBM-PMF-3: Shipboard medical may have assumed that Sailors will self-disclose all external medical care or operate under the belief that existing EHR systems provide adequate visibility, not fully recognizing system limitations or patient reluctance to share information, which would prevent effective coordinated care [SBM-UCA-2].
- SBM-PMF-4: Medical providers may assume patients adhere to all medication directions and restrictions [SBM-UCA-3].

SBM Contextual Factors:

- SBM-CF-1: Shipboard medical, particularly mental health, operated with staffing far below actual need and DHA standards, as they were billeted only one Psychiatrist, and one Behavioral Health Technologist, instead of the estimated ~2.6 needed to meet the DHA standard based on workload [SBM-UCA-1, 4].
- SBM-CF-2: Mental health providers onboard USS *George Washington* faced overwhelming patient demand, averaging up to 20 patients daily per provider, far exceeding shore-based averages. This limited time per patient for assessment, counseling, coordination, and delays for care [SBM-UCA-1].
- SBM-CF-3: Mental health care providers billeting is controlled by higher authorities (OCNO/NPC/TYCOM). There were providers available as TYCOM surged additional mental health providers only after the suicides in April and May 2022 [SBM-UCA-4].
- SBM-CF-4: The Electronic Health Record systems reportedly lacked interoperability between military and civilian providers, and shipboard systems faced unique constraints tracking patient wait times, hindering comprehensive record-keeping and information transfer during care transitions [SBM-UCA-2].
- SBM-CF-5: The high-stress RCOH environment likely contributed to increased demand for mental health services, placing greater strain on understaffed department [SBM-UCA-1].
- SBM-CF-6: A significant portion of Sailors onboard reported stigma, shame, or distrust associated with seeking Navy healthcare, and a permeated belief that seeking mental health assistance would negatively impact their careers, potentially hindering seeking of help, disclosure of external treatments, or substance use to providers [SBM-UCA-2, 3].
- SBM-CF-7: In specific cases like S2's, disagreements between Navy medical providers (SMO vs. NMCP Psychiatrist) complicated the treatment plan and care coordination [SBM-UCA-2].
- SBM-CF-8: Despite constraints, shipboard medical staff made significant efforts to address the deteriorating mental health conditions onboard. They handled extremely high patient volumes, prioritized emergencies, communicated emergencies to the Triad, utilized group settings when able, and the SMO voiced concerns about patient volume to leadership [SBM-UCA-4].

Questions Raised:

- Why did the patient wait time, and load tracking systems utilized onshore not able to be utilized onboard?
- Why did the shoreside, and shipboard EHRs not communicate well?
- What is the process for communicating civilian and military EHRs?
- What specific procedures are utilized for those Sailors who have a history of substance abuse, or suicidal ideation when applying prescriptions?
- Why did the stigma onboard regarding mental health care continue to permeate, and what was medical doing to combat it?
- Why did so many medical providers pertaining to S2 disagree or provide inconsistent care?

3.4.1.8 Command Resilience Team

Applicable Safety Related Responsibilities (developed with [5], [7], [40], [41], [46], [47], [48], [49], [62], [68]):

- Act as the interface between the crew and the commander.
- Evaluate the command climate and develop actions to address struggling departments and Sailors.
- Develop, manage, and groom the CCA through multiple methods, including surveys like DEOCS, focus groups about issues, and feedback from the various program manager members.
- Evaluate common trends and areas of concern/weaknesses and recommend corrective actions from the DEOCS to the commanding officer.
- Develop, implement, and monitor a PO&AM of corrective actions pertaining to the CCA.
- Acts as the CCA coordinator (CMEO/Command climate specialist (CCS)).
- Maintain the last three years of CCAs for historical and POAM trend monitoring (CCS).
- Summarize and provide the CCA to TYCOM (CCS).
- Train EDL on fostering resilience, monitoring Sailor wellbeing, and developing destructive behavior prevention plans.
- Gather data and instances of their members' roles to develop a holistic and systemic mental model of command resilience.
- Review cases of destructive behavior and develop long-term action plans for their well-being (CRTHFC).
- Monitor and report the status of Sailor retention, advancement, and career development (Command Career Counselor) (pg. 98).
- Ensure robust dissemination and, at a minimum, annual training of suicide-related materials and topics throughout the command (SPC) (pg. 104).
- Provide feedback to the Command Triad about the command climate and crew resilience issues.

CRT Unsafe Control Actions Contributing to Hazardous State:

- CRT-UCA-1: Did not effectively conduct its main role as an interface to the triad on command climate, and emerging resilience risks to the Command Triad.

- CRT-UCA-2: Did not effectively manage the Command Climate Assessment process, including actions related to DEOCS participation/analysis, POA&M development/tracking, and required reporting to TYCOM.
- CRT-UCA-3: Did not provide forceful backup to the Command Triad and enforce required attendance and participation of required members at CRT meetings.
- CRT-UCA-4: Did not effectively address and assuage resistance from leadership (EDL) towards resilience-building initiatives like the CRTHFC process.
- CRT-UCA-5: Did not effectively communicate to the Command Triad that the resistance encountered from EDL regarding resilience initiatives and intrusive leadership towards their Sailors was inhibiting the effectiveness of CRT/CRTHFC program and indicative of deeper fissures onboard.
- CRT-UCA-6: Did not maintain required documentation and records of the Command Climate Assessment.

CRT Process Model Flaws:

- CRT-PMF-1: The CRT (including its leadership) may have believed that holding scheduled meetings fulfilled its function, without a clear understanding or execution of its analytical, feedback, and action-tracking responsibilities [CRT-UCA-1, 2, 3].
- CRT-PMF-2: The CRT may not have perceived the CCA/DEOCS process as a critical tool for understanding and improving command climate particularly within the shipyard environment [CRT-UCA-2].
- CRT-PMF-3: CRT members may not have fully appreciated and embraced the importance of their roles since the CRT process seemed to be an afterthought [CRT-UCA-3].
- CRT-PMF-4: The CRT may assume leadership directives are sufficient to implement programs, underestimating the impact of passive resistance or competing priorities among EDL on the success of initiatives, and may lack processes to effectively report this resistance upward [CRT-UCA-5].
- CRT-PMF-5: The CRT may have lacked the resources, expertise, or guidance to develop or deliver tailored training modules addressing specific shipyard stressors [CRT-UCA-1].
- CRT-PMF-6: The CRT/CCS had inadequate backup within the command and higher controllers ensuring compliance with instruction on CCA-related activities [CRT-UCA-6].

CRT Contextual Factors:

- CRT-CF-1: Critical leadership engagement was absent, as shown through the XO (designated CRT Lead) reportedly being unaware of this role for months after checking aboard, did not attend meetings during that period, and overall CRT function was poor per a later TYCOM audit [CRT-UCA-1, 3].
- CRT-CF-2: The CRT was missing several required members (e.g. the SAPR victim advocate, command financial specialist, suicide prevention coordinator, deployed resiliency counselor, command indoctrination coordinator, expanded operational stress control (EOSC) team lead, and the ship's clinical psychologist) frequently from meetings. Additionally, meetings were sporadic and lacked proper documentation

efforts per a later TYCOM audit, indicating widespread dysfunction [CRT-UCA-1, 3, 6].

- CRT-CF-3: Overall command manning shortages, particularly in support billets, likely limited CRT members' availability and bandwidth [CRT-UCA-3].
- CRT-CF-4: Limited resources like computer access also hindered some program execution like command indoctrination [CRT-UCA-3].
- CRT-CF-4: The Chaplain encountered significant resistance from some EDL towards perceived intrusive initiatives like the CRTHFC which created barriers to implementing CRT-related actions effectively [CRT-UCA-5].
- CRT-CF-5: TYCOM oversight was minimal for some programs until after the crisis. Failure to submit the CCA to TYCOM was not detected or corrected by TYCOM in a timely manner [CRT-UCA-2].
- CRT-CF-6: DEOCS results indicating rising suicidal ideation awareness were not acted upon. Additionally, low participation rates (11-12%) ensured that the process was ineffective [CRT-UCA-2].
- CRT-CF-7: Navy-wide policy (OPNAVINST 5354.1 series) directs and governs CRT structure, roles (incl. CCS), CCA process, DEOCS, POA&M, and TYCOM reporting [CRT-UCA-All].
- CRT-CF-8: The SPC operates under Navy Suicide Prevention Program directives (OPNAVINST 1720.4 series). They reported limited contact with TYCOM Suicide Prevention Program Manager and a lack of support suggesting controller resource gaps inhibited CRT function [CRT-UCA-2].
- CRT-CF-9: RCOH environment hindered meeting attendance, communication, and prioritization of CRT functions amidst pressing maintenance schedules [CRT-UCA-All].
- CRT-CF-10: The TYCOM audit conducted in May 2022 found that the designated Command Climate Specialist (CCS), responsible for coordinating key aspects of the CRT and CCA process, lacked the required level of knowledge regarding basic program requirements. This deficiency likely hindered the proper execution of CRT functions, including CCA management, record-keeping, and reporting [CRT-UCA-2, 7].
- CRT-CF-11: The CRT combined CRT/CRTHFC meetings as directed by Command Triad, which diluted focus [CRT-UCA-1].

Questions Raised:

- Why was the XO, designated lead of the CRT, unaware of this role for several months? What breakdown occurred in turnover or command indoctrination? What was their training pipeline like?
- Why did no one onboard provide backup to the XO?
- What factors contributed to the extremely low DEOCS participation rates in 2021, and what actions, if any, did the CRT take to address or report this issue as part of CCA management?
- Why was the significant increase in crew awareness of suicidal ideations reported in the 2020 DEOCS not effectively incorporated into the CCA POA&M or trigger specific CRT actions?

- Why were required members not attending CRT meetings, and what mechanisms did the CRT/CCS use (or not use) to encourage participation?
- Why was there no one who provided forceful backup to the CCS either within the command or at a higher controller?
- What specific data sources (beyond DEOCS) did the CRT utilize, or attempt to utilize, to build a "holistic and systemic mental model of command resilience"?
- How did the known deficiencies identified in the May 2022 TYCOM audit develop over time without earlier detection or intervention by either the Command Triad or TYCOM?
- What was the specific process intended for the CRT (via CCS) to summarize and provide the CCA to TYCOM, and why did this process break down?
- How did the CRT attempt to address or communicate upward the EDL resistance to resilience initiatives?
- Why the Command Triad not intervene and directly have a meeting with EDL about the importance of intrusive leadership and the CRTHFC process?
- What is the process the CCS utilized for administration, and why did it breakdown?

3.4.1.9 Engaged Deck Plate Leadership

Applicable Safety Related Responsibilities (developed with [5], [7], [41], [45], [49], [62], [62], [67], [68], [69], [70]):

- Engage with daily, mentor, and train Sailors within their division.
- Foster and encourage Culture of Excellence tenants, and policies within the division.
- Actively monitor, manage, and distribute RCOH workload at the divisional level to manage fatigue.
- Manage and execute the RCOH schedule at the divisional level.
- Hold Sailors accountable for deviations from standards, instructions, and policy consistently and fairly.
- Maintain a record of Sailors' discrepancies and counseling.
- Refer Sailors to the anti-suicide resources (chaplain, medical, SPC, etc.) for suicide-related behaviors immediately.
    - If there is an emergency, escort the Sailor directly to the medical department.
- Provide guidance and training to Sailors about destructive behaviors and resources available to assist them.
- Review active, destructive behavior cases monthly.
- Implement systems to track and manage Sailor qualifications proactively.
- Conduct regular, impactful, private check-ins with Sailors.
- Adjust the Sailors' assignments to duty sections and watch teams as necessary.
- Escalate unresolved quality-of-life, personnel, and safety issues.
- Ensure divisional program coordinators effectively integrate and execute their duties (e.g., the sponsorship coordinator ensures new Sailors have sponsors).
- Communicate openly with Sailors about work, expectations, destructive behavior training, and available support.

EDL Unsafe Control Actions Contributing to Hazardous State:

- EDL-UCA-1: Provided inadequate daily engagement, mentorship, and training to junior Sailors within the shipyard availability.
- EDL-UCA-2: Did not effectively and rapidly identify warning signs for Sailors in distress in some cases.
- EDL-UCA-3: Did not effectively manage divisional workload and watch team assignments to mitigate or report excessive fatigue accumulation for some Sailors.
- EDL-UCA-4: Inadequately enforced disciplinary standards, rules, and regulations for some Sailors.
- EDL-UCA-5: Did not maintain records or documentation of counseling and infractions of policy for some Sailors.
- EDL-UCA-5: Did not effectively or persistently escalate unresolved divisional issues regarding quality-of-life (habitability), safety, or personnel well-being up the chain of command.
- EDL-UCA-6: Did not ensure effective functioning of assigned divisional collateral duties for Sailor support programs (e.g., sponsorship program).

EDL Process Model Flaws:

- EDL-PMF-1: EDL may prioritize immediate work tasks over proactive mentorship and check-ins due to high workload, manning gaps, and administrative burdens [EDL-UCA-1].
- EDL-PMF-2: EDL may misinterpret distress signals from their Sailors as simply poor performance indicators or disciplinary issues. Additionally, they may lack training in how/when to intervene or refer Sailors [EDL-UCA-2].
- EDL-PMF-3: EDL may have assumed that watch bill coordinators and Navy shift work policies adequately manage fatigue [EDL-UCA-3].
- EDL-PMF-4: EDL may not have the awareness/tools to assess cumulative fatigue indicators from their Sailors [EDL-UCA-3].
- EDL-PMF-5: EDL could have been missing clear guidance, training, or expectations from leadership on discipline and documentation standards, especially balancing accountability vs. support [EDL-UCA-4].
- EDL-PMF-6: EDL most likely assumed the Command Triad was already aware of persistent quality-of-life and personnel issues through other reporting processes or lacked clear guidance on how to effectively escalate such issues beyond routine reporting [EDL-UCA-5].
- EDL-PMF-6: EDL possibly did not recognize the importance that collateral duties like sponsorship have on easing the transition for new Sailors into the Navy [EDL-UCA-8].

EDL Contextual Factors:

- EDL-CF-1: Significant billeting gaps with experienced supervisors (E6+ avg 69 percent fill on USS *George Washington*) created an environment where remaining EDL had larger requirements of control, potentially less experience, and reduced capacity for individual Sailor engagement, mentorship, and oversight [UCA-1, 2, 3, 4].
- EDL-CF-2: EDL was responsible for RCOH divisional planning, scheduling, and execution. On top of this core divisional duty, they had other administrative tasks,

collateral duties, and managing systemic issues impacting their Sailors (like parking logistics), limiting available time for proactive leadership [EDL-UCA-All].

- EDL-CF-3: Other shipboard resources that could be utilized by EDL were dysfunctional, or under immense strain such as Shipboard Medical, which was overwhelmed with long wait times, the CRT which was not fully in accordance with written instruction, and key support billets like DAPA were gapped [EDL- UCA-2).
- EDL-CF-4: EDL promulgated and worked within a command climate where some Sailors felt leadership "didn't care", reported difficulty conveying struggles upward the chain of command, and potential stigma existed around seeking help which hindered those engaged EDL's ability to build trust, receive honest feedback, or have their own concerns addressed when escalated [EDL-UCA-5, 6).
- EDL-CF-5: In a prolonged, high-stress environment with resource constraints, acceptance of minor deviations from standards became normalized throughout the command, impacting and influencing EDL enforcement (EDL-UCA-4).
- EDL-CF-6: Some EDLs were reportedly resistant to new intrusive leadership initiatives like CRTHFC, reflecting historical cultural norms and beliefs onboard and more broadly throughout the Navy, on how to lead onboard. All this furthered skepticism about program effectiveness [EDL-UCA-1, 2].
- EDL-CF-7: Some EDL reportedly felt they lacked time sufficient time for subordinate mental health issues and preferred to pass off that responsibility to other controllers [EDL-UCA-1, 2].
- EDL-CF-8: Sailors throughout the command arrived without, and then were not assigned sponsors, indicating a failure point EDL was responsible for which was overseeing and fostering adaptation to the command for new Sailors [EDL-UCA-6].
- EDL-CF-9: EDL responsibilities for leadership, mentorship, training, discipline, safety, and Sailor well-being are outlined in numerous foundational Navy documents like the Charge of Command, Standard Organization and Regulations Manual (SORM), UCMJ/JAGMAN, and program-specific instructions they are expected to implement.
- EDL-CF-10: EDL responsibilities established within the military chain of command are specified by Title 10 U.S.C. and Navy Regulations (e.g., Ch. 10 "Precedence, Authority and Command," Ch. 11 "Duties of Officers"), responsible for executing lawful orders from superiors and exercising direct supervision over their assigned junior personnel according to organizational manuals (SORM) and command directives [EDL-UCA-All].
- EDL-CF-11: EDL are the primary leaders for executing the Navy standards for performance and conduct at the deckplate level. They are responsible for utilizing corrective actions and counseling, initiating disciplinary measures according to the UCMJ (10 U.S.C. Chapter 47) and command guidance (JAGMAN procedures), while also being expected to identify and connect Sailors with appropriate support resources.

Questions Raised:

- Given the documented manning shortages and other administrative requirements, how much time out of the day could EDL realistically dedicate to proactive, individual engagement and mentorship versus reactive problem-solving and task management?

- What specific RCOH-focused training did EDL receive on topics like stress recognition, mental health care, resource navigation, fatigue management, and mentoring junior Sailors in an industrial environment?
- What was the command's communicated standard and expectation for documenting informal vs. formal counseling and escalating disciplinary issues? Why did apparent inconsistencies occur (e.g., S3 case)?
- What tools or guidance were EDL provided to monitor or assess cumulative fatigue among their Sailors beyond tracking watch schedules? If an issue was noted, why were they not able to act on it?
- Where were the obstacles when EDL attempted to escalate quality-of-life, personnel, or safety concerns?
- How was the effectiveness of the divisional sponsorship program monitored by EDL and the command, and what actions were taken to address known deficiencies?
- How did EDL perceive the support and resources available to them (from Medical, Chaplain, CRT, etc.) when dealing with Sailors exhibiting significant distress or behavioral issues?
- Did EDL feel that they could report problems up the chain of command, particularly issues that might negatively impact materiel readiness or ship's schedule?
- How was the concept of "Engaged Deck Plate Leadership" defined and operationalized within the context of USS *George Washington*'s RCOH environment and its unique challenges?

3.4.1.10 Navy Personnel Command

Applicable Safety Related Responsibilities:

- Execute the manning strategy from OCNO via detailing and continuation contracts.
- Utilize monetary incentives (e.g., bonuses) and other programs (e.g., graduate school) to facilitate retention goals.
- Billet personnel to positions Navy-wide, working with TYCOMs/RFCs to fill vacancies according to established priorities, including designated critical fills.
- Conduct promotion and selection boards.
- Execute strategic guidance and strategies from the OCNO to attract and retain personnel for specific billets or duty types, like critical RCOH positions.
- Track billet fill rates (manning health) across the fleet and report data/gaps to relevant higher headquarters.

NPC Unsafe Control Actions Contributing to Hazardous State:

- NPC-UCA-1: Executed guidance from higher controllers which resulted in billet gaps onboard USS *George Washington* (e.g., supervisors E6+, medical, key admin/support roles like DAPA/PS).
- NPC-UCA-2: Did not effectively utilize retention incentives (bonuses) or specific detailing strategies to enhance retention rates, or mitigate manning shortfalls in critical billets on USS *George Washington* during RCOH.
- NPC-UCA-3: Did not provide backup to higher level controllers regarding RCOH billet fill rates and critical gaps.

NPC Process Model Flaws:

- NPC-PMF-1: NPC detailing processes operate primarily based on executing priority codes and distribution guidance received from OCNO/RFC/TYCOM, potentially lacking authority to independently adjust assignments based on unit-level distress indicators, like poor climate or quality-of-life [NPC-UCA-1].

NPC Contextual Factors:

- NPC-CF-1: NPC's primary function is executing the manning priorities established by OCNO (NAVPLAN) and implemented via RFC/TYCOM billet requirement submissions. The documented lower priority assigned to RCOH units directly constrained NPC's ability to preferentially fill USS *George Washington* billets over higher-priority operational units. [NPC-UCA-1].
- NPC-CF-2: Navy-wide retention difficulties in certain critical ratings, NECs, or paygrades limit the overall available personnel for NPC to distribute across all competing fleet requirements [NPC-UCA-1].
- NPC-CF-3: The Navy personnel distribution system involves complex factors beyond unit priority, including Sailor PRDs, career milestones, required screenings, available school quotas, Sailor preferences (where applicable), and balancing needs of the Navy across the entire fleet [NPC-UCA-1, 2].
- NPC-CF-4: Within the Navy and its culture, operational duties and sea service billets are more desirable and career enhancing. Therefore, extended duty on a ship undergoing RCOH in an industrial environment has the potential to be less desirable or career-enhancing making it harder for NPC detailers to fill billets voluntarily or retain personnel in those assignments without strong incentives [NPC-UCA-1, 2].
- NPC-CF-5: OCNO and SECNAV control the availability, funding levels, and criteria for special duty assignment pay or retention bonuses. Congress approves the budget which limits NPC's ability to apply them without higher authorization. [NPC-UCA-2].

Questions Raised:

- Were there any mechanisms or flexibilities for NPC detailers to address urgent, safety-critical manning shortfalls on lower-priority units based on direct input from TYCOMs or commands?
- How were the specific manning gaps on USS *George Washington* (supervisory, medical, support) communicated from TYCOM (CNAP N1) to the relevant NPC detailers, and how was this information factored into assignment decisions against competing higher-priority requirements?
- Were any specific detailing strategies (e.g., directed assignments, modified tour lengths) or retention incentives utilized by NPC specifically for USS *George Washington* RCOH billets during this period? If not, why not?
- Why is there not an independent mechanism for PERS to fill billets if it guarantees retention of the Sailor since that is there main mission?
- Does NPC factor qualitative information about command climate or quality of life at specific commands (if available) into the detailing process?

3.4.1.11 NAVSEA (NAVSEA & NAVSEA 04)

Applicable Safety Related Responsibilities (Developed with [5], [7], [72], [73], [74], [75], [76], [77], [78]):

- Allocate funding provided for RCOH execution towards specific shipyard work, upgrades, and availabilities.
- Provide technical expertise, define engineering scope, and contribute to schedule development for shipyard availabilities.
- Monitor shipyard production capacities and degradations related to RCOH execution (NAVSEA 04 responsibility via delegation and execution to SUPSHIPNN).
- Provide technical oversight for RCOH contracts (via SUPSHIPNN).
- Integrate quality of life requirements into RCOH planning, budgeting, scheduling, and contract coordination with program managers (PEO/PMS 312).
- Establish clear contractual requirements for shipyard quality-of-life support.
- Influence the prioritization of habitability-impacting work within the RCOH master schedule, coordinating with program managers and shipyards.
- Conduct rigorous oversight of contractor performance via SUPSHIPNN.
- Ensure lessons learned are incorporated into future strategic-level RCOH planning.

NAVSEA Unsafe Control Actions Contributing to Hazardous State:

- NAVSEA-UCA-1: Allocated funding to the USS *George Washington* RCOH contract execution (via SUPSHIPNN) that did not fully cover the contracted scope of work.
- NAVSEA-UCA-2: Approved RCOH schedules and technical scope that proved unrealistic given historical performance, initial funding, known complexities, and emergent work potential.
- NAVSEA-UCA-3: RCOH technical planning and scheduling processes did not sufficiently prioritize or protect the early restoration and sustainment of critical shipboard habitability systems (e.g., HVAC, plumbing, electrical for living areas).
- NAVSEA-UCA-4: Did not effectively provide oversight to enforce shipyard contractor performance (via SUPSHIPNN) executing the schedule.
- NAVSEA-UCA-5: Did not effectively incorporate lessons learned from previous RCOHs regarding cost and schedule issues for complex repairs, modernization, and habitability work into the USS *George Washington* RCOH planning.
- NAVSEA-UCA-6: Did not efficiently or intervene regarding RCOH progress to mitigate schedule slippage and increasing the availability duration.

NAVSEA Process Model Flaws:

- NAVSEA-PMF-1: NAVSEA's schedule and scope modeling processes rely heavily on historical data and engineering standards that may not adequately account for the high degree of uncertainty, emergent work, and potential for cascading delays inherent in complex RCOH availabilities on aging platforms. [NAVSEA-UCA-2, 5].
- NAVSEA-PMF-2: NAVSEA most likely prioritizes structural, nuclear, or combat system work early in the availability due to the rigor involved and system availability, restricting resources for habitability system restoration [NAVSEA-UCA-3].

- NAVSEA-PMF-3: NAVSEA may assume that SUPSHIPNN's contract administration and oversight processes are sufficient to identify and address all performance related issues (including schedule adherence and technical execution affecting personnel), without accounting for higher-level NAVSEA intervention [NAVSEA-UCA-4].
- NAVSEA-PMF-4: The Navy is notorious for capturing lessons learned, but then immediately moving onto the next project without pausing, thinking, and planning on how to incorporate those lessons into future projects [NAVSEA-UCA-5].

NAVSEA Contextual Factors:

- NAVSEA-CF-1: NAVSEA executes RCOH technical work within budget allocations provided by the Navy's programming and budgeting process (influenced by Congress/SECNAV/OCNO) and managed by the relevant Program Office (PEO Carriers/PMS-312). The known initial $322M deficit for USS *George Washington* RCOH represented a significant constraint from the start [NAVSEA-UCA-1].
- NAVSEA-CF-2: Navy leadership emphasis on carrier availability and operational readiness creates pressure throughout the force (including on NAVSEA) to develop and adhere to demanding, and optimistic RCOH schedules [NAVSEA-UCA-2].
- NAVSEA-CF-3: NAVSEA acts as the lead technical authority and manages shipyard execution via SUPSHIPNN but works in coordination with PEO Carriers/PMS-312 who hold overall program management and primary budget authority. Decisions often involve balancing NAVSEA's technical recommendations with PEO/PMS's programmatic (cost/schedule) requirements [NAVSEA-UCA-All].
- NAVSEA-CF-4: NAVSEA manages RCOH through complex, long-term contracts with a sole-source provider (HII-NNS). Shipyard performance, capacity, workforce issues, and the inherent difficulty of contracting precisely for all manners of work makes it extremely difficult to account for all outcomes [NAVSEA-UCA-2, 4, 6].
- NAVSEA-CF-5: CVN RCOH involves highly complex nuclear refueling, major structural work, and integration of new technologies onto an aging platform. Unpredictable emergent work is common and significantly impacts cost and schedule adherence [NAVSEA-UCA-2, 6].
- NAVSEA-CF-6: There is a history of cost, and schedule overruns, particularly amongst major shipyard availabilities like RCOH. These issues are covered further in multiple GAO reports on the state of shipbuilding and ship program management within the Navy [NAVSEA-UCA-2].
- NAVSEA-CF-7: The absence of clear, enforceable Navy standards specifically for RCOH habitability/suitability made it difficult for NAVSEA, as the technical authority, to write and enforce explicit technical requirements or contractual clauses for quality-of-life aspects onboard [NAVSEA-UCA-3].
- NAVSEA-CF-8: NAVSEA delegates many aspects to its Supervisor of Shipbuilding (SUPSHIPNN) who oversees the day-to-day contract administration, technical oversight, and interfaces directly with the shipyard [NAVSEA-UCA-4].
- NAVSEA-CF-9: NAVSEA operates under broad statutory authority (derived from Title 10 U.S.C. governing the Department of the Navy) as the Navy's primary command for engineering, building, buying, and maintaining ships, submarines, and systems, establishing its role as the lead technical authority for RCOH within the framework set by SECNAV/CNO.

Questions Raised:

- Why was the deficit approved or missed in the first place?
- Why was NAVSEA unable to incorporate previous lessons learned into USS *George Washington*'s RCOH?
- How were requirements for habitability system restoration (HVAC, plumbing, berthing refurbishment) sequenced and prioritized within NAVSEA's schedule for the GW RCOH?
- Why is NAVSEA's formal process for capturing and incorporating technical and execution lessons learned (including personnel impacts) from projects like the RCOH ineffective, or un-utilized?
- When the schedule began to slip, what technical or contractual levers were available to NAVSEA/SUPSHIPNN to compel corrective action from the shipyard, and were they utilized effectively?

3.4.1.12 SUPSHIPNN

Applicable Safety Related Responsibilities (Developed with [5], [7], [36], [77]):

- Act as the Naval Supervising Authority and representative for NAVSEA (04) at HII-NNS.
- Provide day-to-day monitoring and administration of contracts within RCOH utilizing SCN funding.
- Allocate up to $75 million in funding toward housing, lodging, parking, and transportation contracts.
- Serve as the ultimate technical authority as the Naval chief engineer for the RCOH project.
- Make changes to parking contracts.
- Execute maintenance and repair for issues pertaining to Huntington Hall through contracts.
- Assign rooms at Huntington Hall to the different ships under construction at HII-NNS (pg. 82).
- Advocate for NAVSEA and the Aircraft Carrier Program Office for adequate funding for quality-of-life needs.
- Facilitate communication between the ship's force and the NAVSEA/Aircraft Carrier Program Office regarding shipyard issues.
- Ensure that lessons learned are recorded and implemented into future training plans and RCOH schedules, and that the crew is adequately trained on them.

SUPSHIPNN Unsafe Control Actions Contributing to Hazardous State:

- SUPSHIPNN-UCA-1: Did not prevent significant schedule slippage or effectively address contractor performance issues impacting RCOH progression and ship habitability conditions.
- SUPSHIPNN-UCA-2: Administration and oversight of contracts related to personnel support services (parking, transportation, housing) did not result in adequate or suitable quality-of-life requirements for the crew.

- SUPSHIPNN-UCA-3: Did not ensure that Huntington Hall was renovated and suitable for extended living arrangements.

SUPSHIPNN Process Model Flaws:

- SUPSHIPNN-PMF-1: HII-NNS was performing IAW contract specifications and schedules, SUPSHIPNN potentially focused more oversight resources on major schedule milestones rather than minute tracking and providing forceful backup of habitability issues [SUPSHIPNN-UCA-1, 2].
- SUPSHIPNN-PMF-2: SUPSHIPNN's focus heavily on technical acceptability of major systems, potentially giving lower priority to verifying the functional suitability and completeness of habitability-related systems when the crew is living onboard [SUPSHIPNN-UCA-1].
- SUPSHIPNN-PMF-3: Since a carrier is almost always in RCOH, there may have been insufficient time to renovate or build another lodging facility, while keeping RCOH vessels on schedule [SUPSHIPNN-UCA-3].

SUPSHIPNN Contextual Factors:

- SUPSHIPNN-CF-1: SUPSHIPNN is the technical authority integrated into shipyards and is delegated by NAVSEA to manage the availability within the significant budget, schedule, and scope constraints established by the RCOH contract managed under PEO/PMS and NAVSEA oversight [UCA-1, UCA-2].
- SUPSHIPNN-CF-2: The specific terms, payment structures, and incentives within the complex, multi-billion-dollar RCOH contract heavily restrict SUPSHIPNN's available options for managing HII-NNS performance executing the availability and service contracts [SUPSHIPNN-UCA-1, 2].
- SUPSHIPNN-CF-3: SUPSHIPNN's effectiveness with driving the schedule of the availability is directly linked to the performance, capacity, and responsiveness of HII-NNS, which was dealing with its own struggles, workforce issues, and competing projects, like the USS John C. Stennis arrival for RCOH, and construction of other ships [SUPSHIPNN-UCA-1].
- SUPSHIPNN-CF-4: SUPSHIPNN integrates with HII-NNS across all their projects, therefore staffing levels (e.g., enough experienced engineers, contract administrators, QA inspectors) relative to the massive scope of the shipyard, may have spread those who could provide sufficient oversight too thin [SUPSHIPNN-UCA-1].
- SUPSHIPNN-CF-5: SUPSHIPNN acts as a critical communication interface, relying on information from HII-NNS (progress reports), Ship's Force (progress reports and issue identification), and guidance from NAVSEA/PEO/PMS [SUPSHIPNN-UCA-1).
- SUPSHIPNN-CF-6: The absence of clear, specific Navy standards for shipyard habitability/suitability makes it difficult for SUPSHIPNN to enforce and provide backup on criteria for crew move aboard [SUPSHIPNN-UCA-1].
- SUPSHIPNN-CF-7: SUPSHIPNN operates under the same schedule and cost pressures as other Navy leadership controllers, which could have potentially influenced prioritization of oversight activities [SUPSHIPNN-UCA-1].
- SUPSHIPNN-CF-8: SUPSHIPNN is responsible for managing contracts, and room assignments pertaining to Huntington Hall with equitable distribution across all

thousands of Sailors, across multiple ships within the shipyards. Huntington Hall was known to be substandard [SUPSHIPNN-UCA-2, 3].
- SUPSHIPNN-CF-9: SUPSHIPNN administered and had oversight related to the parking/transportation contracts which added hours to each Sailors commute, and which were a major source of crew dissatisfaction and time loss [SUPSHIPNN-UCA-2].

Questions Raised:
- What specific metrics and processes did SUPSHIPNN use for day-to-day monitoring of HII-NNS schedule adherence and technical performance on USS *George Washington* RCOH, particularly for habitability systems?
- Why was the parking at HII-NNS never updated? Why were the parking provisions persistently inadequate according to crew feedback, and no further action taken?
- Why was Huntington Hall not updated following the inspection in 2010?
- What as the workload for SUPSHIPNN pertaining to the other vessels at HII-NNS besides USS *George Washington*?

3.4.1.13 HII-NNS

Applicable Safety Related Responsibilities (Developed with [5], [7], [77]):

- Provide parking and transportation services for Sailors at HII-NNS within contractual requirements.
- Execute the shipyard side of the RCOH schedule.
- Coordinate with the ship's force for collaborative maintenance evolutions.
- Train ships force on uncommon RCOH evolutions and maintenance.
- Provide housing for Sailors when the ship is uninhabitable within contractual requirements.
- Report the status of work progress accurately to SUPSHIPNN.
- Divert resources as necessary to other projects within the shipyard.
- Ensure completion of RCOH on time IAW contract.
- Provide a safe working environment.
- Minimize disruption to shipboard habitability.

HII-NNS Unsafe Control Actions Contributing to Hazardous State:
- HII-UCA-1: Did not adhere to the established RCOH schedule.
- HII-UCA-2: Executed work packages onboard the severely impacted habitability (e.g., HVAC, plumbing, berthing areas) and did not execute the maintenance in a timely manner suitable for long-term crew occupancy.
- HII-UCA-3: Did not provide adequate, or suitable parking infrastructure, transportation and housing to meet the needs of the assigned Navy personnel.
- HII-UCA-4: Mismanaged the execution of the shipyard portion of the availability.

HII-NNS Process Model Flaws:
- HII-PMF-1: HII-NNS scheduling and resource projections are overly optimistic regarding performance factors (since they are incentivized to do so) or may not

adequately account for the high degree of uncertainty pertaining to emergent work and complexity inherent in CVN RCOH [HII-UCA-1, 4].

- HII-PMF-2: HII-NNS workers do not live onboard and are therefore oblivious to the impacts that their work packages may have on the habitability within certain areas. Additionally, production processes prioritize major technical milestones (e.g., reactor work, combat systems) over the timely completion and quality assurance of habitability-related systems [HII-UCA-2].
- HII-PMF-3: HII-NNS, and other government contractors, operate under the premise that providing services strictly according to contractual requirements fulfills their obligation, without necessarily considering the actual suitability or adequacy of those services for the crew's well-being [HII-UCA-3].

HII-NNS Contextual Factors:

- HII-CF-1: HII-NNS's performance, scope, schedule, quality requirements, and responsibilities (including for support services) are explicitly defined and constrained by the specific terms, conditions, and funding profile of the availability [HII-UCA-All].
- HII-CF-2: HII-NNS executes the shipyard portion of the availability under the continuous technical oversight, quality assurance monitoring, and contract administration of the on-site Navy authority, SUPSHIPNN, acting on behalf of NAVSEA [HII-UCA-All].
- HII-CF-3: Instability, delays, or shortfalls in funding authorized and provided by the Navy (originating from Congress/SECNAV/OCNO/PEO) can directly impact HII-NNS's workflow, resource allocation, and ability to meet schedule milestones [HII-UCA-1, 4].
- HII-CF-4: The inherent engineering, and planning complexity of a CVN RCOH almost guarantees growth work, which requires contract modifications and impacts planning, resource allocation, and schedule adherence [HII-UCA-1, 4].
- HII-CF-5: HII-NNS production capabilities depend on the availability, experience, skill level, and stability of its large, specialized workforce. Broader economic factors, labor relations, and managing capacity across multiple large Navy contracts (including new construction and the arrival of USS John C. Stennis, influence resource allocation [HII-UCA-1, 4].
- HII-CF-6: HII-NNS execution of work effectively requires daily coordination with the shipboard crew for operating systems, controlling access, and potentially performing parallel work within the same constrained industrial environment [HII-UCA-1, 3].
- HII-CF-7: The absence of specific, contractually defined Navy standards for RCOH suitability (vs. basic habitability specs) makes it difficult for HII-NNS to plan, execute, and be held accountable for delivering a specific level of living quality [HII-UCA-2].
- HII-CF-8: HII-NNS was responsible for providing parking infrastructure and transportation from those lots to the ship under the contract, services which were widely reported as inadequate and a major source of frustration and distraction from actual production [HII-UCA-3].

Questions Raised:

- What specific schedule performance metrics, incentives, or penalties were included in the USS *George Washington* RCOH contract?
- Why was HII-NNS able to direct resources away from completing RCOH without some measure of enforcement from higher controllers?
- Did they have permission to direct production away, and what were the punitive results for doing so?
- Why were habitability maintenance items not prioritized by HII-NNS earlier in the availability prior to move aboard?
- Did the Navy adequately write and fund contracts with HII-NNS for housing, parking, and transportation based on the demand?
- What processes were in place for deconflicting shipyard work schedules and Ship's Force operational/training needs within shared spaces? How were issues resolved?
- How was HII-NNS able to be so off schedule without further investigation and oversight from the SUPSHIPNN?
- How did HII-NNS manage potential impacts of resource allocation decisions (e.g., due to USS John C. Stennis arrival) on the USS *George Washington* RCOH schedule and quality?
- What feedback mechanisms existed for SUPSHIPNN or Ship's Force to formally document and address concerns with HII-NNS work quality, safety practices, or coordination directly with HII-NNS management?

3.4.1.14 Aircraft Carrier Program Executive Office (PEO/PMS-312)

Applicable Safety Related Responsibilities (Developed with [5], [7], [36], [77], [78], [79]):

- Utilize SCN and RDT&E funding to budget new aircraft carrier construction programs and RCOHs (pg. 221) [36].
- Responsible for the overall execution of RCOH (PMS-312).
- Report the status of RCOH to higher authorities.
- Maintain a common systemic view and plan with SUPSHIPNN.
- Provide and fund sufficient physical fitness facilities to meet the demand (pg. 107).
- Integrate quality-of-life requirements into RCOH planning, budgeting, scheduling, and contracts from the planning phase onward.
- Ensure lessons learned regarding RCOH issues, particularly personnel impact, are integrated into future RCOH planning.
- Make decisions balancing cost, schedule, and personnel well-being during RCOH execution.

PEO Unsafe Control Actions Contributing to Hazardous State:

- PEO-UCA-1: Made budget allocations, and funding cuts which negatively impacted USS *George Washington*'s junior Sailor's quality-of-life, well-being, and safety.
- PEO-UCA-2: Did not ensure quality-of-life requirements (e.g., suitable long-term temporary housing funding, parking availability) were adequately integrated, funded, or protected within the RCOH program baseline and execution priorities.

- PEO-UCA-3: Did not ensure lessons learned from previous RCOHs regarding realistic budgeting, scheduling needs, or critical personnel support requirements were incorporated into the schedule planning.

PEO Process Model Flaws:

- PEO-PMF-1: Program management trackers and incentives heavily emphasize meeting cost and schedule targets relative to the project contract, potentially leading decision-makers to underestimate or de-prioritize less quantifiable factors like Sailor well-being or long-term readiness impacts when making decisions regarding which tasks to accomplish first [PEO-UCA-1].
- PEO-PMF-2: The process for defining and integrating quality-of-life requirements into the program baseline may be insufficient, treating them as secondary objectives compared to stereotypical engineering work scope within the acquisition framework [PEO-UCA-2].
- PEO-PMF-3: The process or system for incorporating lessons learned into new program planning or major overhauls may be weak, ignored or forgotten especially regarding quality-of-life degradations and issues [PEO-UCA-3].

PEO Contextual Factors:

- PEO-CF-1: PEO Carriers/PMS-312 are granted authority under the DoD acquisition policy framework (described in DoD Instructions 5000.02), establishing Program Managers (like PMS-312) with accountability primarily focused on achieving approved cost, schedule, and technical performance parameters defined in the program baseline [PEO-UCA-1].
- PEO-CF-2: The authority for Navy acquisition programs and the roles of PEOs/PMs are outlined within Title 10 U.S.C. (particularly Subtitle D concepts), which mandates the command structure and requirements for a structure program management structure within the acquisition's organization [PEO-UCA-All].
- PEO-CF-3: PEO/PMS-312 managed the specific RCOH SCN budget line allocation starting with a known, funding deficit ($322M), constraining programmatic options and forcing difficult trade-offs [PEO-UCA-1, 2).
- PEO-CF-4: As program managers, PEO/PMS rely on NAVSEA/SUPSHIPNN for technical execution and shipyard oversight, requiring coordination to align programmatic goals (cost/schedule) with engineering and production realities [PEO-UCA-1, 2].
- PEO-CF-5: PEOs/PMs face intense scrutiny from Navy leadership focused on controlling RCOH costs, adhering to schedules, and returning carriers to operational status quickly, influencing decisions to de-prioritize quality-of-life requirements [PEO-UCA-All].
- PEO-CF-6: PMS-312 denied the USS *George Washington* Commanding Officer's request for extended temporary housing funding due to budget pressures [PEO-UCA-1. 2].
- PEO-CF-7: There is a system for which controllers throughout the RCOH command structure can recommend lessons learned for PEO/PMS to document and implement into future availabilities, but this is often done as a check in the box without actual implementation [PEO-UCA-3].

- PEO-CF-8: After an initially identified budget deficit, PEO directed PMS-312 early on in RCOH (2016) to actively "pursue cost savings with all suppliers—government and contractors" to attempt completion of the full RCOH scope within the constrained budget [UCA-1, 2].

Questions Raised:

- How did PMS-312 initially plan to manage the allocated RCOH budget, and its known $322M deficit, within the program baseline despite historical data contrary to that being a possibility?
- What are the criteria utilized by PEO/PMS-312 to evaluate trade-offs between cost/schedule adherence and personnel well-being impacts when making decisions like the housing fund denial? Was personnel well-being explicitly weighted?
- How were QoL requirements (temporary housing standards, parking needs, MWR facilities) formally defined, budgeted, and tracked as distinct elements within the PMS-312 managed RCOH program baseline?
- How were risks related to inadequate personnel support (housing, medical access, impact of delays on morale) formally captured, assessed, and reported within the PEO/PMS-312 risk management system, particularly related to schedule creep?
- Why is the formal process within PEO Carriers/PMS-312 for incorporating lessons learned, especially regarding personnel support challenges, from one RCOH to the next not effectively utilized?

3.4.1.15 Shore Support Commands (CNIC/Naval Weapons Station Yorktown, Virginia/Huntington Hall)

Applicable Safety Related Responsibilities (Developed with [5], [7], [80]):

- Develop, implement, and execute housing programs on all naval installations (pg. 81) (CNIC).
- Provide fitness staff and facilities for physical fitness training at CNIC installations (pg. 8) [80] (CNIC).
- Provide MWR on-base support services (CNIC).
- Develop, implement, and disseminate morale and welfare-related programs (CNIC).
- Billet and fund two on-board MWR experts (Fit Boss and Fun Boss) to organize and provide services to the crew (CNIC).
- Supplement the on-board MWR program budget via grants (CNIC).
- Provide semi-annual training and assist visits in preparation for the annual audit of the onboard MWR programs (CNIC).
- Monitor the liberty and fitness center at Huntington-Hall (NWSY).
- Provide monthly MWR events and disseminate information to ships (NWSY).
- Ensure MWR facilities are adequate and accessible (CNIC).
- Accurately assess the total Sailor population needs when determining facility requirements and funding (CNIC).
- Enable resource and execution of MWR programs (CNIC/NWSY).

SSC Unsafe Control Actions Contributing to Hazardous State:

- SSC-UCA-1: CNIC downgraded Huntington Hall MWR facility classification (e.g., from "medium" to "small).
- SSC-UCA-2: Provided subpar military housing facilities.

SSC Process Model Flaws:

- SSC-PMF-1: CNIC's process for classifying MWR facilities and allocating resources is primarily based on the actual personnel living within the facility rather than adequately accounting for the total population that utilize the facility, including large rotational crews from nearby ships [SSC-UCA-1].
- SSC-PMF-2: CNIC may not have data of the actual usage patterns and total population load on shore support facilities at shipyard [SSC-UCA-1].
- SSC-PMF-3: CNIC's requirements for Navy housing standards may assume general habitability and suitability criteria are sufficient [SSC-UCA-2].
- SSC-PMF-4: CNIC may assume local installation commands (NWSY), and contractors are ultimately responsible for enforcing the standards of housing [SSC-UCA-2].

SSC Contextual Factors:

- SSC-CF-1: CNIC reclassified Huntington Hall from "medium" to "small" based on personnel living there, ignoring the large user population from ships at HII-NNS. This resulted in reduced funding, staffing, and services via NWS Yorktown [SSC-UCA-1].
- SSC-CF-2: Huntington Hall was an aging, substandard facility well before the classification change, indicating persistent issues with the quality of available government-controlled housing (SSC-UCA-2].
- SSC-CF-3: NWS Yorktown operated the Huntington Hall facilities within the resource constraints (funding, staffing) determined by CNIC's classification decision. Their ability to provide services was limited by these allocated resources [SSC-UCA-1 ,2].
- SSC-CF-4: CNIC manages Navy MWR and housing programs based on established policies intended for standardized support [SSC-UCA-1, 2].
- SSC-CF-5: During the period where the accident occurred multiple carriers (USS *George Washington*, USS John C. Stennis) were simultaneously undergoing or preparing for RCOH at HII-NNS. In addition, there were other construction and repairs occurring which created an unusually high concentration of personnel requiring shore support from limited local infrastructure [SSC-UCA-1].
- SSC-CF-6: CNIC supplements the onboard MWR services with a $100,000 grant at the end of each year when an aircraft carrier is in the yards and unable to access other means of funding (CNIC).

Questions Raised:

- What specific criteria and population data sources does CNIC use in its standardized model for classifying MWR facilities Navy-wide?
- Did CNIC coordinate with Fleet/TYCOM/Program Offices to anticipate and plan for the cumulative shore support requirements generated by multiple concurrent carrier RCOHs at HII-NNS?
- What impact did the reduced funding/staffing have on the specific types and availability of MWR programs and fitness center access at Huntington Hall?

- What Navy-wide housing standards applied to barracks like Huntington Hall, and did they include specific criteria for long-term suitability (privacy, noise, amenities) beyond basic safety and habitability, especially for industrial environments?
- How does CNIC ensure compliance with its housing standards at installations supporting large industrial activities like Newport News?

3.4.2 Impact of a Global Pandemic

The COVID-19 pandemic was a crucial contextual factor impacting USS *George Washington*'s RCOH environment. Although many organizational breakdowns pre-dated the pandemic or were developing independently, COVID-19 introduced unprecedented, system-wide stress that significantly altered conditions for all personnel and controllers involved.

For 13 challenging months, from March 2020 to April 2021, the crew operated under restrictive COVID-19 Health Protection Condition (HPCON) Charlie measures. These necessary public health directives limited personal travel off base, prohibited gatherings of more than ten people, mandated strict social distancing and mask use, and closed or severely restricted access to numerous off-base facilities essential for well-being, including gyms, restaurants, salons, and entertainment venues. Consequently, Sailors faced significantly reduced opportunities for normal stress relief and social interaction. This prolonged isolation and the effort required to implement mitigation measures added substantial burdens to strained command resources and personnel (pg. 132) [7].

These restrictions heavily impacted critical support systems onboard and ashore. For instance, the ship's medical department became significantly burdened with extensive COVID testing, contact tracing, and quarantine (ROM) management, reducing their capacity for other essential healthcare monitoring and routine care. Departmental absences due to ROM requirements further strained the overworked providers. Mental health services were particularly affected as telehealth limitations reduced counseling effectiveness, and providers lost more subtle physical cues to the health of their patients. Furthermore, they could not perform therapies designed for face-to-face interaction. Similarly, Fleet and Family Support Center (FFSC) support largely shifted to virtual or remote formats, which were less effective for fully assessing well-being, all while demand for mental health and financial counseling remained high despite significant regional provider shortages (40-50% vacancy rates reported) (pg. 133) [7].

Morale, Welfare, and Recreation (MWR) adapted with creative, but potentially less engaging virtual or small group distanced activities. However, the lack of regular access to gyms and normal recreation negatively impacted physical fitness and overall crew morale. Command Indoctrination experienced months of complete pause followed by severely restricted class sizes, creating year-long backlogs for arriving personnel and sometimes occurring in suboptimal training conditions (like a poorly air-conditioned gym). The sponsorship program became unreliable as assigned sponsors frequently entered ROM status, leading to communication failures for new check-ins. Substance abuse programs also experienced screening and treatment delays, reduced session capacity due to distancing requirements, and increased difficulty monitoring Sailors effectively when in-person contact was limited. Even mandatory training, such as suicide prevention, encountered significant challenges in delivery and verification (pg. 134) [7].

The final major effect of COVID-19 was on the leadership at all control levels, which dedicated significant time and daily focus to managing their COVID response, including

overseeing policy adherence, testing protocols, temperature checks, and coordinating ROM logistics. Unfortunately, this diverted attention and resources from direct RCOH production oversight and Sailor mentoring. Personnel absences due to ROM exacerbated existing critical manning shortages across the ship. Canceling nearly all traditional command events, like all-hands calls, picnics, and social gatherings, eliminated meaningful opportunities for leadership engagement, building unit cohesion, and informal observation of the crew's climate (pg. 135) [7].

3.4.2.1 COVID Contextual Factor

The following contextual actor applies to the system as a whole and describes the system-wide impact of COVID-19, focusing on isolation, communication, and monitoring, which influence the actions and effectiveness of nearly all controllers:

Total_System-CF-1: The COVID-19 pandemic and the required implementation of prolonged, restrictive Health Protection Condition measures (HPCON C, Mar 2020-Apr 2021) functioned as a significant system-wide stressor. The restrictions of social distancing, gathering/travel limits, facility closures, and ROM exacerbated Sailors' isolation by severely limiting normal MWR, fitness, and social and community engagement opportunities both on and off the ship. They created substantial communication barriers, hindering the effectiveness of face-to-face mental health counseling, FFSC support, command indoctrination, sponsorship interactions, substance abuse treatment, and the delivery/verification of essential training. Furthermore, the combination of remote work, ROM requirements sidelining available personnel, shifts in leadership focus towards pandemic management, and limitations on in-person interaction restricted the ability of leadership (Triad, EDL) and support systems (Medical, CRT, Supervisors) to effectively monitor Sailor well-being, recognize nuanced distress signals, maintain situational awareness, and provide timely, personal intervention, thereby degrading the effectiveness of existing safety controls and feedback mechanisms during a critical phase of the RCOH.

3.5 Step 4 of CAST: Identify Control Structure Flaws

The CAST analysis conducted on the hazardous conditions experienced during the USS *George Washington*'s RCOH, which influenced multiple suicides and widespread engineering dysfunction, reveals inadequate control and feedback within the Navy's safety control structure. The tragic outcomes were not attributable to isolated components but emerged from complex and unsafe interactions spanning multiple controllers across all organizational levels, strategic, operational, and tactical. This analysis highlights control limitations in how the Navy systematically planned for, resourced, managed, and oversaw personnel safety and well-being within the uniquely demanding RCOH environment. Coincidingly, four key limitations emerge:

3.5.1 Ineffective Oversight and Feedback Throughout the Control Structure

As stated previously, a foundational aspect of STAMP and CAST is the element of control. However, controlling a process requires timely, specific, and accurate feedback. Without that feedback, it is impossible for the controller to safely manage the process, which in this case is the Sailor engaging in destructive behavior. The overall safety management structure was composed

of weak oversight, broken communication pathways, and a lack of learning from experience or current indicators, preventing timely detection and correction of hazardous conditions.

Oversight mechanisms were ineffective at multiple levels. TYCOM oversight of USS *George Washington*'s command climate programs (CRT, CCA, DEOCS) and habitability inspection process was ineffective before the crisis (TYC UCAs 2, 4, 5, 7, 9, 10; TYC-CF-5). Higher-level oversight (RFC of TYCOM [RFC-UCA-4], NAVSEA of SUPSHIPNN [NAVSEA-UCA-4], PEO/PMS program reviews) did not prevent the escalation of problems. Congressional oversight allowed systemic issues documented by GAO to persist (USC-UCA-5).

Reduced manning levels, as shown in Table 7, particularly in the medical department and supervisor levels, reduced effective monitoring and care of the ship's crew, which, compounded with increased exposure to an industrial environment, compounded the complicated social condition.

Table 7: Taken from [5]. Depicts the percentage of gap-fill billets for personnel onboard.

		NOV 21			DEC 21			JAN 22			FEB 22			MAR 22			APR 22		
		BA	Onboard	Fill %	BA	Onboard	Fill %	BA	Onboard	Fill %	BA	Onboard	Fill %	BA	Onboard	Fill %	BA	Onboard	Fill %
N21412 - CVN 73 GEORGE WASHINGTON	APPRENTICE	1,548	1,360	87.9%	1,548	1,337	86.4%	1,548	1,362	88.0%	1,548	1,368	88.4%	1,548	1,381	89.2%	1,546	1,468	95.0%
	JOURNEYMAN	1,022	850	83.2%	1,022	884	86.5%	1,022	883	86.4%	1,022	879	86.0%	1,025	892	87.0%	1,027	884	86.1%
	SUPERVISOR	260	180	69.2%	260	181	69.6%	260	178	68.5%	260	177	68.1%	260	176	67.7%	260	169	65.0%

BA: Billets Authorized
APPRENTICE: Paygrades E1-E4
JOURNEYMAN: Paygrades E5-E6
SUPERVISOR: Paygrades E7-E9

Controllers throughout the system were not receiving vital feedback from the lower echelons, including the individual Sailors. Sailors struggled to communicate the severity of conditions (CT-CF-4, H4:25). EDL may have been hesitant or unable to effectively escalate issues (EDL-UCA-5, EDL-PMF-5). The CRT was dysfunctional and did not support the CO as an intended interface to the crew (CRT-UCA-1). Shipboard Medical reporting on resource strain did not compel timely action (SM-UCA-4). SUPSHIPNN and PEO/PMS reporting did not capture risks (SUPSHIPNN-UCA-4, PEO-UCA-3). Higher-level policy controllers (i.e., Congress) relied on filtered information that did not reflect the situation and environment in which the Sailors lived (USC-PMF-3, SECNAV-PMF-2, 6). The DEOCS survey, a key feedback tool, was undermined by low participation and policy changes obscuring data (CRT-UCA-2, OCNO-UCA-4).

Lessons learned from previous RCOHs regarding realistic cost/schedule estimation and the critical need for personnel support planning were not effectively incorporated into the USS *George Washington* RCOH planning (PEO-UCA-3, NAVSEA-UCA-5). Humans and the Navy, in this case, consistently fail to learn from the past. The Navy has intricate, boundless reporting and documenting processes for lessons learned. However, nothing really delineates how to learn from all those lessons or trains leaders to incorporate those lessons learned systematically. This inability to adapt based on past negative outcomes allowed similar patterns of budget shortfalls, schedule delays, and personnel strain to recur.

The persistence of problems like substandard housing, inadequate parking, inconsistent discipline, and procedural shortcuts, despite attempts to report them (feedback), suggests these became accepted norms within the RCOH environment, weakening overall safety controls.

3.5.2 A Myriad of Flawed Mental Models of Environment, Resilience, and Risk

Decisions and actions across the control structure were often based on flawed assumptions or mental models about the RCOH environment, personnel resilience, process effectiveness, and risk.

Historical naval culture emphasizes operational proficiency, and RCOH was viewed as a lower-risk period than deployment (RFC-PMF-3). Additionally, there were assumptions that Sailors possessed sufficient resilience to endure substandard conditions for a prolonged, uncertain duration (CT-PMF-4), underestimating the cumulative psychological impact of the industrial environment, lack of mission focus, and persistent QoL deficiencies.

Controllers at multiple levels operated as if initial budgets and schedules were realistic despite historical data on RCOH overruns and known initial deficits (USC-PMF-1, SECNAV-PMF-1, PEO-PMF-1, NAVSEA-PMF-1). This reliance on unrealistic projections and budget placed pressure on and drove decisions by project managers that would de-prioritize quality-of-life services, exacerbating strain on the Sailors. Similarly, through their efforts to prioritize warfighting effectiveness, the Navy has underfunded and allowed the services that improve the QoL of our Sailors to atrophy, particularly in the shipyards. History does not often repeat, but it often rhymes. The Navy is seeing some of the exact same issues that it encountered decades ago with low retention and recruitment. The lack of prioritization and funding for the Quality-of-Life enhancers that Sailors need to thrive is affecting the ability of the Navy to recruit and retain qualified, capable, and ready-to-serve servicemembers. Former Chief of Naval Operations Admiral Zumwalt faced similar circumstances and had the following to say about them:

> "Although improvements have been made, years of limited funds for construction and maintenance have resulted in far too many substandard living quarters and personnel support, welfare, and recreational facilities which are most detrimental to the retention of the Navy man, our most valuable resource. Specific areas to be given priority attention for immediate accomplishment nearest Fleet concentrations include living facilities, temporary lodgings, parking facilities, trailer parks, locker clubs and recreation clubs, and welfare facilities. The impact and importance of this program in enhancing all aspects of a Navy career cannot be over-emphasized, and early allocation and effective use of manpower and funding resources must be made to fully implement this concept as rapidly as possible. Local initiatives with respect to this program are desired and are to be encouraged to the utmost. (pg. 19) [7]."

The controllers within the safety control structure assumed that established support systems would function as expected under RCOH conditions. This included assumptions about TYCOM oversight effectiveness (RFC-PMF-4 implicitly), CRT performance (CT-PMF-5), medical department capacity (SM-PMF-1), EDL mentorship capacity despite manning gaps (EDL-PMF-1), contractor performance (SUPSHIPNN-PMF-1), and the sufficiency of standard Navy processes such as housing standards [SECNAV-PMF-5, SSC-PMF-4], feedback channels [CT-PMF-7], and discipline [EDL-PMF-5], training [CT-PMF-8]. These assumptions persisted even as evidence of system control deficiencies emerged.

Additionally, higher-level controllers assumed lower levels were adhering to policies and controls they put in place, such as OCNO assuming initial recruiting screening policy enforcement [OCNO-PMF-5]. In reality, breakdowns occurred, like how S2 made it through the

initial boot camp despite many mental health issues and inconsistent EDL discipline regarding S3 [EDL-UCA-4].

Furthermore, the control structure lacked a clear framework or Navy policy guiding how leaders should manage the inherent conflicts between competing goals like cost, schedule, technical performance, and personnel well-being, especially under the intense pressures of RCOH. Without explicit guidance requiring documentation of trade-offs and prioritization of safety constraints, decisions favored tangible metrics (cost/schedule) over less quantifiable well-being factors, allowing flawed assumptions about acceptable risk to personnel to go unchallenged.

3.5.3 Ineffective Implementation of Programs for Personnel Wellbeing

Another key theme from this CAST, and research conducted in Chapter 2, indicates that despite a myriad of reports and research to the contrary, considerations for Sailor psychological and physiological well-being were ineffectively integrated into the core planning, resourcing, and execution plan for USS *George Washington*'s RCOH. When it came down to it, the Navy returned to the cultural norm of mission first, frequently resulting in personnel's well-being being treated as secondary to schedule and operational priorities.

The first aspect of this theme is that strategic-level decisions heavily influenced the ineffective implementation. For example, OCNO and RFC issued strategic guidance, which TYCOM and NPC executed, assigning RCOH units the lowest manning priority (OCNO-UCA-2, RFC-UCA-1), leading directly to critical billet gaps onboard USS *George Washington*, especially with experienced supervisors (EDL-CF-1, RFC-CF-5).

Simultaneously, initial RCOH budgets approved by Congress after being championed by Navy leadership of SECNAV and OCNO were known to be insufficient from the start (USC-UCA-1, SECNAV-UCA-1, OCNO-UCA-1, PEO-UCA-1, USC-CF-3, SECNAV-CF-4). Improper budgeting, which had been previously identified by GAO, created immense pressure on the lower controllers to meet the budget and schedule by any means necessary. Under this pressure, program managers, PEO and PMS-312, explicitly decided to cut or deny funding for quality-of-life enhancers like temporary housing offship (PEO-UCA-1, PEO-CF-6).

Additionally, shore support command, CNIC, utilized funding models that did not account for the actual population and demand of all ships under construction at HII-NNS, resulting in congested and overwhelmed MWR resources at Huntington Hall (SSC-UCA-1, SSC-PMF-1, SSC-CF-1). The systematic under-resourcing by higher-level controllers treated personnel support not as a critical safety requirement but as a variable cost, directly contributing to the hazardous environment.

The second aspect of this theme is that quality-of-life requirements were not adequately defined or accounted for within the RCOH program baseline managed by PEO/PMS (PEO-UCA-2, PEO-PMF-2). Furthermore, the Navy lacked clear, enforceable suitability standards specifically for long-term RCOH berthing (SECNAV-CF-7, NAVSEA-CF-7, TYC-CF-11), leaving a policy gap that hindered effective planning and oversight by multiple controllers (SECNAV-UCA-4, TYC-UCA-2, SSC-UCA-2). This mirrors situations where human factors are considered secondary to system hardware/software requirements during design.

Potential flaws in the contracting strategy also enabled this ineffective implementation regarding personnel well-being. The analysis suggests that requirements for critical personnel support and quality of life elements (such as suitable temporary housing standards enforced via

contract, adequate parking/transportation provisions managed by HII-NNS or SUPSHIPNN, or timely habitability system restoration by HII-NNS) may not have been sufficiently defined, specified, funded, or contractually protected against de-scoping when budget and schedule pressures mounted. This represents a lack of control in utilizing the contract as an effective control mechanism for ensuring necessary personnel support throughout the RCOH.

3.5.4 Culture of Acceptance

The next theme revealed by the CAST analysis is significant gaps in the standards, processes, and resources meant to directly support the Sailor's well-being and mitigate hazards in the RCOH environment. This theme goes beyond the under-resourcing described in section 3.4.2.2 to specific control mechanism failures.

There was a lack of clear, enforceable standards and requirements for suitability onboard for long-term RCOH berthing (SECNAV-CF-7). Without those clear, enforceable procedures and standards, planning, contracting, and overseeing living conditions onboard were obstructed throughout the control structure (NAVSEA-UCA-3, SUPSHIPNN-CF-6, TYC-UCA-2, CT-UCA-4). Similarly, specific guidance and standards for managing cumulative fatigue in RCOH were not effectively enforced (OCNO-UCA-8, TYC-UCA-12, CT-UCA-9).

Key control actions were ineffective or improperly executed. Habitability inspections were ad-hoc and unreliable (TYC-UCA-5, TYC-CF-4, 5, 6). If it even occurred, communication between military and civilian medical providers was missing critical information (SM-UCA-2). Disciplinary processes were applied inconsistently (EDL-UCA-4). The DEOCS/CCA process was mismanaged, and data tracking and implementation resulted in inadequate feedback to higher-level controllers (CRT-UCA-2). Mental health screening and waiver requirements allowed individuals with significant histories to enter and remain in stressful environments without adequate tracking or support (OCNO-UCA-5, S2 Case).

Finally, there was ineffective control and assignment of resources that were critically needed, which was conveyed via direct feedback and historical precedent. Medical and Mental Health providers faced unsustainable patient loads as shown in Table 8 and Table 9, reducing their capability to provide care (SM-UCA-1, SM-CF-1, 2). The CRT lacked the required members and enforcement of program requirements (CRT-UCA-3, CRT-CF-2, 10).

Table 8: Taken from [7]. Of note, USS *George Washington* Sailors experienced significantly longer initial intake and follow-up wait times for Naval healthcare providers near HII-NNS, which were both well above the DHA standard.

Facility or Network	Average Wait Time for Initial Intake Evaluation	Average Wait Time for Follow-up
Local Hampton Roads Tricare Network (June 2022)	34.9 days	-
All Tricare East Network Providers	34.8 days	-
USS *George Washington* Average (April 2021–May 2022)	32 days	18 days
Defense Health Agency Standard	28 days	7 days
All Aircraft Carriers (April 2021–May 2022)	17.5 days	16.1 days
All East Coast Navy Military Treatment Facilities (June 2022)	15.5 days	-
Navy Medical Center Portsmouth (June 2022)	12.7 days	-

Table 9: Taken from [7]. Contains monthly patient encounters for all East Coast carriers. USS *George Washington* was significantly above the average for monthly encounters and required several additional psychologists onboard to provide adequate care.

CARRIER MONTHLY TOTAL MENTAL HEALTH PATIENT ENCOUNTERS										
	OCT 2021	NOV 2021	DEC 2021	JAN 2022	FEB 2022	MAR 2022	APR 2022	MAY 2022	Average	Number Psychologists Required per DHA Standard
USS *Nimitz*										
Number patient encounters	101	201	198	185	272	253	204	233	206	2.64
USS *Dwight D. Eisenhower*										
Number patient encounters	66	134	105	65	90	167	127	79	104	1.33
USS *Carl Vinson*										
Number patient encounters	270	242	210	246	123	92	124	93	175	2.24
USS *Theodore Roosevelt*										
Number patient encounters	56	61	62	87	85	81	77	68	72	0.92
USS *Abraham Lincoln*										
Number patient encounters	70	223	56	135	141	106	111	117	120	1.53
USS *George Washington*										
Number patient encounters	200	157	157	167	179	262	243	272	205	2.62
USS *John C. Stennis*										
Number patient encounters	97	116	126	93	243	269	260	254	182	2.33
USS *Harry S. Truman*										
Number patient encounters	282	50	228	147	237	257	269	267	217	2.78
USS *Ronald Reagan*										
Number patient encounters	176	112	106	110	155	187	207	320	172	2.21
USS *George H.W. Bush*										
Number patient encounters	132	93	183	183	255	204	218	158	178	2.28
USS *Gerald R. Ford*										
Number patient encounters	99	67	71	79	102	136	144	82	98	1.25
Fleet Average										
Average number of total patient encounters	**141**	**132**	**137**	**136**	**171**	**183**	**180**	**177**	**157**	**2.02**

3.5.5 Summary of Control Structure Flaws

This CAST analysis of the USS *George Washington* RCOH identified critical, interacting flaws within the Navy's safety control structure that created hazardous conditions for the crew. A fundamental weakness was the systemic de-prioritization and under-resourcing of RCOH units, driven by high-level strategic guidance, flawed assumptions about risk and resilience, and budget processes that favored operational readiness or tangible metrics over personnel well-being. This resulted in debilitating manning shortages, particularly among experienced supervisors, and decisions to sacrifice Quality of Life necessities like suitable housing and shore support when faced with predictable budget and schedule pressures stemming from unrealistic initial planning.

Compounding these resource issues were ineffective oversight mechanisms and broken feedback loops throughout the control hierarchy. Critical information regarding deteriorating living conditions, personnel strain, and the dysfunction of key support programs, like the CRT and shipboard medical, did not reach controllers promptly. This lack of timeliness was due to

information filtering up the control structure, a lack of clear reporting channels, or inadequate response from oversight bodies. Furthermore, the absence of clear RCOH-specific standards (especially for living condition suitability) and inconsistent enforcement of existing policies allowed deviations and substandard conditions to become normalized. This behavior was underpinned by flawed mental models across multiple levels, which underestimated the unique human factor risks of prolonged RCOH and lacked effective frameworks for managing conflicting goals or ensuring lessons learned were applied. All these effects ultimately prevented the system from recognizing and correcting the escalating hazards to Sailor's well-being.

3.6 Step 5 of CAST: Create an Improvement Program

The CAST analysis identifies deep systemic issues requiring interventions that strengthen the overall safety control structure for RCOH. The following recommendations address flawed assumptions, redesign feedback and controls, and improve organizational learning. The goal of these recommendations is to hone in further on the underlying systemic control or feedback breakdowns, while still considering the recommendations produced by the Naval Investigators in reports [5], [7].

Recommendations summarized from [7]. This is a comprehensive and robust recommendation list that addresses many issues within the system:

1. Conduct a study to evaluate the required manning during RCOH and determine if any changes occur during the four phases. (OPNAV N1)
2. Change detailing practices such that new Sailors are sent to operational ships first, but if they must be sent to a ship in a maintenance availability (RCOH), it is for no longer than two years. (OPNAV N1)
3. For those Sailors sent to a ship in a maintenance availability for longer than a year, develop a program that prioritizes them for cross-decking to other operational ships. (OPNAV N1)
4. Develop a new mini-shopping area near the shipyards that provides healthier options for Sailors. (OPNAV N4)
5. Always provide BAS to enlisted Sailors, regardless of sea or shore status and rank, particularly in RCOH. (OPNAV N9)
6. When the galley is unavailable, have the Navy provide meals even if the Sailors receive BAS.
7. Evaluate and improve options for parking for Sailors at HII-NNS. In the meantime, the access and frequency of transportation from the current distance parking lots should be improved. (PEO Aircraft Carriers, Naval Facilities Engineering Systems Command (NAVFAC), Commander, Navy Installations Command (CNIC), Supervisor of Shipbuilding, Conversion and Repair-Newport News (SUPSHIPNN), In-Service Aircraft Carrier Program Manager (PMS-312))
8. Re-evaluate, investigate, and develop a universal definition for shipboard habitability to be codified in instructions for when to conduct move-aboard following a shipboard availability. (USFFC, USPACFLT, NAVSEA 05, TYCOMs)
9. 9: With the new definition of habitability, ships must conduct a suitability inspection of the entire ship to ensure it is genuinely ready for the crew to live onboard. (USFFC, USPACFLT)

10. Develop and implement a new policy that the only time a Sailor shall live onboard a ship or barge is when they are underway. (SECNAV/CNO)
11. Provide BAH for all Sailors or housing for those not currently eligible for BAH. (OPNAV N1)
12. Review and change current contractor-supplied housing to ensure it meets the suitability, habitability, and QoL requirements outlined in the new instructions. (NAVSEA)
13. Ensure access, quality, and centrality of shoreside QoS facilities for all HII-NNS vessels under construction. (TYCOM, SUPSHIPNN, PMS-312)
14. Review whether U.S. privately owned shipyards meet contractual requirements, including shipbuilding capabilities and QoS requirements. (NAVSEA)
15. Centralize and reduce the requirements as applicable for all existing Naval programs that take away attention from EDL to ensure they can monitor their Sailors effectively. (TYCOMs)
16. Revamp and clarify the minimum required feedback loop via Command Climate Assessments (CCAs) to ensure that the responses are viable, relevant, and capable of being utilized to make changes. (OPNAV N17)
17. Revamp and restructure the suicide, prevention, and awareness questions of the Defense Organizational Climate Survey (DEOCS) to each branch to ensure that the information received is viable and implementable. (OPNAV N1)
18. Develop and implement a survey through which Sailors can anonymously communicate habitability concerns up the chain of command. (OPNAV N2N6)
19. Assess and determine the effectiveness of the current state of the Human Factors Councils and Command Resiliency Teams to codify lessons learned from those that were successful and those that were not. (OPNAV N17)
20. Compare current Naval education plans on destructive behaviors against those taught in the civilian section to make changes as necessary to improve the current product. (NETC/OPNAV N17)
21. Investigate and correct current Drug and Alcohol treatment programs to attack the backlog and delay in care. (Bureau of Medicine (BUMED))
22. Investigate and address whether Level 1 Substance Abuse should be treated off the ship for ships in the yards. (BUMED, TYCOMs)
23. Review and verify if DRCs are adequately trained and capable of performing their assigned duties. Verify that the training highlights other Navy-wide programs and their responsibilities within the ecosystem. (CNIC, Fleet and Family Support Centers (FFSC))
24. Increase or adjust the incentive pay for counselors at the Fleet and Family Support Center to aid recruitment and retention. (CNIC)
25. Increase or adjust the pay or incentives for mental health treatment professionals to aid in recruiting and retaining expert aid for all Sailors. (DoD, DoN, CNO)
26. Investigate and verify an increased and adequate requirement for additional mental health professionals onboard all aircraft carriers to reduce strain on current providers and improve the quality of care for our Sailors. (CNAF)
27. Increase the advocacy and training, breaking down the stigmas and beliefs that there are career implications and potential professional reprisal for seeking help for mental health services. (BUMED, NETC)
28. Investigate and increase the collection and tracking of reasons behind Sailors' separation for destructive behaviors. This is to identify and clarify behavioral trends and potential

root causes that have been missed. (BUMED, U.S. Military Entry Processing Command USMEPCOM)

29. Reevaluate current behavioral health screenings before entering service to prevent personnel with prior behavioral-related issues from entering the Navy and being exposed to conditions that might exacerbate them. (USMEPCOM)
30. Implement and recruit a billet for a Force Psychologist to advise the fleets on the best practices for addressing destructive behaviors. (CNAL, USFFC, USPACFLT)
31. Swap the chain of command and administrative control for USPACFLT carriers to USFFC, CNAL when in RCOH or other extended maintenance availabilities and vice versa to ensure the chain of command's clarity, continuity, efficiency, and accountability. (CNO)
32. Investigate, adjust, and reevaluate the current working groups before ships enter RCOH. A year before a vessel enters, all stakeholders shall meet for a working group to verify requirements, including that there are sufficient funds for off-ship housing for all Sailors, which are set before commencing RCOH.
33. Evaluate, assess, and modify current processes for the development and execution of integrated maintenance schedules in RCOH. This evaluation should also include a review of the contract strategy to ensure on-time delivery of vessels undergoing prolonged depot maintenance or new construction availabilities. (NAVSEA / PEO Aircraft Carriers)

Recommendations summarized from [5]. This is a comprehensive and robust recommendation list that addresses many issues within the system:

34. Promote mental-health resource visibility by directing every CVN and naval-aviation command to publish prominent, unit-specific contact details for available counseling resources and to confirm completion with their administrative ISIC. (CNAF)
35. Ensure adequate ASIST coverage by requiring each CVN to maintain at least one ASIST graduate per division and report monthly totals to the TYCOM Suicide-Prevention Program Manager; prioritize training for all LPOs, LCPOs, and division officers. (CNAF)
36. Clarify DRC oversight through revising CNICINST 1754.3A to assign TYCOMs formal responsibility for Drug-and-Alcohol Rehabilitation Counselor (DRC) manning on CVNs, LHDs, and LHAs. (CNIC)
37. Optimize DRC workspace by evaluating the benefits of relocating DRC offices off-ship during industrial availabilities to quieter, more private facilities that support confidential counseling. (CNIC with ship TYCOMs)
38. Leverage the Command Resilience Team by formalizing the DRC, chaplain, and embedded mental health providers as standing members of each ship's CRT to brief leadership on behavioral health trends. (Unit COs / TYCOMs)
39. Strengthen the Sponsorship Program after conducting a comprehensive review of command sponsorship processes to ensure new Sailors receive effective integration and support. (CNAF for CVNs and aviation units)
40. Revitalize mentorship networks by directing each CVN and aviation unit to assess and refresh mentorship programs, and confirming active participation across ranks. (CNAF)

41. Increase CRT battle rhythm by mandating monthly CRT meetings for ships in RCOH until yard work is complete, with membership reflecting a cross-section of paygrades, genders, races, and departments. (Unit COs / TYCOMs)
42. Expand high-risk case reviews and require monthly CRT-Human-Factors Council sessions during RCOH; include individual sailor reviews for all security personnel and anyone handling weapons, with additional AA&E screenings when warranted. (Unit COs)
43. Simplify care-transfer procedures following tasking of BUMED to publish clear, standardized guidance for transferring primary-care and specialty referrals from afloat units to shore-side or civilian facilities, eliminating common administrative barriers. (BUMED)
44. Augment non-medical counseling by instructing CVN commanding officers to request at least one Military-Family Life Counselor (MFLC) billet to supplement shipboard mental-health services. (CVN COs / OSD MC&FP)
45. Synchronize medical records by directing DHA to implement a process that guarantees TRICARE-network treatment notes are uploaded to each active-duty sailor's electronic medical record, ensuring continuity of care. (DHA)
46. Enhance shipboard competence and train senior leaders on generational communication and styles to improve engagement with junior Sailors. (CNAF / TYCOMs)
47. Consolidate CoE compliance and charge the CNAF CoE Team to create a checklist covering all Sailor-support programs (e.g., mentorship, sponsorship, resilience, etc.) and to incorporate it into annual assist visits, capturing best practices across the fleet. (CNAF)

3.6.1 Enhance System Understanding & Decision Models

Mandate Systems Thinking and Human-Systems Integration (HSI) Training: Implement required training modules across all leadership levels involved in planning, resourcing, managing, or executing RCOHs (PEO/PMS, NAVSEA, SUPSHIPNN, Fleet/TYCOM, Shipboard Triad, EDL). This training should focus on understanding complex system interactions and feedback loops, like the reinforcing cycle of maintenance delays and manning stress identified in RFC-PMF-1, non-linear effects, and identifying inaccurate assumptions. Additionally, the training should be oriented towards recognizing human performance limitations under chronic stress and applying HSI principles to integrate personnel well-being into technical and logistical planning from the start. Ideally, the training should be conducted by a dedicated team of experts familiar with extended shipyard availabilities and all the lessons learned from previous availabilities like RCOH.

The impact of this recommendation would be that leaders would be better equipped with systems thinking, who might have better anticipated the cascading negative consequences of early decisions like underfunding (PEO-UCA-1) or low manning priority (OCNO-UCA-2). An understanding of HSI could have led PEO/PMS and NAVSEA to prioritize habitability system restoration (preventing NAVSEA-UCA-3) and reject unsuitable living conditions (preventing CT-UCA-4) by recognizing their direct impact on human performance and safety, rather than viewing them as secondary concerns to outright schedule and cost. It could also help challenge flawed assumptions about Sailor resilience (CT-PMF-4).

Revise Shipwide Performance Metrics & Incentives to Include Well-being: Integrate specific, measurable, and significantly weighted metrics related to personnel well-being into ship performance evaluations and command assessments, program management reviews, and potentially contractor incentive structures for RCOH. Metrics should include command climate indicators (beyond DEOCS scores), personnel readiness (retention, mental health access/wait times), safety climate, and validated compliance with RCOH suitability and manning standards.

This recommendation would create tangible accountability for well-being outcomes and directly counter the historical and embedded Naval cultural bias towards prioritizing only operational or production metrics (OCNO-CF-4, RFC-CF-3). If commanders (Triad, TYCOM) and program managers (PEO/PMS) were evaluated on these factors, they would be incentivized to address issues like CRT dysfunction (CRT UCAs), medical backlogs (SM-UCA-1), low morale indicated by feedback (CT-UCA-7/13 Add), and supervisory manning gaps (TYC-UCA-1) proactively, rather than allowing them to compound.

Develop and Implement Policy for Balancing Conflicting Goals: Develop and implement a clear DON/Navy strategic policy clarifying decision-making when critical goals conflict during RCOH (e.g., schedule vs. cost vs. technical scope vs. personnel well-being/safety). This framework must require explicit consideration and documentation of risks to personnel, including long-term readiness impacts like retention and recruitment. Additionally, it should define conditions under which well-being/safety constraints cannot be compromised for schedule or cost. Personnel well-being and safety would never have to be overruled unless necessary due to national security or major operational concerns.

This recommendation would provide formal guidance to counter the intense pressure for schedule/cost (PEO/PMS-CF-5, NAVSEA-CF-2), leading to decisions negatively impacting quality-of-life (PEO-UCA-1, H4:11 housing denial). It gives leaders, like PEO/PMS and the CT, policy backing to prioritize personnel safety constraints, potentially preventing unsafe decisions like the premature move-aboard (CT-UCA-1) or allowing critical manning gaps onboard to persist (CT-UCA-6). It addresses the process flaw where quantifiable metrics override less tangible well-being factors (SECNAV-PMF-7, PEO-PMF-1).

3.6.2 Redesign Feedback and Oversight for Proactive Control

Implement Multi-Channel, Protected, Effective Junior Sailor to Higher Controller Feedback System: Create and mandate the use of redundant feedback channels, including anonymous options like surveys for specific issues like habitability, designed to capture ground truth from junior personnel regarding quality of life, safety, climate, and leadership effectiveness. Ensure this feedback is accessible by all relevant decision-makers, including CNIC for shore support, PEO/PMS for program impacts, TYCOM/RFC/OCNO/SECNAV for oversight without filtering, and require documented tracking of issues and responses. Ensuring this compliance may require the establishment of a new role within each controller's staff that can provide the relevant unfiltered information to the commanders.

This recommendation addresses the multiple degraded or missing feedback loops identified (CT-UCA-7, EDL-UCA-5, PMFs across controllers). Effective feedback could have alerted leadership much earlier to the severity of habitability problems (CT-UCA-4), parking issues (SUPSHIPNN-UCA-2), low morale (CT-UCA-13), medical system strain (SM-UCA-4), and CRT dysfunction (CRT-UCA-1), potentially resulting in corrective actions before the crisis. It

counters the filtering of feedback up the control structure and ensures the actual decision makers have access to the most accurate from the deck-plate information (SECNAV-CF-2, CT-CF-4).

Define & Enforce Personnel Well-being Safety Constraints: Establish specific, non-negotiable thresholds for RCOH personnel well-being, to include minimum supervisor ratios, maximum medical/MH wait times, maximum fatigue indicators, and compliance with RCOH suitability standards. The goal would be to have these constraints as enforceable as pilot flight hours and required rest times. To enforce them, implement monitoring systems, like badge-in and badge-out, utilized by the shipyard, and mandate corrective actions. Those corrective actions could be resource shifts, schedule adjustments, or work stoppages when thresholds are approached or violated.

Implementing this recommendation shifts the system from reactive problem-solving to proactive constraint enforcement. If this recommendation were placed and enforced, it could have directly controlled the excessive medical wait times (SM-UCA-1), chronic supervisory understaffing (TYC-UCA-1, EDL-CF-1), extreme fatigue (CT-UCA-9, S3:11), and potentially the move-aboard into unsuitable conditions (CT-UCA-1, CT-UCA-4). Additionally, the metrics gathered would improve the feedback so controllers could enforce stricter safety constraints.

Restructure Oversight for Proactive RCOH Well-being Audits: Revise the control structures oversight process to include specific, rigorous, periodic audits focused on personnel well-being during RCOH and other shipyard availabilities. The audits and inspection teams should verify compliance with defined safety constraints (Rec #4), the effectiveness of critical support programs (CRT, Medical access, SPP implementation), the health of feedback mechanisms, and leadership climate. Inspection teams should conduct the audit using data and direct personnel interviews with the individual Sailors onboard.

The recommendation corrects ineffective oversight findings (USC-UCA-5, RFC-UCA-4, TYC UCAs, CRT-CF-5). Proactive, focused audits likely would have detected the severe CRT deficiencies (C5:22), the inadequate habitability inspection process (TYC-UCA-5), and perhaps the escalating medical crisis much earlier, forcing earlier correction.

3.6.3 Strengthen Organizational Learning and Adaptation

Establish a Systemic Events and Analysis Team: Create a dedicated Navy team to analyze significant safety events, near-misses, or major program disruptions like the USS *George Washington* and USS *Theodore Roosevelt* systemic quality-of-life issues. If this is unattainable, the appointed accident investigators should be mandated to undergo training on these methods before commencing the investigation. This team should use systems thinking methods to identify deep-seated control structure flaws, flawed assumptions, and unsafe interactions, supplementing traditional investigation methods.

By identifying earlier indicators (e.g., the 2020 DEOCS SI awareness spike [C5:3], initial budget deficit [H4:5], historical RCOH delays [NAVSEA-CF-6]) through a systemic lens might have revealed the interacting risks building within the USS *George Washington* system before the suicides occurred.

Enforce Verifiable Lesson Implementation & Tracking: Implement a formal, robust, Navy-wide process that ensures validated lessons learned from systemic analyses and major investigations are translated into specific, actionable changes in policy, planning models (budget/schedule), risk assessments, training curricula, and contracting requirements. This process must include independent verification that the changes were implemented and

mechanisms to track their long-term effectiveness. Additionally, this system should mandate required training before commencing major shipyard availabilities, like RCOH, including historical lessons learned. To effectively implement this recommendation, a dedicated person or team within the shipyard may be required to maintain continuous oversight of the lessons learned tracker and ensure continuity of understanding between the different ships that enter.

This recommendation addresses the failure to effectively apply lessons from previous RCOHs regarding realistic costs, schedules, and QoL needs (PEO-UCA-3, NAVSEA-UCA-5, PMF-4 across controllers). Enforced implementation could have led to more realistic initial planning for USS *George Washington*, adequate budgeting for quality-of-life needs, and prevention of recurring unsafe actions.

3.6.4 Comparison of CAST Recommendations and Navy Investigation Recommendations

The recommendations from the Navy investigations following the USS *George Washington* RCOH incidents are detailed and encompassing, and they address many specific problems identified across the system. They include concrete actions such as studying RCOH manning requirements and changing detailing practices (Navy Recs 1-3), improving specific quality-of-life infrastructure like parking, food options, and housing (Navy Recs 4-7, 10-14), defining habitability standards (Navy Recs 8-9), fixing issues with specific support programs like DEOCS, CRT, SPP, Mentorship, and Sponsorship (Navy Recs 16-19, 34-35, 38-42), adding resources like MFLCs and Force Psychologists (Navy Recs 27, 30, 44), improving medical and mental health access, staffing, incentives, screening, and record-keeping (Navy Recs 21-26, 28-29, 35, 43), enhancing specific training (Navy Recs 20, 27, 36, 46), clarifying command relationships during RCOH (Navy Rec 31), and improving RCOH planning and contracting processes (Navy Recs 32, 33). These recommendations target many systemic symptoms and controller-level failures highlighted by the CAST analysis. In total, they represent necessary steps toward improvement.

However, while conceptually aligned in many aspects, the CAST-based recommendations focus more explicitly on the underlying systemic control structure flaws that allowed these symptoms to emerge and continue in the first place. In comparison, the Navy recommendations focus more on fixing or improving specific components or processes. Specifically, the CAST recommendations emphasize strengthening the overall safety control system design, decision-making processes, feedback loops, and organizational learning capabilities.

The first way that the CAST recommendations improve and augment the Navy's is by tackling the flawed assumptions throughout the System. While the Navy recommendations include specific training (e.g., generational competence, ASIST), the CAST analysis identifies systemic, flawed assumptions across multiple controllers regarding RCOH risks, personnel resilience, budget/schedule realism, and program effectiveness. CAST Recommendation #1 of mandating systems thinking and HSI training directly targets correcting these flawed mental models by equipping leaders at all levels with the tools and knowledge to understand complex interactions, identify hidden assumptions, and integrate human factors from the outset. By doing so, the CAST recommendations aim to prevent unsafe decisions rooted in incorrect beliefs about the system.

The second way CAST recommendations augment and improve upon the Navy's list is by focusing on a systemic redesign of feedback loops up to the higher controllers from the Individual Sailors, rather than solely on tool fixes. While Navy recommendations address

improving specific instruments like DEOCS or adding surveys (Navy Recs 16-18), the CAST Recommendation of implementing a multi-channel and effective feedback system targets the entire feedback pathway across all controllers. This systemic approach emphasizes creating protected channels for unfiltered information, particularly from junior personnel, ensuring the raw, real-time, and accurate data and experiences reach all relevant decision-makers, including those managing programs like PEO/PMS or shore support like CNIC. Additionally, response tracking should be enforced to verify that feedback genuinely influences control actions and drives change, addressing the filtering and lack of response identified throughout the control structure.

Additionally, the CAST analysis emphasizes the need for explicit safety constraints and requirements to manage conflicting goals safely. While Navy recommendations address the negative outcomes of trade-offs, like quality-of-life cuts, they don't specify how such decisions should be made under pressure. CAST Recommendation of developing policy for balancing conflicting goals directly targets this decision-making process flaw by advocating for a clear Navy policy to guide leaders in making and documenting trade-offs between critical goals like cost, schedule, technical scope, and personnel well-being. Having explicit guidance and a framework would ensure risks to personnel are considered and safety constraints are not sacrificed.

Fourthly, CAST results propose establishing enforceable safety constraints for personnel well-being, shifting focus from merely improving conditions to actively preventing hazardous states. The Navy recommendations aim to incrementally improve manning, quality-of-life, and medical access. In contrast, the CAST Recommendation to define and enforce personnel well-being safety constraints calls for defining specific, measurable, non-negotiable thresholds for factors like minimum supervisor ratios, maximum medical wait times, fatigue limits, and RCOH suitability standards. It also recommends implementing active monitoring systems and mandatory enforcement mechanisms that compel corrective actions, like resource shifts or schedule adjustments, before these safety boundaries are violated, creating a more proactive and robust control system.

Furthermore, CAST recommendations focus on strengthening the Navy's fundamental organizational learning processes. Navy Recommendations 19 address assessing specific program effectiveness and sharing best practices. However, the CAST recommendation to establish a systemic event analysis team proposes using systemic methods to uncover deeper, systemic flaws beyond traditional analyses. Complementing this, the CAST recommendation to enforce lesson implementation and tracking advocates for a robust, mandatory, and audited process to ensure lessons learned lead to tangible and lasting changes in policy, planning models, training, and requirements across the institution. Doing so addresses the identified issues with applying past failures effectively.

Finally, CAST highlights the powerful leverage point of altering performance incentives and accountability structures. While various Navy recommendations aim to improve specific programs or add resources, the CAST recommendation to revise performance metrics and incentives directly addresses the Navy’s cultural prioritization issue. By recommending formal changes to how leaders and programs are evaluated, and integrating meaningful metrics for climate, personnel readiness, and safety, we can shift behavior systemically. Making well-being outcomes a tangible accountability component becomes a powerful control lever to ensure adherence to the system’s safety constraints.

In conclusion, the Navy investigation recommendations provide a valuable and necessary roadmap for addressing numerous specific deficiencies uncovered by the USS *George Washington* RCOH tragedies. The CAST-derived recommendations complement this list by offering a higher-level, systemic perspective focused on strengthening the underlying safety control structure. They emphasize changing how leaders think and make decisions, ensuring effective feedback, enforcing non-negotiable safety boundaries for personnel, guiding trade-off decisions, and improving the Navy's ability to learn from systemic failures. Integrating both the specific fixes and these broader systemic improvements offers the most comprehensive approach to preventing future occurrences and genuinely enhancing the safety and well-being of Sailors during demanding RCOH periods. Section 3.6.4.1 and Table 10 cover the main differences between the Naval recommendations and the CAST-generated.

3.6.4.1 Summary of CAST Recommendations Improvement

Table 10: Summary of CAST recommendations compared to the original Navy. In effect, CAST focuses further on the systemic effects, and control failures.

Focus Area	Navy Recommendations' Approach	CAST Recommendations' Added Systemic Focus
Primary Target	Specific symptomatic deficiencies (e.g., fix parking, add Healthcare Providers)	Underlying control structure flaws enabling symptoms (e.g., why controls failed)
Mental Models & Assumptions	Address via specific topic training (e.g., ASIST, generational)	Explicitly identify & correct flawed system assumptions via Systems Thinking/HSI training
Feedback Mechanisms	Improve or add specific tools (e.g., DEOCS questions, new surveys)	Redesign the entire feedback system from the bottom to the top of the control structure for effectiveness, influence, & validation
Managing Conflicting Goals	Addresses negative outcomes of trade-offs (e.g., quality-of-life cuts)	Provide explicit process and framework for making & documenting safe trade-offs when planning or making decisions
Safety & Well-being Control	Improve conditions and resources incrementally	Define & enforce non-negotiable safety constraints (hard limits)
Organizational Learning	Assess specific programs, share best practices	Improve fundamental learning process (systemic analysis, enforced implementation)
Driving Change & Culture Shift	Add resources, fix specific programs, provide targeted training	Alter performance metrics & incentives for systemic accountability

Chapter 4: Integrating CAST Findings and Recommendations with a Naval System Dynamics Model

4.1 System Dynamics Fundamentals

System Dynamics (SD) was created by Jay W. Forrester at MIT in the mid-1950s as an outgrowth of feedback-control engineering. Forrester showed through his textbook *Industrial Dynamics* that the recurrent booms, busts, and oscillations observed in industrial and social systems could be reproduced with coupled nonlinear differential equations representing information feedback, physical lags, and decision rules [81].

Although Jay Forrester founded the system dynamics field, Dr. John D. Sterman, a MIT Sloan School of Management professor, operationalized the methodology for broader use. Sterman significantly advanced system dynamics' usability by addressing model validation, behavioral realism, and policy application. His textbook *Business Dynamics* codified the methodology into a comprehensive, structured approach for implementation and use [82].

Sterman's research established an even stronger foundation for the methodology. He demonstrated that system dynamics is not merely a qualitative modeling process but also a formal modeling approach capable of generating the results of actionable policy levers and interventions [83]. His work transformed system dynamics into a broadly adopted systems thinking modeling process practiced across multiple sectors, including defense, healthcare, energy, and public policy. Sterman's work is especially relevant to the shipyard system discussed throughout this thesis, particularly when involving retention and quality of life, where complex feedback loops and time delays complicate solutions. The components of the models are covered in the following sections and summarized in Table 11.

Figure 13 illustrates a simplified system dynamics model of the Active-Duty Servicemember Population that contains the base components described in the following subsections. The population (stock) rises based on the inflow (flow) rate of people joining, and lowers based on the rate of people leaving. An example of an auxiliary variable is shown through Enlisting Incentives (e.g., bonuses, job stability, healthcare, education, etc.), which, as they rise, positively influence (+) the rate of people joining. Meaning that as the incentives go up, the rate of people joining will also go up, and vice versa.

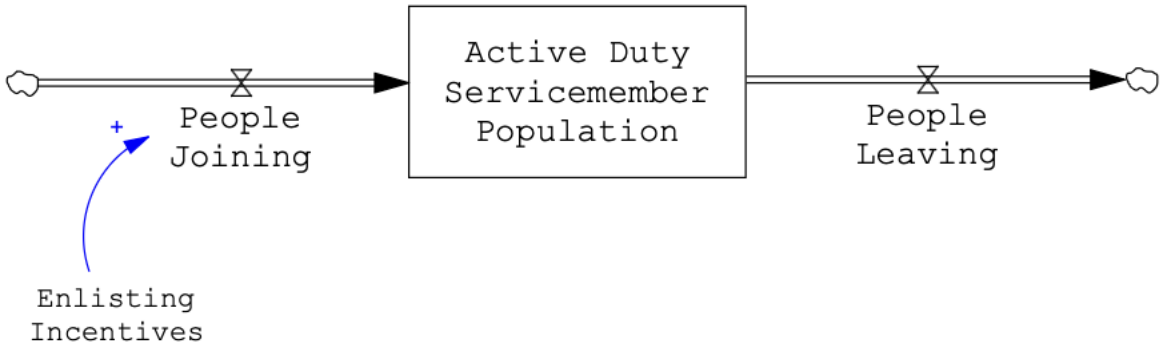


Figure 13: Reveals a simplified stock flow structure governing the active duty servicemember population.

4.1.1 Stocks

Stocks represent the accumulation or the level of things from flows within the system at a specific point in time. A typical example is the level of water in a bathtub. Other examples might be the number of personnel, the amount of work backlogged, or available funding [82]. The only component that can affect a stock is a flow. In Figure 14, they are shown as rectangles.

4.1.2 Flows

Flows are the rates at which things move into or out of stocks, changing their levels over time. For the bathtub example, flows would be the rate at which the faucet is filling the tub and the rate at which the drain empties it. Other examples include hiring rates, separation rates, or task completion rates. The relative rates of each would affect the actual water level within the bathtub [82]. In Figure 14, they are shown as pipes with valves.

4.1.3 Variables (Auxiliaries)

Auxiliary Variables influence the flows or other variables within the system. They can represent policies, decisions, environmental conditions, or calculations based on stocks or other variables (e.g., desired workforce size, quality of life factors, budget levels, incentive effectiveness) [82]. In Figure 14, they are represented by text labels.

4.1.4 Arrows and Polarity

Arrows connect variables, stocks, and flows, showing the direction of influence. Polarities indicate the type of link. A '+' sign near the arrowhead indicates a positive link, where if the source variable increases, the destination variable also tends to increase, or vice versa. A '-' sign indicates a negative or inverse link, where if the source variable increases, the destination variable tends to decrease, or vice versa [82].

4.1.5 Feedback Loops

These are closed circuits of cause and effect where a change in one part of the system eventually loops back to affect that same part. There are two main types.

4.1.5.1 Reinforcing Loops

Reinforcing loops amplify change, creating exponential growth or collapse, with examples like compound interest or the snowball effect [82]. They have an even number of "-" links, or zero.

4.1.5.2 Balancing Loops

Balancing Loops seek equilibrium or try to achieve a goal, counteracting change. An example is how a thermostat regulates temperature [82]. They have an odd number of '-' links; however, it is important to think around the loop to ensure the actual interactions are well-known.

4.1.6 Delays

Systems often have time delays between a cause and its effect, like the delay between recruiting someone and them becoming a productive Sailor. Delays can significantly impact system behavior and stability [82].

4.1.7 Summary of Model Components

Table 11: Summary of Figure 14 System Dynamic components.

Element	**Purpose**	**Navy-Shipyard Examples from** Figure 14
Stocks	Accumulate things from flows.	New Navy Recruits, Experienced Sailors, and the Tasks backlog accumulate over time.
Flows	The rate of change of the thing the stocks are measuring.	New-recruit enlistment rate, Experienced-sailor separation rate, Task completion rate.
Auxiliary Variables	Algebraic variables that affect flows or other auxiliaries.	Quality-of-Life composite variable, Recruitment incentives, Retention incentives.
Causal links & Polarity	Represent direction of influence; "+" means same-direction change, "–" means opposite.	A "–" link Retention Incentives to Experienced Sailor Separation Rate indicates that as Retention Incentives rise, separation rates tend to lower (albeit temporarily).
Feedback Loops	Closed causal loops that drive overall system behavior.	B_1 Recruitment control: higher *Total Sailors* ⇒ less need ⇒ sign on bonuses

		lower ⇒ recruitment incentives lower ⇒ less Sailors join ⇒ less naval recruits ⇒ less total Sailors.
Delays	Material or information lags that separate cause from effect.	Training time and Qualification time (deploy-to-productive).

Table 12: Breakdown of Figure 14 system components and elements into Stocks, Flows, and Auxiliary Variables, including description.

Component Type	Component Name (from Diagram)	Description/Meaning
Stocks	New Navy Recruits	Accumulation representing the number of personnel currently in initial Navy training (e.g., before completing boot camp/A-school).
	Experienced Sailors	Accumulation representing the number of trained and qualified personnel in the fleet available for task completion; a measure of workforce capability.
	Tasks	Accumulation representing the current workload or backlog of operational, maintenance, or training tasks requiring completion.
Flows	New Recruit Enlistment Rate	The rate at which new individuals join the Navy, increasing the New Navy Recruits stock.
	Bootcamp Failure Rate	The rate at which recruits do not complete initial training (through failure, quitting, medical separation, etc.), decreasing New Navy Recruits.
	Sailor Training Rate	The rate at which Sailors successfully complete all initial training and qualifications, decreasing New Navy Recruits and increasing Experienced Sailors.
	Experienced Sailor Separation Rate	The rate at which trained personnel leave the Navy, decreasing the Experienced Sailors stock.
	Buildup Rate	The rate at which new tasks are generated or added to the backlog, increasing the Tasks stock.
	Completion Rate	The rate at which tasks are completed, decreasing the Tasks stock.

Auxiliary Variables		(Grouped Thematically)
Recruitment	Sign on Bonuses	Monetary incentives offered at the point of enlistment to attract new recruits.
	Base Pay	Standard military compensation based on rank and time in service.
	Housing Allowance	Allowance provided for off-base housing, typically based on rank, dependency status, and location.
	Recruitment Incentives	A composite measure representing the overall attractiveness of joining the Navy based on various inducements.
	Expansion Rate	An external factor representing planned changes in the Navy's overall force size or end-strength.
Personnel/Transition	Recruitment	The Navy's overall recruiting effort or established goals.
	Total Sailors	The combined number of New Navy Recruits and Experienced Sailors in the system.
	Training Time	The average duration of the initial Navy training pipeline (e.g., bootcamp and initial schools).
Separation	Qualification Time	The average duration required for additional on-the-job training and qualifications after initial schooling for a sailor to become fully proficient.
	New Recruit Quit Fraction	The proportion of new recruits who leave the Navy before completing their initial training pipeline.
	Experienced Quit Fraction (feq)	A baseline propensity of experienced sailors to leave the Navy, treated as a set level or exogenous input for this model.
Retention	Total Separation Rate	An aggregate measure of all personnel (new recruits and experienced sailors) leaving the modeled Navy system.
	Retention	Represents the Navy's overall effort or focus on retaining experienced sailors.
	Retention Bonuses	Monetary incentives offered to experienced sailors for reenlistment or service extension.
	Retention Incentives	A composite measure of factors encouraging experienced sailors to remain in the Navy.

Quality of Life	Job Stability	Sailors' perception of their career security and likelihood of continued employment.
	Community	The sense of belonging, unit cohesion, and social support experienced by sailors.
	Mental Health Services	The perceived availability, accessibility, and quality of mental health support services.
	Purpose	Sailors' sense of having a meaningful mission, performing valued work, and being appreciated.
	Transportation	The conditions related to commuting, such as parking availability, shuttle services, and travel time.
	Housing	The perceived availability and quality of living accommodations (e.g., barracks, shipboard berthing, off-base housing quality).
Task/Workload	Quality of Life	An overall composite measure of Sailor well-being, satisfaction, and the favorability of living and working conditions.
	Maintenance	Demand generated by equipment preventative and corrective maintenance needs.
	Watchstanding	Demand generated by operational or in-port watch requirements.
	Training Requirements	Demand generated by ongoing individual or unit training needs.

4.2 Naval Shipyard Manning System Dynamics Model

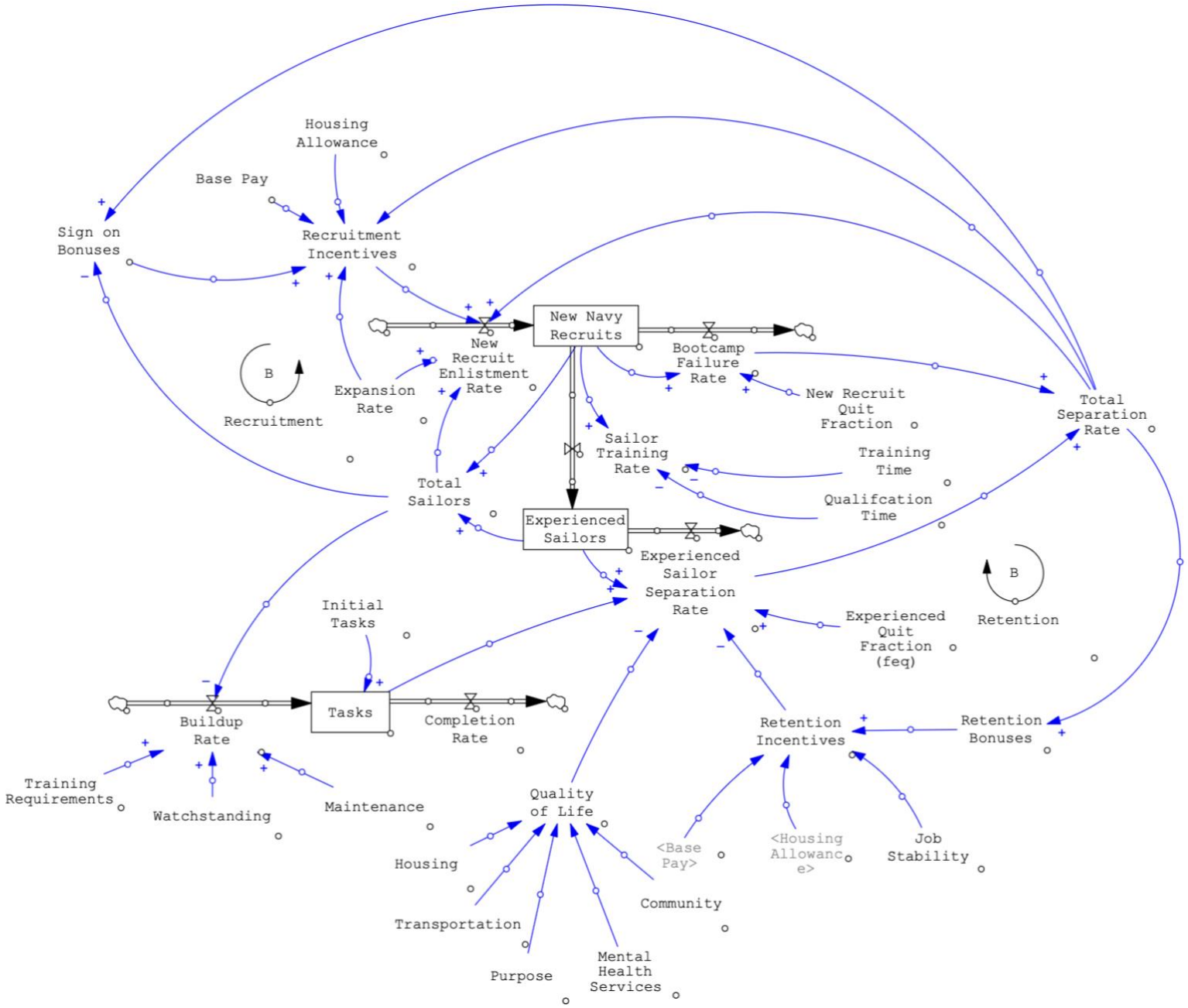


Figure 14: Illustrates the stock-and-flow architecture used to analyze Navy personnel manning dynamics. There are three primary stocks: New Navy Recruits, Experienced Sailors, and Tasks, which are connected by flows representing accession, training, separation, backlog accumulation, and task completion. Auxiliary variables are related to incentives, quality-of-life drivers, and workload, while feedback loops depict the self-reinforcing and goal-seeking tendencies inherent in the system.

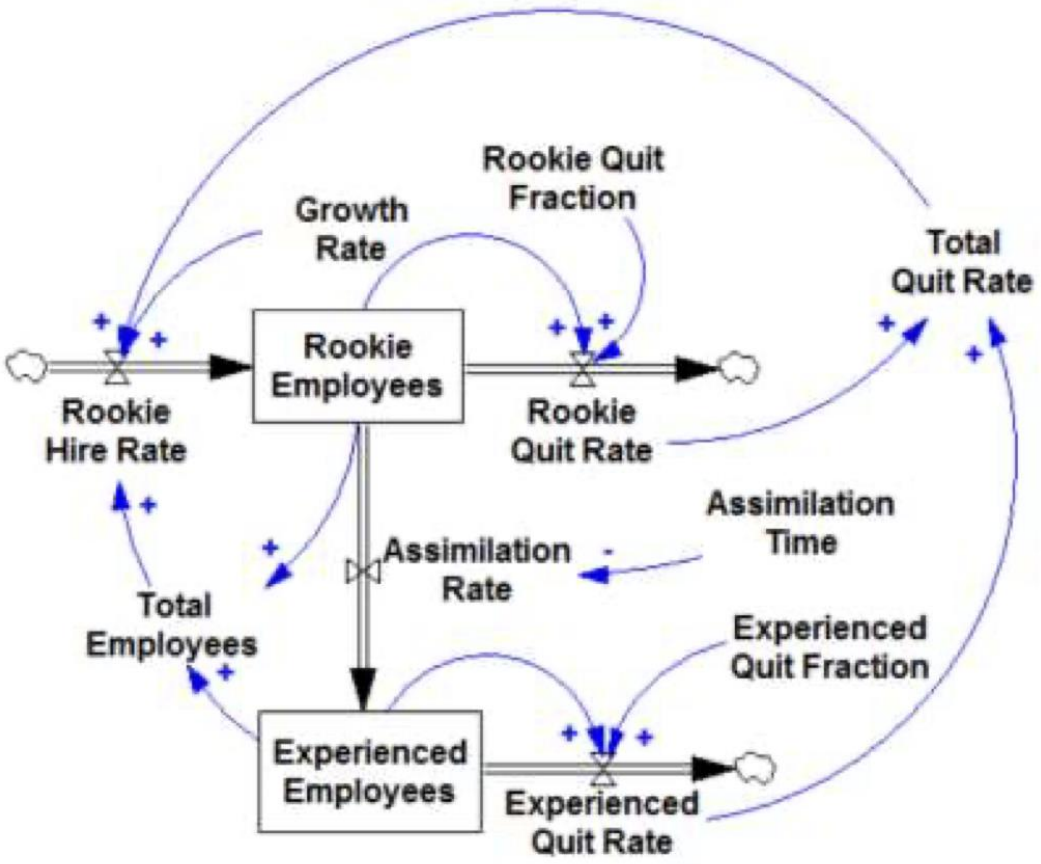


Figure 15: The basis and backbone for the model displayed in Figure 14. This model illustrates the "capability trap", developed by Oliva and Sterman in 2010, via the training of experienced employees, and is explained further in section 4.3.5. Taken directly from (pg. 14) [84].

4.3 System Dynamics Model Explanation

4.3.1 Stocks

Figure 14 represents the U.S. Navy personnel retention, recruitment, and task fulfillment system model. Table 12 contains examples and interactions of all the system model components. Three stocks form the backbone of the model. They are the New Navy Recruits, Experienced Sailors, and Tasks. The New Navy Recruits stock represents the number of Sailors who have entered service and are in the pipeline of schools and qualifications to become experienced Sailors. The Experienced Sailors stock represents those who have completed all required training and qualifications and produce valid work onboard their commands. The Tasks stock represents the accumulated workload and effective task backlog. The levels of these stocks change over time based on the ratio of associated flows, which are affected by the various policies and variables, particularly those focused on quality-of-life factors.

4.3.2 Flows

Flows affecting the New Navy Recruits stock are the personnel inflow rate with the New Recruit Enlistment Rate, which raises the New Navy Recruits stock level, and the outflow rates of

Bootcamp Separation Rate and Sailor Training Rate, which deplete the stock level. New recruits can either progress through the Sailor Training Rate and become Experienced Sailors, which encompasses graduation from Bootcamp, all other pre-command pipeline schools, and qualifications onboard, or separate while in Bootcamp, both of which combine to deplete the New Navy Recruits stock level.

Those New Sailors who successfully pass the Sailor Training Rate become Experienced Sailors. The Experienced Sailors are depleted through the Experienced Sailors' Separation Rate flow, which encompasses those retiring, administratively separated, or have reached the end of their contract and have not agreed to another contract extension.

Additionally, the flows that affect the level of the Tasks stock, which builds up or burns away based on an inflow of Task Buildup Rate driven by the day-to-day requirements Sailors deal with, such as Training, Watch standing, and Maintenance, and outflow of Completion Rate.

4.3.3 Auxiliary Variables

While some auxiliary variables were touched upon when discussing the flows, this section details their roles to ensure their influence on the system is clear. Auxiliary variables are crucial as they define the rates of flows and often represent system conditions, decision rules, or key policy levers.

Regarding Recruitment, several auxiliary variables and policy levers affect the New Recruit Enlistment Rate. The overall attractiveness of enlisting is primarily affected by Recruitment Incentives. This composite variable is positively (+) influenced by financial incentives like Sign on Bonuses, foundational compensation elements such as Base Pay and Housing Allowance, the Navy's perceived need for growth indicated by the Expansion Rate, and by the Total Separation Rate (as higher overall separations may trigger increased recruiting efforts). Conversely, a larger existing force, represented by Total Sailors, tends to decrease (-) Recruitment Incentives, as recruiting goals are met, or there is simply nowhere for the recruits to go. These combined Recruitment Incentives then directly and positively (+) influence the New Recruit Enlistment Rate. The Expansion Rate and Total Sailors also have direct positive (+) influences on the New Recruit Enlistment Rate itself, showing how planned growth and the current size of the force independently affect enlistment targets.

In terms of Personnel Totals and Transition, Total Sailors represents the sum of New Navy Recruits and Experienced Sailors. This variable affects several areas. It negatively (-) influences Sign on Bonuses and Recruitment Incentives (as noted above), positively (+) influences the New Recruit Enlistment Rate, and negatively (-) influences the task Buildup Rate as a larger force can manage or absorb higher portions of the new task generation. The critical transition of personnel from New Navy Recruits to Experienced Sailors via the Sailor Training Rate (flow) is negatively (-) influenced by both Training Time, the duration of initial pipeline training, and Qualification Time, the subsequent period needed for on-the-job proficiency. These represent inherent delays in developing a fully capable, experienced sailor.

Several variables affect Separation dynamics. The New Recruit Quit Fraction is the proportion of recruits who leave before completing initial training and directly and positively (+) influences the Bootcamp Failure Rate. For experienced personnel, the Experienced Quit Fraction, which is a set baseline propensity for this model, also directly and positively (+) influences the Experienced Sailor Separation Rate. The Total Separation Rate then aggregates these various outflows, new recruit attrition, and experienced sailor separations. This aggregate rate, in turn, has a positive (+) influence on the command focus on Retention, Recruitment

Incentives, the New Recruit Enlistment Rate, and Sign-on Bonuses, reflecting the system's attempt to respond to overall personnel losses.

The Retention of experienced personnel is primarily affected by two main auxiliary variables, Retention Incentives and Quality of Life, both of which directly and negatively (-) influence the Experienced Sailor Separation Rate. Therefore, as these factors rise, the separation rate decreases. The overall focus on Retention, which is (+) influenced by the existing stock of Experienced Sailors and the Total Separation Rate, drives (+) Retention Incentives. These Retention Incentives are further bolstered by specific Retention Bonuses, adequate Base Pay, Housing Allowance, and Sailors' perception of Job Stability.

The Quality of Life variable is an easily forgotten yet vital component in organizations, particularly onboard ships, but is accounted for in this model. It is positively (+) affected by good Housing, a strong sense of Community, accessible and effective Mental Health Services, adequate Base Pay, perceived Job Stability, and a strong sense of Purpose. Conversely, poor Transportation (e.g., long commutes, parking issues) negatively (-) impacts Quality of Life. This overall Quality of Life variable then directly and negatively (-) influences the Experienced Sailor Separation Rate.

Finally, factors influencing Task and Workload include Maintenance demands, Watchstanding requirements, and ongoing Training Requirements, all of which positively (+) drive the Buildup Rate of Tasks. As noted, Total Sailors has a negative (-) influence on this Buildup Rate. The variable Initial Tasks represents a starting workload or a significant influx of work into the Tasks stock. The Completion Rate of these tasks is, most importantly, positively (+) influenced by the number of Experienced Sailors.

Understanding these auxiliary variables and their interconnections is key to interpreting how policies, conditions, and decisions propagate through the system to affect personnel levels, workload, and ultimately, overall fleet readiness and Sailor well-being.

4.3.4 Feedback Loops

The behavior of the Navy personnel system depicted in Figure 14 is largely driven by several interconnected feedback loops. These loops explain how changes in one part of the system can ripple through and influence other parts, sometimes amplifying initial changes or working to stabilize the system.

Two reinforcing loops are central to determining the stock of Experienced Sailors, primarily through the direct impacts of Quality of Life and Retention Incentives on the Experienced Sailor Separation Rate. When Quality of Life is high, it directly reduces (-) the separation rate, helping to retain more Experienced Sailors. If a larger, more stable, and less stressed body of Experienced Sailors then contributes positively back to factors enhancing Quality of Life (such as a stronger Community or more effective Task completion, reducing overall stress), a reinforcing loop forms. Essentially, better conditions lead to higher retention and a more capable workforce, or conversely, deteriorating conditions fuel a downward spiral of attrition. Similarly, strong Retention Incentives also directly reduce (-) the Experienced Sailor Separation Rate. If the command's focus on Retention, which drives these incentives, is itself positively influenced by the health of the Experienced Sailors stock, this creates another reinforcing dynamic supporting the experienced workforce.

In addition to these reinforcing loops, balancing loops attempt to regulate the system and drive it towards equilibrium. When the Experienced Sailor Separation Rate begins to rise, which then contributes to a rising Total Sailor Separation Rate, this signals a personnel problem to

senior leaders and potentially triggering an increased focus on Retention and boosting Retention Incentives (like Retention Bonuses). These enhanced incentives then work to reduce (-) the Experienced Sailor Separation Rate, forming a balancing loop aimed at counteracting high attrition. A similar balancing loop manages overall recruitment. A high Total Sailor Separation Rate can spur Recruitment efforts, leading to higher Recruitment Incentives and increasing the New Recruit Enlistment Rate. As Total Sailors approach desired levels, these incentives might then be reduced, helping to stabilize overall force size. Another crucial balancing loop aims to control the Tasks backlog. An increasing Tasks stock creates pressure to raise the Completion Rate, which is positively influenced by the number of Experienced Sailors. A higher Completion Rate, in turn, reduces the Tasks stock.

In this model, the Experienced Quit Fraction, which is at a set level, acts as a baseline factor contributing positively (+) to the Experienced Sailor Separation Rate. The actual separation rate is then affected by the direct negative influences of Quality of Life and Retention Incentives; their strength determines how much the separation rate can be driven below, or how much it might rise above, this baseline level.

The critical dynamics of the model emerge from the interaction of these loops. The Workload Management Loop heavily depends on the stock of Experienced Sailors. If this stock is depleted, either due to a degrading Quality of Life-Experience Reinforcing Loop, an ineffective Retention Incentive Adjustment Loop, or insufficient inflow of new sailors, then the Completion Rate for tasks cannot keep pace with the Task Buildup Rate. Consequently, the Tasks backlog grows. This escalating workload and pressure can directly degrade Quality of Life. A decline in Quality of Life then directly increases (+) the Experienced Sailor Separation Rate, further shrinking the Experienced Sailors stock. This creates a vicious cycle where eroding capability leads to more pressure, which further erodes capability. This dynamic, known as a capability trap, is a critical behavior exhibited by this system structure and will be explored in detail in the following section.

4.3.5 The Capability Trap

The interaction of these loops and the stock-flow structure of a Naval Shipyard, as shown in Figure 14, is a clear example of a system Sterman and Landry call a “capability trap”, shown in Figure 15 [84]. Specifically, this capability trap, which results in poor work quality and production loss, occurs when organizations experience rapid hiring and high turnover. In Figure 14, this is shown through how the Navy experiences low retention rates, resulting from experienced Sailors separating. Organizations perform better with more employee knowledge, which is almost directly linked to experience. Organizations with high turnover, like the Navy and especially vessels in the shipyards, tend to have a higher percentage of employees on the less experienced side, negatively affecting performance [84]. Overall performance declines because experienced personnel face a dual burden that divides their time and reduces their available capacity. They must shoulder a larger share of the workload to compensate while new hires get up to speed and simultaneously dedicate valuable time to training those newcomers. Consequently, with their focus split and capacity stretched, experienced staff have significantly less time available for their own productive work, leading to a drop in overall organizational output. Furthermore, whatever work that the new hires produce is often substandard and either requires rework or significant experienced employee oversight, further degrading useful organizational output and production.

Considering that USS *George Washington* had significantly reduced the supervisor manning percentage, and many of the most junior recruits were sent there following boot camp, this reduced skill and productivity, further reinforcing the stress, hardship, and quality of life deficiencies that the Sailors were experiencing. The idea of the capability trap and its effect on not only the vessels in the shipyards but also the Navy as a whole is confirmed through a GAO report on Sailor-led maintenance, where a lack of qualified and experienced personnel affects the ability of the ship to meet the required availability deadline [8].

The capability trap manifests when pressure increases due to a high Tasks backlog or insufficient Experienced Sailors. If the response to this pressure involves actions that degrade Quality of Life (e.g., cutting support services due to budget constraints, increasing workload without commensurate support) or fail to maintain adequate Retention Incentives, the Experienced Quit Fraction and Separation Rate rise further, depleting the Experienced Sailors stock. Fewer experienced Sailors reduce the Completion Rate, making it harder to manage the Tasks, potentially increasing pressure further. Additionally, the Experienced Sailors need to train personnel transitioning from Bootcamp, which implicitly drains time that could otherwise contribute to the Completion Rate, aligning with the "dual burden" concept. High turnover from a high Separation Rate and reliance on new Enlistment exacerbate this training load.

Therefore, the model structurally demonstrates how the low supervisor manning and influx of junior personnel onto USS *George Washington*, coupled with severe quality-of-life deficiencies, directly fed into the negative dynamics of a capability trap. Low Quality of Life increased the Experienced Quit Fraction, which, coupled with the intentional transferring of experienced personnel to operational assets, accelerated the loss of the already scarce experienced supervisors. Those remaining experienced personnel were burdened with task completion and mentoring/training, reducing overall effectiveness and potentially reinforcing the cycle of delays and stress. The model visually confirms that maintaining Quality of Life is not just a welfare issue but a critical factor in sustaining the core capability of Experienced Sailors needed to perform work, Completion Rate, and escape the capability trap.

4.4 Implementation of CAST Findings with System Dynamics

The CAST analysis of the USS *George Washington* RCOH context revealed systemic issues that align closely with behaviors modeled in the system dynamics structure. These findings are directly mapped onto model elements and demonstrate their operational significance.

4.4.1 Resource and Priority Misalignment

The CAST analysis identified strategic issues of resource and priority gaps (e.g., OCNO-UCA-2; RFC-UCA-1), especially in under-resourcing quality-of-life elements such as housing and mental health services (USC-UCA-1, 2; SECNAV-UCA-1, 2). In the System Dynamics model, underfunding directly reduces the Quality of Life variable, coincidentally increasing the Experienced Quit Fraction and Experienced Sailor Separation Rate, compounding the capability trap, which weakens the retention loop, and diminishing the Experienced Sailors stock.

4.4.2 Degradation of the Retention Loop

Beyond underfunding contributing to the reduced quality of life, there were just physical adverse quality of life experiences like poor living conditions, inadequate support services (e.g., SSC-UCA-1, and high stress), which correspond to weakening the Retention Loop. As Quality of Life diminishes, the system experiences higher outflows from the Experienced Sailors stock, reducing the system's ability to meet Task requirements.

4.4.3 The Capability Trap in Application

As discussed in section 4.3.5, the model reflects a classic capability trap [84], where leaders, or in the CAST terminology, controllers, emphasize short-term objectives (e.g., schedule and cost compliance) at the expense of long-term capacity. The CAST analysis noted that efforts to meet budgetary constraints decreased investments in quality-of-life and workforce development (PEO-UCA-1, 2, NAVSEA-CF-2). In the model, this manifests as increased strain on the Experienced Sailors population, further reducing the Completion Rate, thereby threatening schedule performance and exacerbating stress. In RCOH and other shipyard availabilities, this is even further pronounced due to strategic and intentional shifting of supervisors away to operational assets. Holistically, this same model and capability trap applies to the Navy's sailor recruitment and retention issues across the entire fleet, which drives the need to prioritize billet assignment for those operational assets. Additionally, those effects increase the quit rate, which, since Sailors cannot legally quit the Navy, tends to result in Destructive Behaviors as a coping mechanism.

4.4.4 Feedback Loop Failures and Control Flaws

Several CAST findings were that feedback mechanisms were ineffective, such as failure to report issues or act on DEOCS data (CRT-CF-6), and flawed assumptions about personnel resilience. These correspond to weak or missing feedback paths in the system dynamics model. For example, if decision-makers do not receive timely and accurate feedback on rising Experienced Quit Fractions and Separation Rates, corrective actions on Retention Incentives or quality-of-life investments will be delayed or ineffective, contributing to accelerating degradation of the Experienced Sailors stock and therefore shipyard schedules and performance.

4.4.5 Model Validation with CAST-Driven Recommendations

While many of the recommendations provided by the previous investigations would also improve the dynamics of the Naval shipyard system, the additional ones generated during the CAST analysis directly link to one or more elements composing the system dynamics model, which improves the model's functionality without adding components (i.e., new variables or loops).

The recommendation for systems-thinking and human-systems-integration training improves the quality and effectiveness of various Auxiliary Variables that affect Recruitment, Quality of Life, and Retention Incentives. Better-trained leaders would make Recruitment Incentives, Retention Incentives, and Quality-of-Life affecting decisions more systemically and adjust those incentives more precisely before sailor morale and capability erodes. Within the model, this reduces swings in the Experienced Quit Fraction, Enlisted Sailor Separations Rate, stabilizes the

outflow from the Experienced Sailors stock, improving production capabilities, and lowers stress.

The recommendation of embedding explicit thresholds for personnel well-being considerations into the planning that sets production tempo and cost tolerance will improve the Quality of Life variable, Buildup Rate, and Task Completion Rate. When Tasks exceed the sustainable capacity of the Experienced Sailors' stock, commanders would instead have to adjust either the Task Buildup Rate or the Completion Rate target rather than relying on unsustainable overtime. In effect, the recommendation tightens the gain of the existing balancing loop that links backlog growth to corrective action, preventing the feedback from becoming sluggish and resulting in the Tasks stock stabilizing at a lower level. Additionally, codifying a Quality of Life improvement like fatigue management would ensure that the Sailors working are physically in a state to do so, reducing the possibility of rework, and improving Sailor efficiency.

The recommendation of integrating well-being metrics into performance evaluations raises the weighting of quality-of-life indicators in the Recruitment and Retention Incentive algorithms. This change reduces the response lag between deteriorating living conditions and managerial intervention. Specifically, a smaller decline in quality-of-life now triggers a larger, quicker boost in retention benefits, constraining the outflow of experienced personnel well before the stock of Experienced Sailors reaches a critical level.

The requirement to define quantitative well-being safety constraints strengthens the model's existing balancing loops by providing concrete points for action. When medical wait times or supervisory ratios approach their limits, the safety constraints governing the Experienced Sailor Separation Rate flow automatically diverts resources, authorizes schedule relaxation, or initiates temporary task re-allocation.

Proactive control structure audits enhance the enforcement of quality-of-life variables. Audits do not create new loops. Instead, they improve accuracy and enforcement within existing ones, ensuring that the Retention-Incentive function and the Task-completion productivity remain correctly managed over time. By doing so, it empowers quicker response time for system controllers to address deficiencies before reinforcing upon each other to increase the capability loss.

Establishing multi-channel, protected feedback mechanisms upgrades the reliability and timeliness of the information that conveys deckplate quality-of-life data to decision-makers. In the model, this manifests as a shorter and less noisy delay in the perception of quality-of-life and task buildup, allowing the Retention-Incentive auxiliary loop to be adjusted on more accurate inputs. Additionally, it allows other factors like buildup within the Tasks stock to drive incentive increases to compensate. However, the most important effect is identifying issues that would degrade the Quality of Life variable and thus reduce the rate of Experienced Sailor Separation Rate.

Finally, verified controller lesson retention and implementation ensure that any modifications to auxiliary parameters remain and are not forgotten, preventing drifting back toward historical levels. This institutional memory guards against the gradual erosion of quality-of-life standards, enhancing the calibration of policy implementations and levers that determine both enlistment and separation flows.

In sum, the CAST recommendations do not introduce new structural complexity; instead, they enhance the fidelity, responsiveness, and stability of components already embedded in the model. Stocks gain greater protection from undesirable levels, flows respond sooner and more proportionally to stressors, auxiliary variables operate on clearer data, and information links

transmit signals with less distortion and delay. Together, these refinements increase the model's capacity to maintain a healthy, experienced force under a manageable workload without altering its fundamental structure.

Chapter 5: Conclusion

This thesis concludes that the destructive behaviors and hazardous conditions during the USS *George Washington* RCOH resulted from the emergence of interacting systemic flaws within the Navy's safety control structure, not isolated controller failures or individual errors. While the thesis focused on one ship, the findings have parallels and are applicable across all Naval vessels undergoing extended availabilities. Critical weaknesses included systemic under-resourcing and flawed assumptions about the demanding RCOH environment and personnel resilience. These weaknesses, combined with ineffective oversight, broken feedback loops, and deficient support standards, subject Sailors to prolonged periods in harsh industrial settings with often substandard living conditions and inadequate shore infrastructure.

The system dynamics analysis further highlighted how these flaws can manifest as a capability trap. Pressures from unrealistic schedules and budgets drove decisions that eroded essential personnel support and Quality of Life, leading to increased experienced Sailor attrition, which, coupled with intentional reduction of experienced personnel, further skewed the percentage of Sailors onboard to the inexperienced. This further depleted the critical experienced workforce, degrading overall capability and simultaneously placing a dual burden on the remaining senior personnel, who had to cover workload gaps while also training and supervising an influx of inexperienced replacements. This reduced effective production capacity and further exacerbated Sailors' stress, and schedule delays in a reinforcing cycle. Ultimately, these deeply rooted systemic issues operating within the challenging context of chronic shipyard maintenance delays and inadequate support systems produced the hazardous conditions contributing to the tragic loss of life.

Addressing Sailor safety and well-being during future RCOHs and all extended shipyard availabilities, therefore, requires a fundamental shift towards a proactive, systems-thinking approach focused on strengthening controls, validating assumptions, ensuring adequate resources, and prioritizing personnel as integral to mission capability.

5.1 Contributions

This research contributes a unique perspective by linking multiple systems thinking methodologies, CAST, and System Dynamics to analyze the complex factors contributing to the USS *George Washington* RCOH events. Moving beyond traditional analyses often focused on individual components or proximate causes, this approach provides a holistic, multi-level view that identifies inadequate controls and flawed interactions across the entire organizational hierarchy. These flawed or ineffective interactions were present from strategic policy down to shipboard execution. By linking the findings and recommendations of the CAST analysis to the System Dynamics model, this thesis provides further validation of both methods to better understand accidents when they occur.

A key contribution of the CAST analysis is identifying flawed assumptions and mental models held by various controllers regarding risk, resilience, and resource adequacy, demonstrating how these assumptions influenced unsafe decisions throughout the system. Furthermore, integration with system dynamics highlights the critical role of feedback loops and non-linear interactions, particularly identifying the capability trap dynamic as a core mechanism that explains the reinforcing cycle of personnel strain and declining performance observed during the RCOH and other Naval vessels in shipyard availabilities. Consequently, this thesis offers

systemically focused recommendations aimed at strengthening the underlying safety control structure, enhancing decision-making processes, and improving organizational learning, thereby providing insights that complement component-level fixes by addressing systemic control faults within the safety system's design and operation.

5.2 Limitations and Future Work

Despite the insights that this analysis provides, there are limitations to how this analysis was conducted. The first limitation is that this thesis conducts the analysis based on a culmination of events onboard one ship. To gain an even deeper insight into the system of RCOH, the CAST analysis should be applied to other ships that have undergone an RCOH availability to verify findings and validate the potential solutions. Additionally, while it was briefly mentioned in Chapter 2 about another aircraft carrier, USS *Theodore Roosevelt*, that had experienced severe disruptive behaviors (e.g., suicide) onboard due to debilitating work conditions, the analysis should be applied across other vessels in extended availabilities to ensure a fully systemic understanding of the Navy's maintenance system.

Another limitation of this thesis is the absence of quantification of the system dynamics model. Quantifying the insights from the qualitative model would add another layer of systemic understanding and ability to fine-tune and see the effects that policy decisions would have on the performance of the system.

Future work includes further CAST and STPA analyses, which could be proactively applied to other complex, high-risk Navy operations, such as different types of ship maintenance availabilities or operational deployment cycles, to identify control structure vulnerabilities before major safety events occur. Additionally, the STAMP analyses could be applied to other vessel types or commands under different operational and administrative command structures.

Additional future work would be developing the qualitative system dynamics model presented here into a quantitative simulation model. Simulation would empower policymakers to have a tool for testing the dynamic impact of the interventions explored in the recommendations, such as different RCOH manning levels, specific Quality of Life investments, or alternative retention incentive structures.

Additional future work could include researching the practicality of implementing some of the systemic recommendations proposed. This includes designing effective RCOH-specific leadership training that incorporates systems thinking and HSI principles, developing robust yet practical frameworks for managing conflicting goals under pressure within the Navy context, and establishing validated metrics and effective monitoring systems for the proposed personnel's well-being and safety constraints.

Finally, there should be further investigation into methods for effectively identifying and correcting flawed assumptions held by decision-makers, and fostering genuine, sustainable organizational learning from complex systemic failures within the expansive, bureaucratic Department of the Navy and Defense.

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