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Improve Manning Options for Small Craft Action Teams

December 2024

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Prepared for the Naval Postgraduate School, Monterey, CA 93943.

ACQUISITION RESEARCH PROGRAM
DEPARTMENT OF DEFENSE MANAGEMENT
NAVAL POSTGRADUATE SCHOOL

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ABSTRACT

The current practice of assigning Small Craft Action Team (SCAT) duties to Sailors onboard U.S. Navy destroyers poses significant risks to ship protection against small boat attacks. This approach relies on Sailors who take on SCAT responsibilities as a collateral duty, often lacking the specialized training and precision required for optimal performance in high-stakes scenarios. This thesis proposes integrating U.S. Marines into SCAT roles to address these challenges by leveraging their specialized combat training and tactical expertise. This study evaluates SCAT practices, Marine training protocols, and cost implications through a comprehensive approach that includes operational readiness analysis, a detailed cost estimation exercise, and a review of relevant policies. Findings demonstrate that Marine integration significantly enhances SCAT precision, readiness, and effectiveness, providing a robust solution to modern asymmetric threats. The cost analysis reveals that the benefits of this approach far outweigh the financial investment over the course of a military career. These measures ensure superior shipboard defense, reduce vulnerabilities, and align with the Navy's mission to maintain maritime dominance.

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Their dedication and mentorship have been pivotal to our academic and professional growth, and we are truly honored to have had the opportunity to work under their guidance.

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LIST OF ACRONYMS AND ABBREVIATIONS

AOR	Area of Responsibility
AT	Antiterrorism
CE	Certification Event
CG	Combat Systems Gunnery
CO	Commanding Officer
COA	Course of Action
CoC	Chain of Command
CRUDES	Cruiser-destroyer
CSWI	Combat Systems Weapons Instructor
DDG	Guided-Missile Destroyer
DIVO	Division Officer
DoD	Department of Defense
GMC	Gunner's Mate Chief
HFP	Hazardous Fire Pay
IRGCN	Islamic Revolutionary Guard Corps Navy
LCpl	Lance Corporal
LOC	Lines of Communications
MCCMP	Marine Corps Combat Marksmanship Program
METL	Mission Essential Task Lists
MEU	Marine Expeditionary Unit
MOS	Military Occupational Specialties
NCO	Non-Commissioned Officer
NTTP	Navy Tactics, Techniques, and Procedures
OFRP	Optimized Fleet Response Plan
OPTEMPO	Operating Tempo
PPR	Preplanned Responses
PQS	Personnel Qualification Standards
PV	Present Value
RE	Repetitive Exercise
SCAT	Small Craft Action Team

SFTRM	Surface Force Training and Readiness Manual
SRF	Security Response Force
SW	Surface Warfare
USMC	United States Marine Corps
VSL	Value of Statistical Life

I. INTRODUCTION

The defense capabilities of U.S. Naval ships are paramount in ensuring the security and operational success of missions. Naval vessels serve as critical assets to project power, safeguard global commerce, and uphold freedom of navigation. Among various defense mechanisms, Small Craft Action Teams (SCAT) plays a crucial role in protecting ships against small boat attacks, which pose significant threats due to their speed and maneuverability.

Adversaries, including state and non-state actors, frequently deploy small boats to harass or attack larger vessels. These threats are especially prevalent in confined waterways, such as the Strait of Hormuz, where the U.S. Navy operates under challenging conditions. SCAT must respond with precision and speed to mitigate these risks, but current practices undermine their effectiveness, leaving ships exposed during critical engagements.

A. BACKGROUND

The U.S. Navy relies on SCAT to provide a critical layer of ship defense against small, fast-moving threats (U.S. Navy, 2015). However, from our experience as Surface Warfare Officers onboard DDGs, the Navy's current approach to SCAT operations creates significant challenges, primarily due to the way these duties are assigned and evaluated. Rather than treating SCAT as a specialized function requiring dedicated personnel, the Navy assigns these responsibilities to Sailors as collateral duties. This practice forces Sailors to divide their attention between SCAT and their primary shipboard roles, reducing the time they can devote to training and preparation. As a result, the teams struggle to maintain the high levels of readiness required to respond effectively in high-pressure situations. Figure 1 illustrates Sailors onboard USS John S. McCain (DDG 56) conducting a SCAT drill, demonstrating typical procedures and readiness activities during such operations.

Figure 1. Sailors onboard USS John S. McCain (DDG 56) Conducting SCAT Drill. Source: Castaneda (2020).

SCAT operations demand rapid decision-making, precise marksmanship, and strong teamwork. Despite these requirements, Sailors performing SCAT duties often lack the focused training needed to meet these demands. The Navy's existing training framework emphasizes general readiness and procedural compliance but neglects critical performance metrics, such as hit accuracy and lethality. Without a system that prioritizes these operational outcomes, these teams remain underprepared to counter evolving threats, particularly in contested regions like 5th Fleet.

Evaluation processes further compound this issue. Current assessments measure administrative benchmarks such as watchbill accuracy and communication protocols while ignoring the team's ability to respond effectively in real-world scenarios. In many cases, teams can pass evaluations despite missing critical performance goals, creating a false sense of readiness. This approach leaves ships vulnerable to the very threats SCAT is designed to mitigate, especially in regions where adversaries use small, fast boats to exploit the defensive limitations of larger vessels.

As discussed by the Strauss Center, modern naval threats highlight the urgency of addressing these shortcomings. Adversaries, including non-state actors and regional powers, use small boats to execute swarm attacks, conduct harassment operations, and deploy explosives in close proximity to U.S. ships. These tactics exploit the speed and agility of small craft to overwhelm defensive systems, making them particularly difficult to counter. The Strauss Center discusses how the focal point of small boat attacks is centered around environments such as the Strait of Hormuz, where narrow waterways limit maneuverability, these threats become even more pronounced. SCAT must possess the skills, focus, and coordination necessary to neutralize these risks effectively, but the current system does not adequately support such capabilities (Strauss Center, 2008).

Integrating U.S. Marines into SCAT provides a practical and impactful solution to these challenges. Marines undergo extensive training in combat tactics, heavy weapons, and marksmanship, equipping them with the skills needed to operate effectively in high-stakes scenarios. Unlike Sailors, who split their time between multiple duties, a detachment of Marines can dedicate their primary focus to SCAT responsibilities, ensuring a higher level of readiness and precision. Their expertise in small unit tactics and rapid-response operations aligns perfectly with SCAT's mission, making them an ideal fit for this critical defense role.

By assigning Marines to SCAT, the Navy can address the root causes of its current challenges. Marines bring a level of specialization and combat focus that enhances the overall effectiveness of ship defenses. This integration not only strengthens SCAT but also allows Sailors to focus on their primary roles, improving overall shipboard efficiency. Additionally, the proposed solution aligns with the Department of Defense's emphasis on leveraging specialized skills to meet emerging threats, ensuring that U.S. Naval forces remain adaptable and mission-ready.

1. Problem

The Navy's current approach to manning SCAT onboard Navy destroyers exposes significant vulnerabilities in ship defense. By assigning SCAT duties as collateral responsibilities, the Navy forces Sailors to divide their focus between SCAT and their

primary shipboard roles. This multi-role expectation limits the time and attention Sailors can devote to mastering the skills needed for effective SCAT operations, such as rapid response, precision marksmanship, and team coordination under pressure. As a result, SCAT teams often enter high-risk environments underprepared, leaving ships exposed to asymmetric threats, including small boat attacks.

These challenges are compounded by deficiencies in the Navy's current training and evaluation processes. SCAT training emphasizes procedural compliance and safety rather than combat effectiveness. For instance, Sailors may meet basic qualification requirements for weapon handling but lack the opportunity to train in realistic, high-stakes scenarios. Furthermore, existing evaluations focus on administrative metrics such as proper watchbills and communication protocols while neglecting critical operational indicators like hit accuracy, and overall lethality. This administrative approach creates a false sense of readiness and fails to address the real-world demands of SCAT missions.

The Strauss Center discusses how adversaries, such as IRGCN, increasingly exploit these vulnerabilities. They employ small, fast boats to harass, swarm, and potentially overwhelm larger ships in regions like the 5th Fleet's AOR. SCAT are tasked with defending against these threats, but the current system leaves them ill-equipped to respond effectively. The USS Cole bombing in 2000, which resulted in significant loss of life and ship damage, highlights the devastating consequences of inadequate preparation for small boat threats. Although SCAT was created to address such risks, its current execution remains insufficient (Strauss Center, 2008).

The collateral nature of SCAT assignments not only limits training opportunities but also strains Sailors' capacity to perform both their SCAT duties and primary shipboard roles effectively. This multitasking diminishes overall mission readiness and places unnecessary pressure on personnel, increasing the likelihood of errors during critical moments. These systemic challenges reenforces the urgent need for a reevaluation of SCAT manning and operational practices.

To address these issues, this thesis explores the integration of Marines into SCAT as a focused and specialized solution. Marines, trained extensively in heavy weapons,

marksmanship, and combat tactics, bring a level of readiness and expertise that aligns closely with SCAT's mission. By shifting SCAT responsibilities to Marines, the Navy can reduce the burden on Sailors, improve operational effectiveness, and ensure ships are better prepared to counter modern asymmetric threats.

2. Thesis Statement

This thesis investigates the integration of Marines into SCAT onboard destroyers as a strategic solution to enhance the Navy's ability to defend its ships against increasingly sophisticated small boat threats within the AOR of 5th Fleet. By leveraging Marines' specialized combat and marksmanship training, as well as their tactical expertise in high-pressure scenarios, this study explores how their inclusion can address critical gaps in SCAT operations. These gaps include limitations in precision, readiness, and sustained lethality that currently weaken ship defenses in high-threat environments. Through a cost estimation exercise, this research evaluates the financial and operational implications of this approach, focusing on the ability to improve team cohesion, responsiveness, and overall mission effectiveness.

Through this analysis, this study provides actionable recommendations that not only bolster SCAT capabilities but also align with the DoD's broader priorities of maximizing the effectiveness of specialized personnel in critical defense roles. This integration seeks to ensure Navy destroyers are fully prepared to counter modern asymmetric threats and maintain operational superiority in contested maritime regions.

3. Benefits of this Study

This study addresses a critical shortfall in ship defense capabilities by proposing the integration of Marines into SCAT as a way to improve precision, readiness, and overall operational effectiveness. By focusing on how Marines' specialized combat training and marksmanship skills can enhance SCAT performance, this research provides a practical solution to counter the growing threat of small boat attacks in the contested maritime environment of 5th Fleet.

The findings of this study aim to deliver actionable recommendations that directly address current challenges in SCAT operations, including limited training opportunities, inconsistent evaluations, and divided responsibilities. By exploring the feasibility and impact of Marine integration, this research highlights how targeted personnel solutions can not only improve SCAT capabilities but also align with the Department of Defense's emphasis on deploying specialized skills to critical defense roles.

Additionally, this study contributes to a broader understanding of how the Navy can adapt existing frameworks to meet modern operational demands. It provides a clear example of how leveraging highly trained personnel in specific roles can enhance ship defense while supporting overall mission success. By addressing SCAT-specific vulnerabilities, this research also reinforces the importance of ensuring the safety of crews and maintaining operational superiority in high-risk areas.

This work serves as a step toward improving the Navy's ability to respond to evolving threats while maintaining its strategic advantage in contested maritime regions. Beyond its immediate application to SCAT, this study encourages further exploration of how integrating specialized personnel can strengthen other defense systems across the fleet.

B. RESEARCH QUESTIONS

1. Primary Research Question

- What alternative is available to conduct SCAT duties onboard U.S. Navy destroyers deploying to 5th Fleet?

2. Secondary Research Question

- What are the results of a cost estimate exercise of manning options to incorporate Marines in SCAT?

C. METHODOLOGY

In this study, we evaluate the potential of integrating Marines into SCAT onboard U.S. Navy destroyers as a means of enhancing shipboard defense, especially in high-threat

areas like 5th Fleet. We begin with a comparative analysis of personnel qualifications and training, focusing on the distinctions between Navy Sailors, who perform SCAT duties as a collateral responsibility, and Marines, particularly 0331 machine gunners, who bring specialized skills in heavy weaponry and tactical combat. This comparison helps us pinpoint differences in training intensity, marksmanship proficiency, and operational readiness, providing a clear basis for understanding how Marines might elevate SCAT performance.

We continue with an operational assessment, focusing on the readiness of Marine Corps personnel to fulfill SCAT roles by analyzing their training protocols and evaluating their compatibility with shipboard operations. By examining Marine Corps training documents, including NAVMC 3500.44, alongside SCAT certification processes as outlined in the SFTRM, we determine how effectively Marine training aligns with SCAT's operational requirements and pinpoint any procedural adjustments necessary for seamless integration.

A cost estimate exercise follows, evaluating the financial viability of integrating Marines into SCAT by calculating expenses related to personnel, including base pay, hazardous duty pay, sea pay, and other associated costs. This analysis contrasts these expenses with projected benefits, particularly the potential to prevent high-cost incidents, such as the USS Cole bombing, through enhanced defensive capabilities. The cost estimate framework quantifies the operational advantages and cost savings that Marine-supported SCAT could provide, highlighting both immediate and long-term impacts on defense readiness.

Finally, we evaluate alternative solutions through a counterargument analysis. Here, we explore options like enhanced SCAT training for Sailors and adjusted manning structures to see if these adjustments could achieve similar improvements without Marine integration. By identifying training gaps, feasible manning adjustments, and running comparable scenarios, we determine whether these alternatives could realistically close the performance gaps we've identified.

Each step of this approach contributes essential insights, which we combine to offer a comprehensive view of Marine integration's potential impact on SCAT effectiveness. This structured analysis ultimately provides actionable recommendations for strengthening shipboard defense, advancing the Navy's operational readiness in high-threat maritime regions.

D. THESIS ORGANIZATION

This thesis is organized into six chapters to systematically address the integration of Marines into SCAT onboard Navy destroyers operating in 5th fleet AOR and its potential to enhance ship defense capabilities.

Chapter I serves as an introduction and provides the background and scope of this thesis. It outlines the issue of manning SCAT onboard U.S. Navy destroyers with Sailors as a collateral duty, discusses the potential benefits of integrating U.S. Marines into these roles, and states the research questions. This chapter emphasizes the importance of SCAT operations in ship defense and the current problems with the existing manning model, particularly the impact on operational readiness and combat effectiveness.

Chapter II provides an overview of SCAT operations and their critical role in defending against small boat attacks. It also explores the differences between Sailors' and Marines' training pipelines to demonstrate which group is better equipped to handle SCAT duties. This chapter reviews the current certification and training processes aboard U.S. Navy destroyers, identifying challenges in maintaining readiness and effectiveness. Lastly, we layout the groundwork for an integration plan to achieve team cohesion during a ship's OFRP cycle.

Chapter III consists of a literature review summarizing key research and documents that pertain to SCAT operations and Marine integration. It reviews studies on naval defense strategies, the role of specialized personnel in enhancing operational effectiveness, and the challenges of asymmetric threats. The chapter incorporates lessons learned from integrating Marines into other shipboard roles, such as VBSS teams, to draw parallels with the proposed SCAT improvements. Additionally, it discusses theoretical frameworks for training and manning optimization, providing a robust foundation for evaluating the

feasibility and impact of Marine integration. The review identifies gaps in current literature, highlighting the need for targeted solutions to SCAT's challenges.

Chapter IV discusses the methodology used to assess the operational, financial, and logistical impacts of Marine integration. We conduct a focused cost estimation exercise to evaluate the feasibility of integrating U.S. Marines into SCAT onboard U.S. Navy destroyers. The analysis calculates the costs associated with assigning a Marine detachment, including basic pay, sea pay, and hazardous duty pay for four E-3 Marines over a deployment period. By examining these financial aspects, the study provides a clear picture of the resource implications of this integration. The chapter also evaluates how these costs compare to the operational advantages gained from improved precision, readiness, and lethality in SCAT operations. This assessment highlights the practical considerations of Marine integration, offering a data-driven perspective to inform decision-making.

Chapter V focuses on presenting and analyzing counterarguments to the proposed integration of Marines into SCAT onboard U.S. Navy destroyers. These alternatives include enhancing SCAT-specific training for Sailors and upgrading existing evaluation frameworks. Each alternative is analyzed for feasibility, effectiveness, and resource implications. Counterarguments addressing potential drawbacks of Marine integration, such as logistical challenges and strain on Marine resources, are considered to provide a balanced perspective.

Chapter VI provides a summary of findings, conclusions, and recommendations based on the research and model results. It highlights the operational, financial, and strategic advantages of the proposed solution, such as improved readiness, enhanced lethality, and reduced vulnerabilities to small boat threats. The chapter offers actionable recommendations for implementing Marine integration, including suggested timelines, training requirements, and logistical adjustments. It also identifies areas for future research, such as evaluating the long-term impact of Marine integration on shipboard operations and exploring its applicability to other fleet areas. This chapter emphasizes the broader implications of the study for naval defense strategy and highlights its potential to strengthen the Navy's defensive posture in contested maritime regions.

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II. BACKGROUND

Assigning SCAT duties to Sailors is a key component of the Navy's strategy to counter small boat threats. This section outlines SCAT's current practices, examines the policies guiding their operations, and explores the practical challenges of their implementation. It provides context for understanding how these teams operate, the limitations they face, and the broader strategic environment in which they serve.

A. SCAT PRACTICES AND CHALLENGES

SCAT is crucial to a ship's defense, tasked with countering fast-moving, close-in threats that larger weapon systems often fail to neutralize effectively (U.S. Navy, 2015). These threats, such as small boats armed with explosives or weapons, require rapid, precise, and well-coordinated responses. Despite SCAT's importance, the Navy assigns these duties as collateral responsibilities to Sailors, forcing them to balance SCAT tasks with their primary shipboard roles. This multi-role approach aims to maximize personnel utilization but often compromises the overall effectiveness of SCAT teams.

SCAT operations today are integral to ship safety, particularly during straits transits and Sea & Anchor evolutions, which involve pulling into or out of port or navigating restricted waters. During these evolutions, four SCAT mounts are typically manned to provide 360-degree coverage against potential threats. These mounts (503, 504, 507, and 508) are strategically positioned around the ship to maximize defensive coverage. SCAT members operate crew-served weapons, such as .50 caliber machine guns or M240s, to address threats that may emerge quickly and with little warning in congested maritime environments. These operations are particularly critical in contested regions, such as the 5th Fleet's area of responsibility, where adversaries frequently exploit narrow waterways and restricted maneuvering conditions to harass or threaten naval vessels. Figure 2 displays the SCAT mount locations onboard a DDG, highlighting their strategic positioning to provide comprehensive defensive coverage.

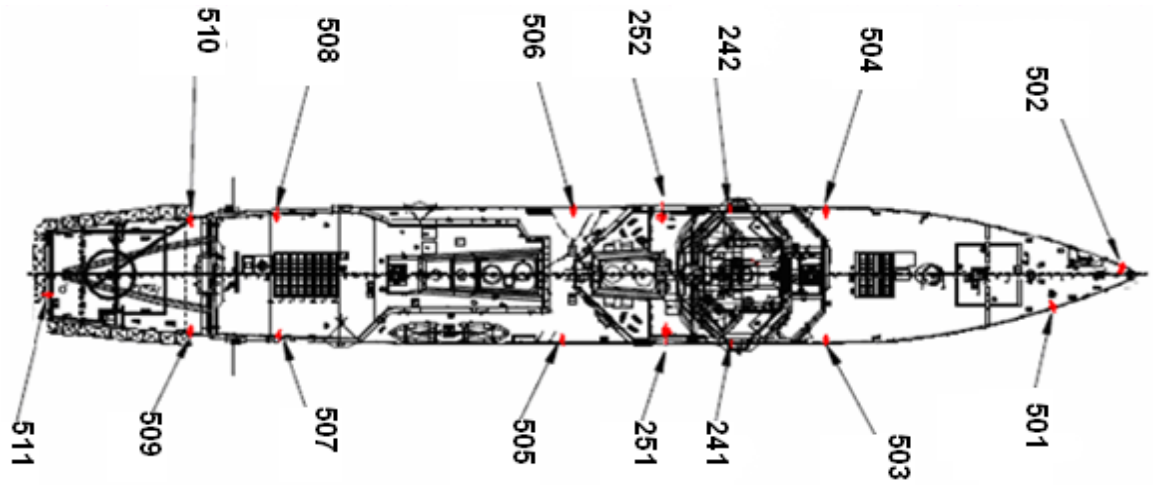

Figure 2. SCAT Mount Locations onboard a DDG. Adapted from Federation of American Scientists (2024).

However, the complexity of modern naval operations and the sophistication of potential threats have revealed the limitations of this practice. Sailors, often engaged in other critical shipboard duties, find it challenging to dedicate the necessary time and focus to hone their marksmanship skills and maintain readiness for SCAT duties. This multitasking requirement results in a dilution of effectiveness, as evidenced by the significant number of missed targets during live-fire exercises.

B. RELEVANT POLICIES AND GUIDANCE

The U.S. Navy's policies and guidance on SCAT operations are detailed in various military instructions and government documents. The NTTP 3–07.2.1 and NTTP 3–07.2.3 provide comprehensive guidelines on the formation, training, and deployment of SCAT units. These documents emphasize the importance of regular training, procedural compliance, and employment of SCAT. Although the use of SCAT is contingent on CO discretion, there are eight principles of machine gunnery highlighted in NTTP 3–07.2.1 that are not meant to serve as absolutes, but as sound ideas proven in combat.

1. Mutual Support. No machine gun should be placed in isolation. Machine guns should be placed where they can cover each other by fire. In some instances, it may be necessary to have other weapons (M203) provide cover fire. Protection of machine guns should be of primary concern. Accordingly, an important facet of the principle of mutual support is

security. Since machine gun positions inflict devastating fire upon the enemy, they will come under concentrated attacks by the enemy in an attempt to stop the fire. To provide protection and security, well-placed riflemen, and/or automatic riflemen, cover approaches that the enemy may use to attack the CSW positions. For example, although machine guns should be placed on the flanks to provide defense, they should not be placed in the outermost position since this leaves them vulnerable to a flanking attack.

2. Employed in Pairs. Employing machine guns in pairs ensures a continuous, high volume of fire. It also gives the guns the capability of engaging targets of larger width or depth than one machine gun could effectively engage alone. Employment in pairs also provides the opportunity for continued fire from one machine gun while the other machine gun is reloading or clearing a malfunction or stoppage.
3. Coordination of Fire. Ensure machine gun fire is coordinated with the fires of other machine guns. In the defensive, the machine gun forms the backbone (last line of defense) around which other weapon systems are organized.
4. Positioned in Defilade. If at all possible, CSW positions should be in defilade. As previously discussed, the enemy will quickly target gun positions, trying to neutralize or destroy them. Placing the machine guns in defilade provides some substantial cover between them and the enemy's direct fire weapons. This could be essential to their survival.
5. Positioned to Produce Enfilade Fire. To achieve the greatest effect from the machine gun, position it so that the long axis of the cone of fire coincides with the long axis of the target. This type of fire, called enfilade fire, causes the maximum amount of rounds to be concentrated on the maximum amount of targets, significantly increasing the chances of hitting targets. Enfilade fire is normally associated with flanking fire.
6. Interlocking Fire. Ensuring that fire from one machine gun position interlocks with the fire of other machine gun positions prevents gaps through which the enemy can easily advance and attack friendly positions. Machine gun fire properly augmented with obstacles and other weapons effects should form a wall of steel between friendly positions and the enemy.
7. Cover and Concealment. Well-planned and well-prepared alternate and supplementary positions that provide cover and concealment for machine guns are essential. Employ machine guns from a covered and, if possible, concealed position. Once machine guns' open fire they may be located by the enemy and become high priority targets. When tactically feasible, employ machine guns from a defilade or partial defilade position. This provides cover and some concealment. The use of cover and concealment protects the guns and their crews.
8. Economy. Machine guns fire at high rates making excessive ammunition consumption a concern. To conserve ammunition, gunners

> should be trained to count the length of the burst and to time the pause in between bursts. Another way to conserve/regulate ammunition expenditure is to employ machine guns in pairs or to use alternating fires. In alternating fires, as one machine gun finishes its burst and is about to pause, the other machine gun opens fire. This technique is known as talking guns. In addition to controlling ammunition consumption, these techniques also reduce the wear and tear on a machine gun's operating parts, prevent overheating, and minimize damage to barrels. Finally, do not engage single enemy personnel with a machine gun. (Office of the Chief of Naval Operations, 2019, p. 6-3)

SCAT certification is governed by the SFTRM, the primary instruction for this process. CE 06 and 19 are specific to SCAT, and fail to assess the team's lethality, instead focusing on watchbill compliance, communications, and misfire procedures. Our analysis of the CE revealed that the SCAT section within SW was viewed as less critical, given the low threshold for passing its assessments. This has led us to believe that SCAT is frequently overlooked, contributing to a vulnerability in ship defense.

Moreover, the DoD has issued several directives aimed at enhancing shipboard defense capabilities. These include the integration of advanced training simulators and the development of specialized training programs tailored to the unique demands of SCAT operations. Despite these efforts, the practical challenges of divided responsibilities and insufficient specialization among Sailors assigned to SCAT roles persist.

1. SCAT Certification

The SCAT certification process, as outlined in the SFTRM, falls under the Surface Warfare and Anti-Terrorism mission area and is categorized as a unit tactical (Tier 2) mission. This classification means that a ship is required to certify in this mission only once every OFRP cycle, or roughly every 36 months. CE 06 and 19, which are specific to SCAT, fail to accurately assess the team's combat effectiveness, focusing instead on procedural elements such as watchbill compliance, communications protocols, and misfire procedures. Our analysis indicates that the SCAT certification process is often viewed as less critical within Surface Warfare, in part due to the low thresholds for passing these assessments. This oversight has contributed to a vulnerability in overall ship defense (Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic, 2022).

Following initial certification, ships are required to complete REs to maintain their certification throughout the 36-month period. Specifically, RE05 applies to SCAT and must be conducted quarterly. However, like the CEs, RE05 does not provide an adequate assessment of a SCAT's lethality. Furthermore, it is a ship-conducted self-assessment, which opens the door to potential bias and diminishes the effectiveness of the evaluation. The combination of infrequent certification and superficial self-assessments leaves SCAT insufficiently prepared to respond to real-world threats, undermining the ship's defensive posture (Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic, 2022).

By prioritizing administrative and procedural checks over combat readiness, the current SCAT certification and training process falls short of ensuring that teams possess the necessary lethality to protect the ship in high-threat environments. This gap needs to be addressed to mitigate vulnerabilities in ship defense.

2. SCAT Member Qualification and Sustainment Requirements

Per the 3300.1F instruction, all armed watch standers are required to complete the Navy Security Force Weapons (NAVEDTRA 43466-D) PQS and Antiterrorism Common Core (NAVEDTRA 43387-2F) PQS to qualify for their assigned duties. These standards establish the necessary foundation for weapon handling, safety, and operational readiness. The CO decides which PQS items must be completed for each qualification, allowing flexibility but also creating potential inconsistencies in training rigor across commands. Commands must use OPNAV Form 5512/2 or a Master Qualification List to document qualifications (Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic, 2024b). The MQS must contain the following:

- Date of AA&E screening and expiration (annual).
- Date of DD Form 2760 screening and expiration (annual).
- Date of Deadly Force training and expiration (quarterly).
- Date of initial OC exposure.
- Date of Non-Lethal Weapons (NLW) training and sustainment due (annual).
- Date of NHQC qualification and expiration.
- Date of Pistol sustainment due and completed.

- Date of HPWC.
- Date of HLLC.
- Date of RQC qualification and expiration.
- Date of Rifle sustainment due and completed.
- Date of RLLC.
- Date of Shotgun Practical Weapon Course (SPWC) qualification and expiration.
- Date of M240 Qualification and expiration.
- Date of M240 semi-annual sustainment drill sets completed.
- Date of M2 Qualification and expiration.
- Date of M2 semi-annual sustainment drill sets completed.
- CAT 1 or CAT 2 will follow member's last name on the MQL. (Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic, 2024b)

Personnel must also undergo semi-annual sustainment training, which includes marksmanship, safety, and weapon familiarization. This training must occur between 120 and 240 days after their last qualification to ensure they maintain proficiency. Additionally, all personnel must complete live-fire qualifications annually, with the qualification expiring on the last day of the month in which it was earned. For afloat commands deployed for 90 days or more, qualifications may be extended up to three months after returning to homeport if range access is limited during deployment (Chief of Naval Operations, 2021).

SCAT members, as Category 2 personnel responsible for securing DoD assets, must adhere to these standards. This category includes law enforcement, non-expeditionary security forces, rover watches, and security reaction force personnel. Navy personnel in Category 2 who are armed with machine guns must also pass an annual performance evaluation to maintain their qualifications. Per COMNAVSURFPAC/ COMNAVSURFLANTINST 3300.1F the minimum number of qualified crew-served weapon personnel for shipboard certification purposes is 36 onboard DDGs; the maximum number for NCEA planning and allocation is 108 (Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic, 2024b). Table 1 summarizes the Cat-II Small Arms Qualification Requirements per unit, delineating the standards for operational readiness and qualification maintenance.

Table 1. Cat-II Small Arms Qualification Requirements per Unit. Source: Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic (2024b).

Weapon	MCM	LCS	CG, DDG, LPD, LSD, & LCC	LHA/LHD ISF CONSTRUCT	LHA/ LHD	DDG 1000	ESB
Pistol	24 (min) 48 (max)	44 (min) 110 (max)	108 (min) 324 (max)	80 (min) 702 (max)	140 (min) 702 (max)	84 (min) 168 (max)	32 (min) 98 (max)
Rifle	18 (min) 36 (max)	24 (min) 72 (max)	36 (min) 108 (max)	36 (min) 108 (max)	36 (min) 108 (max)	24 (min) 48 (max)	12 (min) 24 (max)
Shotgun	8 (min) 16 (max)	12 (min) 36 (max)	12 (min) 36 (max)	12 (min) 54 (max)	18 (min) 54 (max)	18 (min) 36 (max)	4 (min) 8 (max)
Crew Served Weapon	18 (min) 36 (max)	18 (min) 54 (max)	36 (min) 108 (max)	36 (min) 108 (max)	36 (min) 108 (max)	36 (min) 72 (max)	8 (min) 36 (max)

Per the OPNAVINST 3591.1G, the light, medium and heavy machine gun qualification involves a six-phase, 100-round course of fire, conducted on a 400-meter range, either ashore or afloat. Targets are usually 8-by-8-foot structures, such as old tanks or trucks on land, or a "killer tomato" target at sea, placed at 400 to 500 yards. Any rounds not fired due to weapon malfunctions must be fired as alibis after the malfunction is resolved. The course of fire evaluates the shooter's ability to safely manipulate the machine gun, including setting headspace and verifying timing before engaging the target. Shooters must demonstrate proficiency in loading, unloading, and reloading procedures while engaging the target with controlled three- to five-round bursts. After completing five phases of fire, shooters must perform a barrel change and reset headspace and timing, which constitutes the sixth phase (Chief of Naval Operations, 2021). Table 2 provides an overview of light and medium machine gun performance standards, illustrating the requirements for marksmanship and operational proficiency. Table 3 outlines the heavy machine gun performance evaluation criteria, emphasizing the key metrics for assessing shooter capabilities during qualification events.

Table 2. Cat-II Light and Medium Machine Gun Performance Summary Table. Source: Chief of Naval Operations (2021).

Phase	Purpose	Distance (meters)	Rounds	Starting Condition	Starting Position	Sequence
1	Zero or established hold	400m	20	4	Prone-Bipod Standing-Mounted	20 rounds (3 minutes)
2	Engage target	400m	20	3	Prone-Bipod Standing-Mounted	20 rounds (15 seconds)
3	Engage target	400m	20	4	Prone-Bipod Standing-Mounted	20 rounds (20 seconds)
4	Reload	400m	2X10	4	Prone-Bipod Standing-Mounted	One 10-round belt reload; one 10-round belt, reload time limit 15 seconds
5	Reload	400m	2X10	3	Prone-Bipod Standing-Mounted	One 10-round belt reload; one 10-round belt, reload time limit 15 seconds
6	Barrel change	Not applicable (N/A)	N/A	N/A	Unload, show clear	Change barrel

Table 3. Cat-II Heavy Machine Gun Performance Evaluation Summary
Table. Source: Chief of Naval Operations (2021).

Phase	Purpose	Distance (meters)	Rounds	Starting Condition	Starting Position	Sequence
1	Zero or established hold	400m	20	4	Sitting-tripod; standing-mounted	20 rounds (3 minutes)
2	Engage target	400m	20	3	Sitting-tripod; standing-mounted	20 rounds (15 seconds)
3	Engage target	400m	20	4	Sitting-tripod; standing-mounted	20 rounds (20 seconds)
4	Reload	400m	2X10	4	Sitting-tripod; standing-mounted	One 10-round belt, reload one 10-round belt, reload time limit 20 seconds
5	Reload	400m	2X10	3	Sitting-tripod; standing-mounted	One 10-round belt, reload one 10-round belt, reload time limit 20 seconds
6	Barrel change	N/A	N/A	N/A	Unload, show clear	Change barrel Set and verify headspace and timing

Scoring is based on the shooter's ability to safely operate the weapon, knowledge of condition codes, and accurate target engagement. The ship's CSWI evaluates the shooter's overall competency, determining whether they meet the required standard. The shooter must maintain a consistent beaten zone on the target throughout the evaluation.

While this process ensures that shooters meet a minimum proficiency level, it primarily focuses on individual performance rather than team lethality in combat scenarios. The reliance on the ship's CSWI's subjective judgment adds variability to the evaluation, potentially leading to inconsistencies in the assessment of a team's true combat readiness.

To address these gaps, more rigorous and objective evaluations are needed to provide a clearer understanding of SCAT's overall lethality and operational effectiveness.

3. Marine Training

For this thesis, we are focusing on 0331 Marines for our analysis because their role is highly aligned with the mission of SCAT. As machine gunners, 0331 Marines are trained to deliver sustained suppressive fire and provide critical tactical support in high-threat environments, making their expertise directly relevant to SCAT operations. The structured and rigorous training regimen that 0331 Marines undergo ensures they can operate effectively in both offensive and defensive scenarios, skills that are essential for SCAT's role in ship defense. Figure 3 depicts a U.S. Marine Machine Gunner (0331) conducting routine training, exemplifying the level of combat readiness and marksmanship proficiency Marines bring to SCAT operations.

Figure 3. U.S. Marine Machine Gunner (0331) Conducting Routine Training. Source: Before the Corps (2022).

Following basic training, 0331 Marines attend the Infantry Machine-Gunner Course, where they become proficient with various machine guns, including the M240 and the M2HB used by SCAT. This training prepares them to operate in dynamic combat environments, where precision and control are critical. Machine gunners must also continuously reinforce their skills through on-the-job training and formal evaluations, ensuring they are always prepared to deliver effective firepower (Headquarters United States Marine Corps, 2020).

Accuracy and lethality are central to 0331 training. Marines learn to engage targets with precise, controlled bursts to maintain a beaten zone and ensure maximum effectiveness. They are trained to calculate fields of fire, adjust for range and windage, and hit both static and moving targets. Live-fire drills and field exercises emphasize their ability to place rounds accurately on target while managing the heat and wear on their weapons over sustained periods of fire (Headquarters United States Marine Corps, 2020). Through these exercises, Marines are trained to optimize their firepower, ensuring that each burst of fire is both lethal and effective in neutralizing enemy threats.

The advanced training that 0331 Marines receive, such as through the Advanced Machinegun Course, hones their ability to tactically employ machine guns in complex combat situations. This training teaches them how to integrate machine gun fire into both defensive positions, where they provide critical protective fires, and offensive operations, where they deliver suppressive fire to allow maneuver units to close with and destroy the enemy (Headquarters United States Marine Corps, 2020).

Leadership is a key component of 0331 training. As Marines move up in rank, they are expected to lead their teams in combat, positioning their weapons to maximize effectiveness and coordinating fire with adjacent units. Their ability to manage machine gun fire in support of broader mission objectives is continuously refined through regular drills, field exercises, and mission-specific training events (Headquarters United States Marine Corps, 2020).

In the Marine Corps Infantry Weapons Platoon, the Gunner serves as a key combat asset, executing the orders of the Team Leader or unit leader with precision and reliability.

Typically holding the rank of Lance Corporal (E-3), the Gunner is responsible for maintaining the condition and readiness of their assigned weapon and equipment, ensuring both efficiency and effectiveness in combat scenarios. Their primary duty is the accurate and controlled delivery of suppressive and direct fire as directed by the Team Leader, making them indispensable in achieving tactical objectives. Armed with the M4 carbine as their standard issue weapon, the Gunner also carries and operates the medium machine gun, providing critical firepower to the unit during operations (Headquarters United States Marine Corps, 2020). Their core capabilities are as follows:

- Carries out the orders of the machinegun Team Leader.
- Performs the tasks required of a Gunner in a machinegun team.
- Performs operator maintenance for and operates all machineguns and all organic optics.
- Performs operator maintenance for and is a proficient marksman with the M4 carbine and T/O machinegun.
- Performs fire and movement as an individual and as a member of a machinegun team.
- Locates, closes with, suppresses, and destroys the enemy by fire and maneuver.
- Repels the enemy assault by fire and close combat. (Headquarters United States Marine Corps, 2020)

The expertise of 0331 Marines enhances SCAT operations by significantly increasing the lethality and tactical effectiveness of the team. Their specialized training and experience ensure that SCAT units are not only proficient in weapons handling but also capable of executing complex fire missions, addressing a critical gap in current SCAT certification standards.

C. THE SHIPBOARD ENVIRONMENT

The environment aboard naval ships is highly dynamic and demanding. Sailors must navigate a complex array of tasks, from routine maintenance to emergency responses, all while operating in confined and often hazardous conditions. The shipboard environment necessitates a high level of adaptability and multitasking, further complicating the effective performance of SCAT duties.

Recent advancements in naval technology and weaponry have introduced new layers of complexity. For instance, the integration of automated systems and advanced radar technologies has enhanced the ship's overall defense capabilities. However, the human element remains crucial, particularly in scenarios requiring rapid decision-making and precise execution, such as those involving small boat threats.

1. Collateral Duties for Sailors

In the Navy, collateral duties have long been recognized as a hindrance to the performance of Sailors in their primary roles. Sailors face significant challenges in maintaining high levels of readiness and performance due to the distractions imposed by additional responsibilities. This issue becomes particularly critical for roles like the SCAT, where specialized training, focus, and mental readiness are paramount for the safety of the ship and its crew. Currently, being on SCAT is a collateral duty for Sailors. When a Sailor's focus is split between SCAT and other tasks, it detracts from their ability to perform at a high level, potentially leading to dire consequences for ship defense in critical moments.

Collateral duties demand time and mental resources that would otherwise be devoted to warfighting and mission-critical tasks. Sailors are often forced to divide their attention between multiple responsibilities, which reduces their effectiveness in each area. A clear parallel can be drawn from Etter's discussion on Marine aviators, who found that the demands of collateral duties impaired their ability to fully develop their aviation skills (Etter, 1986). This scattered attention diminishes proficiency in key competencies, such as SCAT readiness. The result is a decline in overall mission performance, which poses risks to both ship safety and operational success.

Recognizing this challenge, the Navy has recently taken steps to alleviate the burden of collateral duties, enabling Sailors to focus more on their core functions. A recent NAVADMIN from the Chief of Naval Operations outlined the elimination of seven shipboard collateral duties including Athletics Officer, Library Officer, and Health Benefits Advisor with the explicit intent of "removing burden from Sailors" and "allowing more time to focus on core warfighting" (Chief of Naval Operations, 2017). This initiative reflects a broader understanding that collateral duties detract from Sailors' ability to

perform effectively in mission-critical roles, such as SCAT. By reducing administrative overhead, Sailors can concentrate on their warfighting roles, rather than on outdated or unnecessary collateral responsibilities.

The Navy's goal is to ensure that Sailors are not overburdened by these additional duties, allowing them to excel in tasks that are most crucial to mission success. For SCAT, eliminating this as a collateral duty altogether and instead making it a primary responsibility for Marines attached to ships would significantly enhance the effectiveness and lethality of SCAT. Marines, whose primary mission on these ships would be SCAT operations, would have the capacity to focus solely on this critical role, thereby improving the overall safety and operational readiness of the ship.

The modern Navy faces significant challenges with the distribution of duties among its Sailors. Through extensive operational experience across multiple ship tours, we've observed a consistent pattern of individual Sailors managing three or more concurrent responsibilities. Every Sailor reporting aboard immediately becomes part of the ship's damage control organization, tasked with combating potentially catastrophic fires and flooding (Holwitt & Hays, 2022). They must simultaneously maintain proficiency in their primary rate-specific duties, which they've trained for since boot camp. Beyond these fundamental responsibilities, Sailors are expected to take on additional collateral duties to both support the ship's mission and enhance their advancement opportunities. These collateral duties include, but are not limited to: Medical Response Team, SCAT member, Junior Enlisted Association member, Command Fitness Leader, Command Managed Equal Opportunities team member, Command Pay and Personnel Administrator, Drug and Alcohol Program member, Security Program Manager representative, Mail Control Officer, Urinalysis Program member, and Morale Welfare and Recreation representative (U.S. Department of the Navy, Naval Service Training Command, 2023). This dispersion of responsibilities across multiple domains often compromises a Sailor's ability to perform any single duty with maximum effectiveness. While deficiencies in some collateral duties might have minimal operational impact, inadequate performance in critical areas like SCAT could expose the ship to serious vulnerabilities, potentially compromising force protection capabilities.

The experience of Marine aviators, who improved proficiency when relieved from excessive collateral duties, serves as a compelling example. By removing unnecessary collateral roles, the Marines were able to sharpen their primary skills and focus on their core aviation tasks. Applying this model to SCAT could dramatically improve ship defense capabilities. Bringing Marines aboard ships specifically to handle SCAT duties as their primary job would ensure that these teams are better prepared, more focused, and ultimately more effective in protecting the ship from threats.

In conclusion, transitioning SCAT responsibilities to Marines would enable a dedicated focus on ship protection and threat elimination, while freeing Sailors to concentrate on other essential warfighting tasks. This strategy could result in a significant improvement in both ship safety and operational readiness, creating a more efficient and effective defense system aboard Navy ships.

2. Historical Integration of Marines on Ships

Historically, Marines have played a crucial role aboard U.S. Navy ships, providing security and participating in both shipboard defense and amphibious assaults. Since their formal organization in 1798, Marines have been integral in combat operations, from the Barbary Wars to battling pirates and securing American interests worldwide. Their versatility, training, and effectiveness in ship-based operations established their value in the naval service (United States Marine Corps University, 2006).

In the context of modern naval operations, particularly against small, fast-moving pirate boats, Marines' combat readiness and marksmanship skills make them ideal candidates for integration into SCAT. These agile vessels require accurate and swift responses, which aligns well with the historical strengths of Marine detachments. By placing Marines aboard current Navy destroyers as SCAT members, their precision and tactical expertise could enhance ship self-defense capabilities, addressing a critical need in countering asymmetric maritime threats. Their ability to operate effectively in high-pressure situations mirrors the combat scenarios they historically faced, making them a valuable asset in modern naval defense against piracy and other small boat threats.

The historical application of Marines aboard Navy ships dates back to the late 18th century, where they were crucial in defending ships and engaging in both naval and ground combat. Marine detachments served many purposes, including providing security and defense, showcasing their versatility during operations such as capturing shore batteries and combating piracy in the Barbary Wars. According to Edwards, the use of Marines on ships continued into the 20th century during WWII. On ships, a Marine "detachment consisted primarily of maintaining the internal security of the ship, manning secondary gun batteries in action, and forming landing parties as needed (Edwards, n.d.)." Depending on the size of the ship, a detachment of Marines varied in size, with battleships receiving the largest complement of around 100 enlisted Marines led by multiple officers. Heavy cruisers and carriers were assigned approximately 80 enlisted Marines with one or two officers, while light cruisers operated with smaller detachments of about 45 enlisted Marines under a single officer's command. Marines historically sought out sea duty assignments due to their inherent opportunities for global travel and potential for action. The prospect of serving as part of a ship's landing force in foreign ports particularly appealed to Marines' expeditionary nature and desire for adventure (Edwards, n.d.; Waterhouse & Smith, 2006).

These early experiences of Marines fighting alongside Sailors at sea demonstrate their value in asymmetric warfare, such as against modern-day pirates. Their disciplined approach to "punitive actions against pirates and hostile governments" further reinforces how their specialized skills could be effectively leveraged on today's Navy destroyers as SCAT members (Waterhouse & Smith, 2006, pp. 3). The deployment of Marine detachments during World War II provides a compelling model for enhancing modern destroyer capabilities. During WWII, Marines demonstrated exceptional versatility by simultaneously providing internal ship security, supporting naval gunfire operations, and maintaining rapid-response landing capabilities these skills remain relevant to today's maritime security challenges. In an era where destroyers are facing increasingly complex asymmetric threats, particularly in contested waters, the integration of Marines could significantly enhance a ship's SRF and SCAT capabilities. Their inherent flexibility, advanced combat training, and historical compatibility with naval operations make them ideally suited to provide an additional layer of tactical expertise in high-threat regions

where ships face diverse challenges from small boat attacks to potential boarding efforts. By integrating Marines, who have a long history of defending ships from small, agile threats, the Navy can significantly strengthen its defenses against new-age pirate attacks that require swift and accurate responses.

D. PRACTICAL AND MILITARY CONTEXT

The practical and military context of SCAT operations is emphasized by the need for effective defense mechanisms against asymmetric threats. Small boat attacks, which involve fast, agile vessels equipped with explosives or weapons, pose a significant risk to naval ships. These threats are often employed by non-state actors or during irregular warfare scenarios, making them a critical focus of the Navy's defensive strategies.

Historically, incidents such as the USS Cole bombing in 2000 have highlighted the devastating impact of small boat attacks. In response, the Navy has prioritized the development of robust SCAT units capable of countering such threats. However, the current practice of assigning SCAT duties as collateral responsibilities has proven insufficient in ensuring the necessary precision and readiness.

1. Small Boat Threat

Small boat threats pose a significant challenge to naval operations, especially in high-tension regions such as the 5th Fleet's AOR. According to Shapira, the IRGCN and Iran proxy groups frequently employs small, fast boats as part of its asymmetric warfare strategy. These vessels, ranging from modified fishing boats to armed fast-attack craft, are difficult to detect and engage. They thrive in the narrow waters of the Persian Gulf and the Strait of Hormuz, where larger ships struggle with limited maneuverability. The geography of the region enhances the threat, allowing small boats to close in on larger vessels quickly, using speed and agility to evade detection. The IRGCN regularly uses this advantage to harass U.S. Navy ships and commercial vessels, posing a direct threat to operations. The threat of these small boats is especially pertinent considering their frequent use in swarming tactics, where multiple boats converge on a larger vessel from various directions. This overwhelming strategy often leads to ships being unable to defend themselves effectively, as the sheer number of attackers saturates a ship's defenses, increasing the likelihood of a

successful strike (Shapira, 2024). Figure 4 presents an image of an IRGCN fast inshore attack craft, highlighting the type of small boat threats commonly encountered in high-risk regions such as the Persian Gulf.

Figure 4. IRGCN FIAC. Source: GlobalSecurity.org (2022)

This type of threat has been increasingly recognized worldwide, evidenced by the recent attack on the Cordelia Moon as discussed by Gambrell on October 1, 2024. The Panama-flagged cargo ship was struck by an explosive drone boat launched by Houthi rebels in the Red Sea. The rebels used a combination of ballistic and winged missiles, drones, and uncrewed surface boats to target the vessel. Despite the attack causing significant damage to the ship's ballast tank, the crew remained unharmed, and the ship was able to continue its journey. This incident illustrates the evolving nature of maritime threats, particularly as Iranian proxy groups such as the Houthis begin to employ increasingly sophisticated methods, such as drones and unmanned vehicles, to disrupt commercial shipping. Gambrell's documentation of the attack on the Cordelia Moon attack bears a strong resemblance to tactics used by the IRGCN in the Persian Gulf. Both scenarios involve fast, small vessels targeting larger, less maneuverable ships, which are ill-equipped to defend against such agile threats. This points to the growing concern that, as drone technology continues to improve and

proliferate, traditional defense systems may struggle to keep pace with the speed and creativity of these asymmetric attacks (Gambrell, 2024).

The attack on Cordelia Moon highlights the increasing use of drone boats and other small, fast craft as effective weapons in modern asymmetric warfare. Much like the IRGCN's tactic of swarming, the Houthis used a multi-pronged approach to overwhelm the ship's defensive systems. While the Cordelia Moon survived the attack, it underscores the vulnerability of larger ships to these small boat threats. The Houthi rebels' ability to launch such an attack successfully in the Red Sea further exemplifies the challenges faced by commercial and military ships operating in contested maritime zones. As evidenced by this and other similar attacks, small boat threats are no longer limited to swarming tactics using traditional fast boats. Rather, the integration of drone boats and advanced missile systems further complicates defense strategies. This growing sophistication makes it even more critical for naval forces to adapt their tactics to respond to these emerging threats.

In this context, SCAT play an essential role in defending against these small boat threats. In scenarios like the Cordelia Moon attack, SCAT teams would be responsible for responding swiftly to intercept and neutralize such threats before they can damage the vessel. These threats directly target the weaknesses of larger ships, and SCAT must be trained to respond rapidly and effectively to protect the vessel. The geography and operating environment in regions like the Red Sea and the Persian Gulf make it crucial for SCAT to maintain a high level of readiness, as small boats often appear with little warning and can close in fast.

With scenarios that occur frequently from the IRGCN who employ small agile crafts that often operate "in an unsafe and unprofessional manner" which approach Navy ships "head-on at a dangerously high speed" it is imperative that the Navy's SCAT meet these new challenges (U.S. Central Command, 2024). The use of drones and unmanned boats, like those seen in the Cordelia Moon attack, adds a new layer of complexity to small boat defense. These technologies allow for more precise targeting and can bypass some of the traditional defense systems that larger ships rely on, making SCAT's quick response times even more essential.

In this environment, SCAT teams play an essential role in the ship's overall defense, particularly in protecting against fast-attack craft that larger ships are less capable of engaging at close range. Their ability to respond quickly and accurately in these high-pressure situations can mean the difference between a successful defense and a catastrophic breach of the ship's defenses. This makes SCAT a frontline force against small boat threats, directly contributing to the safety and operational effectiveness of U.S. Navy vessels in the 5th Fleet's operational area. As demonstrated by the Cordelia Moon attack, having an effective SCAT on board can be the critical factor in preventing a small boat threat from escalating into a successful attack, ensuring the protection of both military and commercial vessels operating in contested maritime regions.

2. Piracy Issues

SCAT play a critical role in combating piracy, especially when dealing with modern-day pirates who use small, agile boats to launch swift and unpredictable attacks on larger vessels. These boats are often difficult to detect and target due to their speed and maneuverability, making them a formidable threat in maritime environments (Edey, 2014).

To effectively neutralize such threats, SCAT must rely on highly accurate shooters. Precision is crucial because a single missed shot can mean the difference between repelling an attack and allowing pirates or similar adversaries to strike a catastrophic blow to a multi-billion-dollar warship. Accurate marksmanship ensures that small, fast-moving boats can be quickly disabled, preventing them from closing the distance and posing a direct threat to the ship and its crew.

Tarideal states that "Pirates are very sophisticated attackers. These are not amateurs on small fishing boats. They go out to sea in a command ship equipped with radar and means of communication, while several small boats are arriving from different directions. Pirates use small arms and shoulder-fired missiles This makes it even more important for SCAT to respond quickly and accurately" (Tarideal, 2022). Pirates today often operate in small, well-coordinated groups, attacking in waves or from multiple angles to overwhelm larger ships' defenses. Effective SCAT operations not only involve engaging pirate vessels from a distance

but also require a rapid and coordinated response to neutralize multiple threats simultaneously (Tarideal, 2022).

In this context, improved training, frequent live-fire exercises, and incorporating lethality-focused assessments are vital. These measures ensure that SCAT personnel are well-prepared to deal with high-stakes scenarios where precision and rapid response are essential for the defense of the ship against piracy.

3. USS Cole (DDG-67) Case Study

The USS Cole attack on October 12, 2000, marked one of the most significant strikes against U.S. naval forces in peacetime. While refueling in the port of Aden, Yemen, the DDG was targeted by Al-Qaeda operatives using an explosive laden small boat. "On October 12, 2000, an American naval warship, the USS Cole was attacked by suicide bombers while the vessel was refueling in the Yemeni port of Aden. Seventeen American Sailors were killed and 39 were injured in an attack that caused an estimated quarter-billion dollars in damage" (McHugh & Martin, 2011, pp. 31). The suicide attack was carried out by a small boat that came alongside the warship, bypassing the ship's security forces disguised as a garbage barge. The boat carried 400–700 pounds of C4 explosives and detonated against the Cole's port side, tearing a massive 40x40 foot hole in the hull.

The attack occurred during the vulnerable moment of refueling and struck the ship's galley where Sailors were gathering for lunch. Operating under a low threat condition the Cole had limited defensive measures in place. Yemen was considered a friendly port, and no small boat exclusion zone had been established around the vessel. Figure 5 showcases the extensive damage sustained by USS Cole during the 2000 bombing, reinforcing the critical need for robust small boat defense measures.

Figure 5. USS Cole Bombing Damage. Source: U.S. Department of Defense (2000).

The attack demonstrated Al-Qaeda's growing capability to strike sophisticated military targets and exposed critical vulnerabilities in U.S. naval security. The aftermath led to sweeping changes in Navy procedures, including enhanced small boat defense measures, stricter port security requirements, and improved intelligence sharing protocols. During the 1998 Congressional Hearing Before the Committee on Armed Services on *The Attack on the U.S.S. Cole*, it became evident that the Navy's preparation for small boat threats was inadequate. The tragic loss of life and the severe damage inflicted on the Cole highlighted the Navy's vulnerability to asymmetric threats, particularly small, fast-moving boats capable of delivering explosives. In response, the Navy implemented a reactive solution by establishing SCAT on ships in the years following the attack. SCAT, armed with crew-served weapons, were designed to provide enhanced 360-degree coverage and quickly respond to such threats (*The Attack on the U.S.S. Cole*, 2000).

However, this solution was implemented after the damage had been done, showcasing a reactive posture rather than a proactive strategy. We contend that waiting for another incident like the Cole attack before adopting force protection measures is not sufficient. To ensure the safety and readiness of naval vessels, it is critical to take proactive

steps now by enabling ship commanders to field the most effective and lethal defensive capabilities at their disposal.

One potential proactive measure is the integration of Marines on ships to serve as SCAT mount operators. Marines are already highly trained in the use of heavy weaponry and rapid-response tactics, and their inclusion in SCAT could significantly enhance the Navy's defensive posture. By leveraging their expertise, the Navy could not only mitigate the risk of small boat attacks but also prevent another catastrophic event like the USS Cole bombing from ever occurring. This approach would ensure that naval commanders have a comprehensive and highly skilled team in place, ready to respond to emerging threats with maximum lethality and effectiveness, thus closing a critical gap in naval force protection.

E. INTEGRATION PLAN

Our thesis proposes a new manning structure that incorporates Marines into SCAT to enhance ship defense capabilities against small boat threats. Given that the USMC is part of the Department of the Navy, coordination is streamlined through joint directives and existing interdepartmental frameworks. Marines for SCAT would primarily be drawn from major Marine bases at Camp Pendleton and Camp Lejeune, covering deployments slated for 5th Fleet on the West and East coasts respectively. As of 2022, 83.5% of active-duty Marines are stationed in the United States and U.S. Territories, with over 174,000 Marines representing 13.4% of the active-duty force (Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy, 2023). Of the 1,654 active-duty Marines serving as 0331 machine gunners, our proposal would involve approximately 1.2% of this group, ensuring that SCAT receives specialized support without overextending Marine resources (Manpower Management Enlisted Assignments, 2024). Tasking coordination would occur through SURFLANT/PACFLT and the appropriate MEFs, facilitating the request and deployment process for SCAT-specific support.

Marine integration into SCAT would start in the Basic Phase, a 24-week training period aimed at building tactical proficiency before deployment. During this phase, Marines would participate in classroom training and SCAT drills, allowing them to gain

familiarity with the ship's layout and operations. Marines would also certify with ship's force, allowing them to establish team cohesion. ATG uses the AMTAC process to certify warfare areas, laying out the nominal durations for each step. Out of that 24-week period, we propose that Marines would participate during the SW and AT certifications with a nominal duration of 40 days, with 5 of those days being conducted underway (Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic, 2022).

After completion of the basic phase and warfare certifications, we see continued value in Marine integration during the Advance and Integrated Phase. To build tactical proficiency and prepare Surface Force ships for deployment certification, NAVSURFMINEWARDEVCEN with support from other warfare development centers, will plan and execute SWATT during the Advanced phase. This is a multi-ship, multi-platform, multi-warfare event that will notionally consist of 5 days underway for CRUDES (Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic, 2022).

Following the completion of the Advanced phase, the Integrated Phase would prepare Marine-supported SCAT for deployment by reinforcing standards and enhancing tactical readiness. During this phase, we conduct a series of evaluations, assessments, certifications and inspections to ensure compliance with Navy standards. These processes build consistency and proficiency, ensuring SCAT, now integrated with Marines, meet the highest levels of operational readiness. In this phase, we synthesize individual and unit tactical skills into a cohesive, combat-ready team capable of managing complex warfare scenarios. Each training event builds on the previous one, following the structured approach used in Mobility and Tactical warfare areas. This sequential layering enables SCAT to develop the agility and coordination required for high-threat environments. We also conduct key at sea and classroom trainings during the Integrated Phase, which would provide SCAT and Marine personnel with hands-on experience in multi-warfare settings. These exercises sharpen tactical responses and teamwork, fully preparing Marines for real-world deployment. By the end of the Integrated Phase, Marine-supported SCAT would operate as a unified, highly capable unit, ready to respond effectively to any operational challenge. Figure 6 outlines the 36-month CRUDES Notional OFRP schedule, detailing the training and deployment cycles relevant to SCAT integration and readiness.

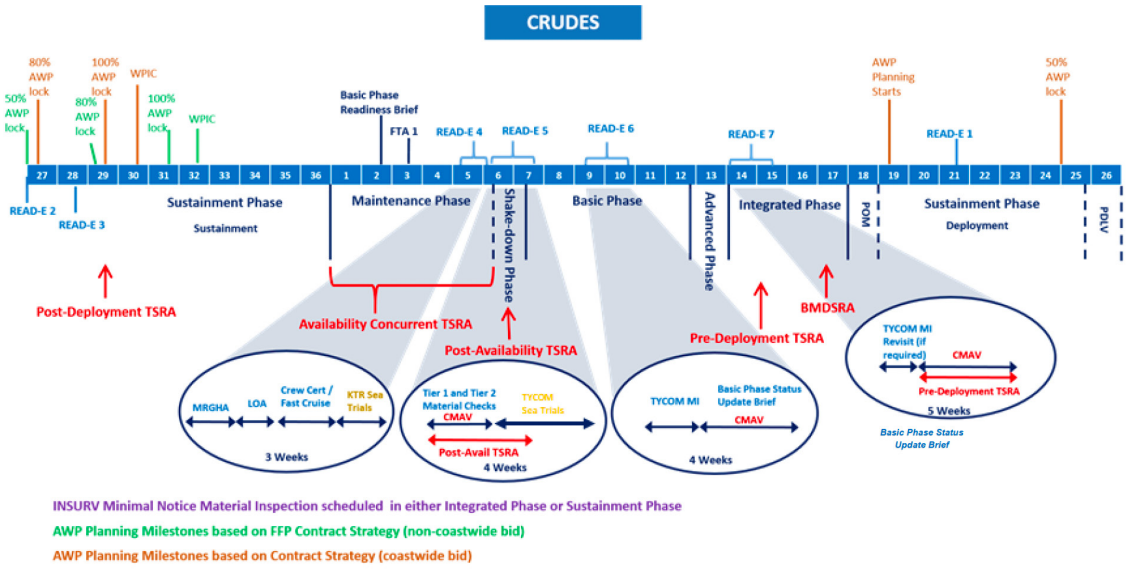

Figure 6. 36-Month CRUDES Notional OFRP Schedule. Source: Naval Surface Force United States Pacific Fleet, & Naval Surface Force Atlantic (2022).

We propose that the detachment of 4 Marines would fall under CG Division, with day-to-day operations and administration managed by the GMC and CG DIVO. This structure allows Marines to integrate smoothly into the existing CoC, supporting operational readiness while also enabling Marines to earn qualifications, such as Basic Maintenance Person. With this qualification, Marines could perform routine maintenance on weapon systems in the armory and SCAT mounts, adding self-sustaining capabilities to the division.

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III. LITERATURE REVIEW

A. INTRODUCTION

Despite SCAT's critical role in defending U.S. Naval ships against small boat threats, the existing literature lacks dedicated studies on SCAT-specific operations, training and challenges. Unlike other essential Navy roles, SCAT duties are often treated as collateral assignments, with minimal scholarly or policy attention to their unique requirements and impact on ship defense capabilities. This gap in the research presents a significant oversight in understanding and addressing the full scope of SCAT's effectiveness, especially given the increasing sophistication of small boat threats posed by asymmetric actors.

1. Analysis of Manning Options for Visit, Board, Search, and Seizure Teams

Newbold's thesis examines alternatives for conducting VBSS operations in the U.S. Navy, with a particular focus on transferring this mission to Marine Corps personnel. Through analysis of training pipelines, operational requirements, and current manning challenges, Newbold makes a compelling case that the Marine Corps' training and capabilities are better aligned with the combat intensive nature of VBSS operations compared to Navy personnel who perform these duties as a collateral assignment. This alignment could extend beyond VBSS operations to encompass SCAT responsibilities on DDGs, where similar challenges in training and readiness persist under current Navy centered models.

A key contribution of Newbold's work is the development of an analytical approach to evaluate the feasibility of transporting Marine VBSS teams between ships based on aircraft range and capacity constraints. Using the CH-46 helicopter as a case study, she demonstrates how Marine teams could be efficiently moved between vessels to conduct VBSS operations while meeting mission requirements. The model provides a framework that can be adapted to analyze different transportation assets and operational scenarios. This framework could be further expanded to evaluate the permanent integration of Marine

Fire Teams into DDG SCAT operations, where dedicated teams of four Marines would enhance force protection capabilities without requiring complex transportation logistics.

The research effectively highlights the current challenges with Navy VBSS teams, including high training attrition rates, limited opportunities for ongoing skill maintenance, and the operational impact of pulling Sailors from their primary duties to conduct VBSS missions. Newbold cites survey data showing that while 82% of Sailors participated in actual VBSS operations, only 5.1% were able to conduct regular training, highlighting a significant readiness gap in the current approach. Similar challenges exist within current SCAT operations, where Sailors must balance their primary duties with force protection responsibilities. The integration of dedicated Marine Fire Teams would address these readiness concerns by providing full-time, specially trained personnel focused solely on force protection duties.

Newbold concludes by presenting three courses of action for VBSS manning: reassigning the mission to MEU personnel, establishing shore-based Marine VBSS teams, or maintaining the status quo with Navy teams. Through analysis of the strengths and weaknesses of each option, she recommends transitioning VBSS responsibilities to MEU Marines as the most viable solution that would improve mission capability while minimizing additional costs and logistical requirements. This analysis parallels the proposed enhancement of SCAT operations through Marine integration, where placing 96 Marines across 24 deployed DDGs would provide dedicated force protection capabilities while leveraging existing Marine Corps training and leadership structures. The thesis provides a valuable framework for evaluating VBSS manning alternatives that could inform future force structure decisions, including the proposed expansion of Marine Corps roles in shipboard force protection through SCAT integration.

The parallels between VBSS and SCAT operational challenges suggest that Newbold's conclusions about Marine Corps integration could be extended to broader force protection missions aboard naval vessels. Both missions require specialized training, dedicated personnel, and clear leadership structures. These are elements that align naturally with Marine Corps organizational models and training pipelines. The success of Marine integration in VBSS operations, as analyzed by Newbold, provides strong supporting

evidence for the feasibility and potential benefits of incorporating Marine Fire Teams into DDG SCAT operations.

2. Terrorism In The Maritime Domain

Tng's thesis investigates maritime terrorism threats, which focuses on how certain terrorist groups may exploit vulnerabilities in maritime systems to conduct attacks. Tng outlines the motives, organizational structures, and capabilities of groups like Al-Qaeda and the LTTE. Tng highlights group interest in maritime targets, such as warships, cargo vessels, and port infrastructure, as well as their potential use of unconventional attack methods, including submersible vehicles. This analysis becomes particularly relevant when one considers the current vulnerabilities in force protection measures aboard U.S. Navy DDGs, specifically within SCAT operations.

Using a systems engineering approach, Tng models maritime terrorism as a "system of systems" to understand how these groups might exploit maritime vulnerabilities. The analysis emphasizes that, while security has improved in land and air contexts, maritime defenses remain comparatively underdeveloped, making them a potential focal point for terrorist activities. This systemic weakness is evident in current SCAT configurations, where rotating Navy personnel must balance force protection duties with their primary responsibilities, potentially creating gaps in readiness and response capabilities that could be exploited by determined adversaries.

Tng concludes that to effectively counter these threats, the maritime sector requires enhanced international intelligence sharing, stricter port and vessel security measures, and collaborative defense efforts. This conclusion strongly supports the proposal to integrate Marine Fire Teams into DDG SCAT operations, as it would address several key vulnerabilities identified in Tng's analysis. The implementation of dedicated four-person Marine teams across 24 deployed DDGs would significantly enhance force protection capabilities through specialized training, dedicated personnel, and clear command structures.

The integration of Marine Fire Teams directly addresses the maritime security gaps highlighted by Tng's research. These teams would provide a consistent, well-trained force

protection element specifically focused on countering the types of asymmetric threats identified in the thesis. The Marine Corps' extensive experience in force protection and small unit tactics makes them ideally suited to defend against the unconventional attack methods described by Tng, including small boat attacks and other maritime terrorist tactics.

The thesis's focus on systems-level vulnerabilities particularly resonates with the proposed SCAT enhancement. Current SCAT operations, relying on personnel with divided attention and responsibilities, represent exactly the kind of systemic weakness that Tng warns could be exploited by terrorist organizations. By addressing these systemic vulnerabilities through the integration of dedicated Marine Fire Teams while providing a robust defensive capability, the proposed SCAT enhancement represents a proactive step toward improving maritime security in an increasingly complex threat environment.

3. Maritime Terrorism and the Small Boat Threat to the United States: A Proposed Response

The persistent and evolving threat of small boat attacks has drawn increasing attention in maritime security literature. Hill's thesis provides a comprehensive analysis of the small boat threat within the context of maritime terrorism. His work identifies small boats as a cost-effective and strategically viable tool for terrorist organizations due to their ease of acquisition, low cost, and ability to evade detection. Hill emphasizes that small boats represent a critical vulnerability in maritime defense strategies, particularly for the United States, which has over 95,000 miles of coastline and a vast maritime domain that is challenging to monitor comprehensively.

Hill's analysis draws attention to key incidents, such as the USS Cole bombing (2000) and the M/V Limburg attack (2002), to highlight the effectiveness of small boats in conducting asymmetric attacks against high-value maritime targets. He argues that these incidents underscore the strategic simplicity and success of such tactics, making small boats a preferred method for adversaries seeking to disrupt maritime security and economic stability.

Hill critiques existing U.S. maritime security frameworks, including the Department of Homeland Security's Small Vessel Security Strategy, for their limited focus

on the unique challenges posed by small boats. His work suggests that the United States must go beyond broad maritime security measures and adopt targeted strategies to mitigate the small boat threat. These strategies include leveraging advanced technologies, enhancing maritime domain awareness, and fostering partnerships across federal, state, and local agencies. Hill also advocates for stronger community engagement through programs like America's Waterways Watch, which could empower the boating public to act as an extended surveillance network.

By examining Hill's findings, this thesis integrates a broader understanding of small boat threats into its discussion of SCAT operations. Hill's emphasis on the necessity of realistic training, technological innovation, and community involvement resonates with the need to strengthen SCAT's role in countering evolving maritime threats. His insights serve as a foundation for advocating improved training frameworks and the integration of specialized personnel, such as Marines, into SCAT teams.

4. The Military VSL

This discussion paper examines economic literature and review theory to provide "a standard value of a statistical life (VSL)" (Kniesner et al., 2024). The paper provides critical insights into how the Department of Defense (DoD) can quantify mortality risk and make informed decisions about force protection investments. The study specifically examines VSL calculations across military pay grades, with particular attention paid to junior enlisted ranks where most combat fatalities occur.

The research reveals that E-3 and E-4 service members, who represent a significant portion of military combat fatalities, have VSL values of $4.04 million and $4.62 million respectively, based on their annual basic pay of $24,301 and $27,765. These figures come from analyzing over "6,700 U.S. military fatalities in Afghanistan and Iraq from 2001 to 2021," where E-3s accounted for 1,436 fatalities and E-4s accounted for 1,842 fatalities (Kniesner et al., 2024). Together with other junior enlisted ranks up to E-5, they represented 72% of all combat fatalities during this period.

It's crucial to understand that these VSL calculations are not meant to value a service member's entire military career or lifetime contribution. Instead, VSL represents

the statistical value placed on reducing mortality risk or preventing fatalities at a specific point in time. The authors illustrate this concept through a hypothetical example where a worker chooses between two jobs with different fatality risks, demonstrating how individuals implicitly value their own lives through risk-based decisions.

The calculation for these VSL values uses a baseline VSL of $11.8 million, adjusted using an income elasticity of 1.0 and compared against the U.S. gross national income per capita of $70,930. However, Kniesner et al. acknowledge that their calculations represent conservative estimates since they only include basic pay in their initial analysis. When accounting for military fringe benefits, which the Bureau of Labor Statistics estimates at 29% of total compensation, the VSL values increase significantly.

The authors emphasize that these figures should be considered "lower bound" estimates because they do not include additional military compensation components such as bonuses, tax savings, and housing allowances. "Adding in fringe benefits increases the weighted average VSL in Table 4 to $7.51 million per statistical life from the previous value of $5.80 million." (Kniesner et al., 2024, pp. 13)

This research provides the DoD with a structured framework for valuing mortality risk reduction, particularly important given that junior enlisted ranks bear the highest combat fatality rates. The study's findings can help military planners and policymakers make more informed decisions about investments in force protection and safety measures, ensuring resources are allocated effectively to protect service members who face the highest mortality risks. Kniesner et al., recommend using these VSL estimates as part of a comprehensive approach to military benefit-cost analyses, while acknowledging that further refinements may be needed to account for the full scope of military compensation and risk factors.

B. COMNAVSURFPAC/COMNAVSURFLANT INSTRUCTION 3502.3: SURFACE FORCE READINESS MANUAL

The SFTRM provides critical guidance for maintaining and certifying the operational readiness of U.S. Naval Surface Force unites under the OFRP. While this manual encompasses carious mission areas, it directly impacts the certification processes

and training requirements relevant to SCAT, particularly in AT and SW roles. It emphasizes a structured progression in readiness, beginning with individual and team-level skills in basic operational and tactical mission areas, before moving to integrated, multi-unit, and group-level capabilities necessary for necessary for complex deployments.

The manual mandates rigorous certification standards across mission areas to ensure proficiency is sustained throughout deployment phases. For SCAT roles, the Surface Warfare section delineates specific requirements that emphasize the importance of continuous proficiency in threat response, essential for defending against asymmetric small boat threats. The certification criteria reinforce the need for robust team-level training, underscoring challenges associated with maintaining SCAT readiness, which can be impacted by collateral duties and personnel limitations. This structure establishes a framework for operational consistency but also highlights limitations in tailored SCAT training, which could benefit from enhanced integration with specialized personnel, such as Marine detachments, to mitigate identified capability gaps.

C. OPNAVINST 3591.1: SMALL ARMS TRAINING AND QUALIFICATION

This instruction provides policies and requirements for the Navy's small arms training and qualification. Issued by the Office of the CNO, it mandates annual live-fire qualifications, safety standards, and sustainment training for Navy personnel who use small arms. The instruction emphasizes standardized training across a range of small arms, covering pistol, rifle, shotgun, and machine gun courses. It also outlines procedural requirements for safe handling, weapon conditions, and ammunition management. The document addresses four categories of personnel, detailing qualification requirements based on each group's duties. Notably, the instruction specifies semi-annual sustainment training to maintain small arms proficiency, underscoring the importance of consistent skill reinforcement.

For SCAT members, this instruction is especially relevant, as it sets the baseline for small arms proficiency across the fleet. Although the policy includes necessary safety and marksmanship fundamentals, it falls short in terms of specialized training for high-

threat environments where SCAT operates, particularly against asymmetric small boat threats.

D. NAVY TACTICS, TECHNIQUES, AND PROCEDURES ANTITERRORISM NTTP 3–07.2.1

The NTTP 3–07.2.1 on antiterrorism establishes the strategic and tactical frameworks that shape SCAT operations. This publication defines tactics, techniques, and procedures that deter, detect, delay, deny, and defend against terrorist threats, focusing on layered defense strategies essential to shipboard security.

NTTP 3–07.2.1 emphasizes integrating physical security measures and proactive force protection plans to counter asymmetric threats, such as small boat attacks. SCAT fulfills a critical role within this framework by maintaining readiness and rapidly responding to evolving threats. The publication positions SCAT as a vital element of shipboard defense, directly contributing to the Navy's broader antiterrorism objectives.

The document outlines PPRs for specific threats, including small boat attacks, and stresses the importance of coordinated reaction times and overlapping fields of fire. These tactics directly support SCAT's mission to defend ships in high-risk areas. NTTP 3–07.2.1 also provides detailed guidance on weapons employment and crew-served weapon operations, reinforcing the need for SCAT personnel to operate effectively under pressure and in combat scenarios.

NTTP 3–07.2.1 highlights the need for realistic training and consistent evaluation to sustain operational readiness. It reveals gaps in current SCAT training requirements, particularly in developing the combat lethality required to neutralize small boat threats. The publication also stresses the importance of conducting vulnerability assessments and tailoring operational plans to mission-specific threats, advocating for a more specialized approach to SCAT operations. This thesis uses these insights to support the proposal for integrating Marines into SCAT teams and improving training programs.

By applying the principles in NTTP 3–07.2.1, this thesis strengthens the argument for SCAT reform. The document's focus on layered defense, realistic training, and specialized tactics aligns with the thesis's recommendations for enhancing SCAT

capabilities through Marine integration and refined training frameworks. These connections demonstrate the necessity of elevating SCAT's operational priorities to effectively address today's maritime security challenges.

E. NAVMC 3500.44: INFANTRY TRAINING AND READINESS MANUAL

This instruction establishes structured standards for training and readiness across Marine Corps infantry units. It specifies both individual and collective training requirements, from basic skills to advanced unit tasks, ensuring that Marines maintain high levels of combat readiness. The manual centers around METLs, which outline critical skills for each MOS within the infantry, covering areas such as marksmanship, mission planning, and combat operations. Each METL is crafted to meet the demands of diverse combat environments, ensuring Marines are proficient and mission-ready.

For SCAT, integrating Marines trained under the T&R Manual could significantly enhance defensive capabilities. Marines, especially 0331 Machine Gunners, bring advanced skills in weapons handling and tactical response that directly support SCAT's mission to counter small boat threats. Their readiness and expertise could close existing training gaps within SCAT, creating a more responsive and lethal defense team.

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IV. COST ESTIMATION EXERCISE

A. ANALYTICAL FRAMEWORK

We propose adding a detachment of four E-3 0331 Marines to DDGs deploying in 5th Fleet, where piracy and small boat threats are a significant concern. As machine gunners, 0331 Marines bring specialized skills that can greatly enhance SCAT, particularly in high-threat environments. Unlike Sailors, who balance SCAT duties with other primary responsibilities, these Marines are focused entirely on heavy weapons and delivering sustained, accurate suppressive fire. This expertise is vital for effectively countering fast-moving small boats. Incorporating 0331 Marines would boost SCAT's combat readiness and significantly improve the ship's defensive capabilities in a region where these threats are frequent. While the addition of personnel involves some cost, the increased protection and operational advantage make this a strategic investment for DDGs in the 5th Fleet.

Estimating the exact number of destroyers operating in the 5th Fleet is difficult due to several factors, including variable deployment cycles, maintenance schedules, and shifting mission requirements. The number of destroyers can fluctuate depending on evolving geopolitical conditions, joint exercises with allied forces, and the Navy's strategic priorities.

For the purpose of this analysis, we will use an estimate of 5 destroyers deployed in the 5th Fleet. This provides a practical baseline for assessing the costs of adding 0331 Marines to SCAT on each ship, offering a realistic framework for our calculations without overstating the fleet's operational size or scope.

B. FACTORS

1. Cost

Factors that are included in the unit-level personnel cost of a U.S. Navy Destroyer on deployment in the 5th fleet AOR by adding a detachment of 4 E-3 Marines.

Basic Pay = $128,649.60

The 2024 pay charts from the Defense Finance and Accounting Service were used to determine pay. Enlisted pay is calculated as follows: E3 over 3 years is $2,680.20 monthly (Defense Finance and Accounting Service, 2024a). A detachment of four E3 Marines would cost $128,649.60 annually per ship.

Sea Pay = $2,400

Career Sea Pay is based on a member rank and their cumulative time at sea. For this analysis we will use E3 under 1 year at sea as the baseline. An E3 under 1 year receives $50 per month (Defense Finance and Accounting Service, 2024c). A detachment of four E3 Marines would cost $2,400 annually per ship.

Hostile Fire Pay = $10,800

For our analysis, we are including Hostile Fire Pay due to the nature of SCAT responsibilities. If SCAT is required to conduct their mission, they would be subject to receiving this additional special pay. Per the Defense Finance and Accounting Service, HFP may be paid to a Service member of a uniformed service who performs duty in a hostile fire area; is exposed to a hostile fire event; is on duty during a month in an area in which a hostile event occurred that placed the Service member in grave danger of physical injury; or is killed, injured, or wounded by a hostile fire event. HFP is a monthly rate of $225 (Defense Finance and Accounting Service, 2024b). A detachment of four E3 Marines would cost $10,800 annually per ship.

Food = $16,147.60

The NAVSUP 7330 memorandum outlines the quarterly guidelines and procedures for food service financial accountability. The cost to feed each person per day onboard a destroyer is $11.06 for FY25 First Quarter (Commander, Naval Supply Systems Command, 2024). A detachment of four E3 Marines would cost $16,147.60 annually per ship.

Marine End Strength Impact

As of 2022, 83.5% of active-duty Marines are stationed in the United States and U.S. Territories, with over 174,000 Marines representing 13.4% of the active-duty force (Office of the Deputy Assistant Secretary of Defense for Military Community and Family Policy, 2023). Of the 1,654 active-duty Marines serving as 0331 machine gunners, our proposal would involve approximately 1.2% of this group, ensuring that SCAT receives specialized support without overextending Marine resources (Manpower Management Enlisted Assignments, 2024).

The Marine Corps is designed to be a versatile, expeditionary force, ready to respond globally, however it's worth mentioning that diverting even a small number of personnel could impact their broader operational readiness. Over time, a consistent rotational deployment to SCAT roles might stretch resources thin, potentially compromising the Marine Corps' ability to meet other mission demands and keep personnel adequately trained for more diverse scenarios.

Total Cost for Fleet (5 Destroyers in 5th Fleet)

For this analysis, the cost of integrating 0331 Marines into SCAT is based on five destroyers deployed in the 5th Fleet. The annual cost per ship is calculated at $157,996.60 per year, which includes $128,649.60 for base pay, $2,400 for sea pay, $10,800 for HFP, and $16,147.60 for food. Multiplying this cost across the five ships provides a total annual cost of $789,983 for the fleet. This framework offers a practical baseline for evaluating the feasibility and financial implications of adding Marines to SCAT without overstating the operational scope.

Total Annual Cost per Ship

$128,649.60+ $2,400 + $10,800 + $16,147.60 = $157,996.60 per year

Total Annual Cost for Fleet (5 Destroyers)

$157,996.60 × 5 = $789,983 per year

2. Benefit of Marine Detachment

Factors we will consider in the added benefit of an improved SCAT with the incorporation of a Marine detachment.

Risk Reduction to Ship = $457,754,065.04 (US$2024)

The USS Cole bombing in 2000, which resulted in $250 million in repairs and the tragic loss of 17 Sailors, is a stark reminder of the threats posed by small boat attacks in high-risk environments like those found in the 5th Fleet's area of operations (McHugh & Martin, 2011). In addition to the financial costs, the attack significantly impacted the Navy's operational readiness and highlighted vulnerabilities in ship defense.

For our analysis, we will use the cost of repair of the USS Cole as a baseline for similar attacks. When accounting for inflation since 2000, a similar repair would cost $457,754,065.04 in 2024. We will also assume that the detachment of 0331 Marines would reduce the risk of another USS Cole bombing by 25%.

Saving lives using VSL

The integration of Marines into SCAT not only strengthens operational capabilities but also offers significant economic and human benefits by reducing casualties and injuries. To quantify these benefits, we employ the Military Value of Statistical Life and cost frameworks for injuries to measure the financial impact of force protection improvements. The loss of 17 Sailors and the injury to another 39 Sailors in the 2000 USS Cole bombing is a tragic reminder of the human toll these incidents can take. Preventing future loss of life should remain a central objective of any security improvement, and readers should keep this in mind throughout the analysis.

- The best-set estimate for the Military VSL is $11.8 million (in 2021 USD). Adjusted for 2024 values, this figure increases to $13.5 million per life (Kniesner, T. J., Sullivan, R., & Viscusi, W. K., 2024).
- Injuries are calculated as a fraction of the VSL. Based on military cost assessments, the financial impact of an injury is 18.9% of the VSL.

Therefore, in 2024 USD, the economic cost of an injury is $2.55 million (0.189 × $13.5 million) (Rohlfs, C. & Sullivan, R., 2013).

The USS Cole incident underscores the immense financial burden of human and material losses in a single attack. In 2024 USD, the total cost is estimated at $786.76 million, with ship damage accounting for the largest portion at $457.75 million, or 58.2% of the total. The loss of 17 Sailors contributed $229.50 million (29.2%), reflecting the significant economic value of human life based on the Military Value of Statistical Life. Additionally, injuries sustained by 39 Sailors amounted to $99.51 million, representing 12.6% of the total cost. These figures highlight the critical need for enhanced force protection measures to mitigate both the human and financial toll of future incidents. Table 4 presents a summary of the costs associated with the USS Cole bombing, including the integration of the Value of Statistical Life framework.

Table 4. Summary Table of USS Cole Bombing Cost to include VSL

USS Cole Incident	Number of Sailors	Cost in Millions (2024 USD)	Percentage of total cost
Injuries	39	$99.51	12.6%
Fatalities	17	$229.50	29.2%
Ship		$457.75	58.2%
Sum		$786.76	

3. Probability of Attack

To incorporate the likelihood of attack into our cost estimation, we include three hypothetical scenarios: 1%, 2%, and 3% probabilities of a small boat attack occurring. These probabilities are illustrative figures chosen to analyze how varying levels of risk affect the cost estimate exercise. By applying these probabilities to the potential

consequences of an attack, we can calculate the expected value of losses and compare them to the costs of integrating Marines into SCAT. This approach allows us to explore how different risk levels influence the value of enhanced defensive measures, ensuring the analysis is both comprehensive and adaptable to varying operational contexts.

1% probability of attack

This is calculated by multiplying the cost of a similar attack of the USS Cole (Ship Repair and VSL costs) by the 1% probability of attack.

786,760,000 million x 0.01 = $7.87 million (expected annual cost)

2% probability of attack

This is calculated by multiplying the cost of a similar attack of the USS Cole (Ship Repair and VSL costs) by the 2% probability of attack.

786,760,000 million x 0.02 = $15.74 million (expected annual cost)

3% probability of attack

This is calculated by multiplying the cost of a similar attack of the USS Cole (Ship Repair and VSL costs) by the 3% probability of attack.

786,760,000 million x 0.03 = $23.60 million (expected annual cost)

C. SUMMARY OF FINDINGS

The cost estimation exercise of integrating Marines into SCAT demonstrates clear financial and operational advantages. With an annual cost of $0.79 million for SCAT improvements across five destroyers in the 5th Fleet, the analysis reveals significant net benefits under various probabilities of attack. At a 1% probability of attack, SCAT enhancements yield a net benefit of $1.18 million annually, increasing to $3.15 million and $5.11 million at 2% and 3% probabilities, respectively. Over a 20-year period, using a 3% discount rate, the present value of these net benefits amounts to $17.56 million, $46.86 million, and $76.02 million, respectively. These findings underscore the financial prudence

and operational necessity of investing in SCAT enhancements, particularly in high-threat environments like the 5th Fleet's AOR. By reducing potential losses from attacks, this investment not only saves lives but also protects critical naval assets, offering a compelling case for its implementation. Table 5 highlights the improvements in SCAT performance and ship defense effectiveness with Marine integration, incorporating the projected benefits of enhanced lethality and precision.

Table 5. Summary of SCAT Improvements with Marine Integration (Including VSL)

Probability of Attack	Cost of USS Cole incident w/ VSL ($786.76M US$2024)	Cost with SCAT Effectiveness (25% Reduction)	Savings from SCAT Improvements	Cost of SCAT Improvements (Marine Integration across 5 DDGs)	Net Benefit (Annual)
1%	$7.87M	$5.90M	$1.97M	$0.79M	$1.18M
2%	$15.74M	$11.80M	$3.94M	$0.79M	$3.15M
3%	$23.60M	$17.70M	$5.90M	$0.79M	$5.11M

According to the GAO's 2020 report, the total operating and support cost for a DDG, including unit-level personnel expenses, was $80.5 million per ship (Government Accountability Office, 2023). Adding a detachment of four E-3 Marines represents a negligible increase in overall cost but offers a significant improvement to the ship's combat readiness and defensive capabilities. Given the minimal financial impact relative to the operational gains, this small investment in specialized personnel is a strategic enhancement that directly strengthens shipboard defense. Integrating Marines with focused combat training not only bolsters SCAT effectiveness but also ensures the vessel is better prepared to respond to asymmetric threats, ultimately providing a high return on investment in terms of mission readiness and crew safety.

(1) Present Value

This section evaluates the economic impact of integrating Marines into SCAT by calculating the PV of future benefits over a 20-year period. Using the following annuity

formula: $PV = \frac{CF}{r} * \left(1 - \frac{1}{(1+r)^t}\right)$; This analysis adjusts annual net benefits for the time value of money. The key variables include:

- Cash Flow (CF): Net benefits from enhanced SCAT capabilities, set at $1.18M (1% probability), $3.15M (2% probability), and $5.11M (3% probability).
- Discount Rate (r): 2.5%, based on OMB Circular No. A-94, which specifies this rate for federal benefit-cost analyses over 20 years (Office of Management and Budget, 2023).
- Time Period (t): 20 years, representing the length of a military career.

This approach quantifies how improved SCAT effectiveness outweighs integration costs, providing a clear, data-driven rationale for proactive investment in ship defense capabilities.

1% probability of attack

$$\boldsymbol{PV = \frac{1.18M}{0.025} * \left(1 - \frac{1}{(1+0.025)^{20}}\right) = \$18.40M}$$

2% probability of attack

$$\boldsymbol{PV = \frac{3.15M}{0.025} * \left(1 - \frac{1}{(1+0.025)^{20}}\right) = \$49.11M}$$

3% probability of attack

$$\boldsymbol{PV = \frac{5.11M}{0.025} * \left(1 - \frac{1}{(1+0.025)^{20}}\right) = \$79.66M}$$

The findings show that even at the lowest probability of attack (1%), the present value of net benefits, $18.40M, represents a significant cumulative financial advantage over the analysis period. This net savings reflects the considerable financial impact of Marine integration over the course of a military career, with long-term benefits far outweighing the recurring annual cost of $0.79M. At 2% and 3% probabilities of attack, the present value of net benefits increases to $49.11M and $79.66M, respectively. These cumulative savings, calculated over the life of a military career, illustrate how increasing probabilities of attack further enhance the financial and operational justification for Marine integration. The net savings demonstrate a lasting financial advantage that outweighs the annual recurring cost of $0.79M. These results provide a data-driven rationale for proactive resource allocation, supporting the Navy's goal of maintaining operational readiness and safeguarding its fleet against evolving threats.

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V. ALTERNATIVE APPROACHES

This chapter presents counterarguments to the proposal of integrating Marine detachments into SCAT for enhanced ship defense. The first argument addresses the leadership concern of a junior detachment of Marines and the limited scope of 5th fleet deployers. The second argument suggests that SCAT's core issues lie in training and manning rather than a need for Marines. By improving SCAT training programs and adjusting shipboard manning to alleviate collateral duties, current teams could achieve greater lethality without external forces. The third argument challenges the notion that limited rack space onboard ships makes it impractical to add Marines. This section explores whether space constraints truly prevent Marine integration or if feasible solutions exist.

A. LEADERSHIP PROBLEM

In this section we will discuss an alternative option of integrating a Fire Team vice four E-3 Marines as SCAT members to address leadership concerns among the detachment. We also address the concern of only focusing on 5th fleet deployers vs. all deployers.

The integration of Marine Fire Teams into DDGs' SCAT represents a strategic enhancement to naval force protection capabilities versus the model of four E-3 Marines. This proposal addresses concerns regarding leadership and experience while maintaining operational effectiveness through the implementation of proven Marine Corps unit structures. By incorporating traditional Fire Teams, according to the DoD, consisting of one E-4 and three E-3 Marines across 24 deployed DDGs, we establish a robust and sustainable force protection framework (U.S. Department of Defense, 2024).

The Marine Fire Team structure brings immediate credibility through its battle tested organizational model. E-4 Team Leaders arrive with extensive training in small unit tactics, advanced weapons qualifications, and crucial personnel management experience. This leadership component directly addresses previous concerns about relying solely on E-3 personnel, as each team now operates under the immediate supervision of an experienced NCO (U.S. Department of Defense, 2024). The established CoC reduces response time while ensuring tactical decisions are made by qualified personnel.

From a resource allocation perspective, the total requirement of 96 Marines (24 E-4s and 72 E-3s) represents a manageable commitment that aligns with typical deployment ratios. This distribution ensures consistent coverage across one-third of the DDG fleet, matching current OPTEMPO (United States Navy, 2021). The Fire Team model seamlessly integrates into existing SCAT frameworks while enhancing capabilities through standardized Marine Corps training protocols.

Risk mitigation is inherent in this structure through leadership redundancy and quality assurance measures. E-4 Team Leaders provide immediate supervision, preventing tactical errors while maintaining clear LOC. The Marine Corps' rigorous training standards ensure consistent performance across all deployed teams, while the Fire Team structure provides internal quality control through established, qualified, leadership dynamics.

Long-term benefits extend beyond immediate tactical advantages. The detachment of Marines gains valuable naval integration experience, establishing a clear career progression pathway while developing maritime security expertise. This cross-training opportunity strengthens interoperability between Navy and Marine Corps personnel, enhancing overall force protection capabilities.

This integration represents a forward-thinking approach to maritime security that addresses current shortfalls while providing a foundation for future enhancements. The higher cost structure is justified not only by the enhanced capabilities but also by the more comprehensive risk management approach represented by the Fire Team model's leadership structure. By combining Marine Corps tactical expertise with naval operations, we create a more resilient and capable force protection system that benefits both services while maintaining operational efficiency and effectiveness.

B. TRAINING VS. MANNING PROBLEM

Our thesis argues that integrating a detachment of Marines into SCAT would significantly improve shipboard defense and overall lethality. However, some could argue that this approach may miss the real issues hindering SCAT's effectiveness. Rather than relying on Marines, a better solution could be found by enhancing the training of current

team members and addressing manning levels to reduce the burden of collateral duties that SCAT members face.

SCAT's current training may not fully prepare Sailors for the specific challenges posed by small boat threats, such as the swarming tactics often used by Iran's IRGCN. While the existing training covers the technical aspects of weapons handling and safety, it may fall short in replicating realistic combat scenarios where Sailors must engage multiple fast-moving targets under intense pressure. Reforming the training program to include more realistic, high-intensity exercises that reflect the complexity of defending against small boats could make a big difference. Incorporating advanced simulations or live-fire drills would push SCAT members to develop the skills needed to handle evolving threats in places like the 5th Fleet's AOR.

Another major issue is manning. SCAT members play this role as a collateral duty which pulls them away from their primary role on the ship. This means less time to focus on training and readiness. Rather than adding Marines, the Navy could focus on increasing the number of Sailors on the ship to ensure SCAT members have more time to focus solely on their mission. By reducing the burden of additional duties, SCAT could become more effective without the need for external forces.

Moreover, adding Marines into SCAT overlooks the fact that Sailors can be just as effective in this role if they are properly trained and supported. Sailors already have a deep understanding of their ship's systems and the operational environment, something that Marines might not possess right away. With improved training and proper manning, SCAT made up of Navy personnel could achieve the same level of lethality that some propose Marines would bring, without the logistical challenges and potential integration issues that adding a Marine detachment might create.

In the end, while adding Marines to SCAT might seem like a quick fix to improve ship defense, it risks missing the deeper, more systemic issues. By focusing on better training for SCAT members and addressing manning levels to reduce collateral duties, the Navy could create a more sustainable and effective solution. This would allow SCAT to

remain adaptable and capable of responding to evolving threats, without needing to rely on external forces like a Marine detachment.

C. LOGISTICAL ISSUES

The Marine Corps is already operating with limited manpower, especially as its force structure is optimized for expeditionary and amphibious operations rather than continuous shipboard duties. Diverting Marines to fulfill SCAT roles on Navy destroyers could strain the Corps' primary mission capabilities by reallocating critical personnel away from essential deployments, training, and combat readiness. Each Marine assigned to a ship for SCAT duties is a resource pulled from broader operational requirements, potentially affecting the Corps' ability to respond to global crises or engage in primary mission areas. Additionally, the unique capabilities of Marines, particularly in rapid-response and land-based operations, may be underutilized in SCAT roles, where the Navy could instead explore enhancing Sailor training to achieve similar outcomes. Therefore, placing Marines on Navy ships could lead to inefficiencies in force allocation, ultimately weakening the Corps' readiness and detracting from its strategic role within the broader Department of Defense mission.

Navy destroyers typically have 320 racks spread across six enlisted berthing spaces, meaning each space houses a substantial number of personnel within a confined area. This arrangement already maximizes the available living quarters, leaving little room for additional personnel without impacting existing crew comfort and functionality. Adding Marines to fulfill SCAT roles would require adjusting the current berthing setup or sharing already limited rack space, potentially leading to overcrowding and reduced quality of life onboard. Adding more than four Marines for SCAT duties could require modifications to berthing arrangements, potentially displacing other personnel or overburdening existing facilities. This lack of available space could lead to discomfort, reduced crew cohesion, and strained resources, impacting overall operational effectiveness and morale onboard.

VI. CONCLUSION AND RECOMMENDATIONS FOR FURTHER RESEARCH

A. CONCLUSIONS

This thesis addresses critical vulnerabilities in the Navy's current approach to manning SCAT onboard destroyers. The reliance on Sailors performing SCAT duties as collateral responsibilities has proven insufficient to meet the demands of modern maritime threats. The gaps in training, readiness, and evaluation expose ships to significant risks, particularly in high-threat regions like the 5th Fleet's AOR. This study identifies the integration of Marines into SCAT roles as a comprehensive solution to bridge these gaps and enhance the Navy's force protection capabilities.

Through rigorous analysis, this research demonstrates that integrating Marines provides both operational and financial advantages. Marines, particularly 0331 machine gunners, bring specialized training in heavy weapons, combat tactics, and rapid-response operations, making them exceptionally suited for SCAT missions. Unlike Sailors, whose attention is divided among multiple shipboard responsibilities, Marines can dedicate their primary focus to SCAT duties, ensuring heightened readiness, precision, and effectiveness. This integration not only addresses the root causes of SCAT's shortcomings but also aligns with the DoD's broader emphasis on leveraging specialized personnel to enhance mission performance.

The cost estimation exercise further validates this proposal. By applying present value calculations over a military career length (20 years), this study quantifies the substantial long-term benefits of integrating Marines into SCAT. For a low probability of attack (1%), the net present value of benefits exceeds $18.40M. At higher probabilities of attack (2% and 3%), the net benefits rise significantly to $49.11M and $79.66M. These cumulative savings demonstrate that the financial and operational advantages of Marine integration far outweigh the recurring annual cost of $0.79M. Additionally, this approach reduces the likelihood of catastrophic events, such as the USS Cole bombing, which incurred significant human and financial losses. Proactively addressing these threats ensures that the Navy can avoid reactive measures and the associated costs of failure.

The proposed integration plan is not only feasible but also strategically sound. Marines would begin their SCAT training during the Basic Phase of the OFRP, allowing them to build team cohesion and operational familiarity with shipboard environments. Their advanced training in scenarios that mimic real-world threats ensures they are prepared to counter increasingly sophisticated challenges, such as swarming tactics, unmanned vessels, and drone attacks. By embedding Marines into the ship's chain of command and providing them with opportunities to earn additional qualifications, this proposal enhances both SCAT effectiveness and overall shipboard efficiency.

Historically, Marines have demonstrated their value in shipboard defense roles, from counter-piracy operations during the Barbary Wars to serving as integral components of naval task forces during World War II. This historical precedent reinforces the practicality of integrating Marines into SCAT today. Their proven ability to operate effectively in high-pressure environments makes them a natural fit for addressing modern asymmetric threats. Furthermore, their presence aboard destroyers strengthens the Navy's broader defensive posture, providing a visible and credible deterrent to adversaries who may seek to exploit small boat tactics.

This thesis also highlights the broader implications of integrating specialized personnel into critical roles. By demonstrating how Marines can enhance SCAT capabilities, this study sets a precedent for exploring similar personnel solutions across other naval operations. This approach aligns with the Navy's mission to adapt to evolving threats, ensuring that its forces remain agile, lethal, and ready to respond to the challenges of modern warfare.

The integration of Marines into SCAT represents a transformative approach to shipboard defense. By addressing current deficiencies and leveraging the unique strengths of Marine personnel, the Navy can significantly enhance its ability to protect ships, crews, and missions from asymmetric threats. This proposal is not merely a tactical adjustment; it is a strategic imperative that positions the Navy to maintain its operational superiority in an increasingly complex and contested maritime environment. Implementing these changes will ensure that the Navy remains prepared to confront emerging threats with confidence and effectiveness, safeguarding its critical role in global security.

B. RECOMMENDATIONS FOR FUTURE RESEARCH

This thesis provides a foundational analysis of integrating U.S. Marines into SCAT onboard Navy destroyers to enhance shipboard defense against small boat threats. However, several areas warrant further exploration to refine and expand the proposed concept. One critical area for future research is the detailed analysis of rotational base requirements for Marine integration across multiple deployment cycles. This would include examining the impact of the OFRP on manning needs and determining the specific size of the rotational pool required to sustain Marine detachments effectively. Such research could provide a clearer understanding of the long-term manpower implications for the Marine Corps and the feasibility of scaling the proposed model beyond the scope of this study.

Another area for investigation involves addressing the challenges posed by deployment uncertainty. Decisions on ship deployment destinations often occur late in the planning cycle or mid-deployment, this would create potential challenges for pre-assigning Marine detachments to SCAT. Research could explore flexible assignment models or contingency strategies to ensure Marine support remains viable under dynamic deployment schedules. Additionally, further analysis could evaluate the operational and cost implications of integrating Marines into other high-stakes defense roles aboard naval vessels, which would expand the potential applications of this concept. These areas of research would help build upon the findings of this thesis, providing greater clarity and operational guidance for future Navy and Marine Corps force protection initiatives.

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