STUDY PROJECT

PROTECTION OF MERCHANT SHIPPING

BY

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result of the current and future threat for merchant shipping are discussed. The purpose of this study is to review historical lessons learned; to examine applicability to future situations requiring protection of merchant shipping; to point up weaknesses in current philosophy and planning for the protection of merchant shipping; to draw conclusions regarding the current philosophy for the protection of merchant shipping; and to make recommendations.

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PROTECTION OF MERCHANT SHIPPING

AN INDIVIDUAL STUDY PROJECT

by

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CHAPTER I

INTRODUCTION

As an island nation, the U.S. has long recognized its reliance on sea lines of communication to maintain its trade with its allies world wide. Freedom of the seas has historically been of such importance to the nation that nearly all of the wars the U.S. has fought have been to preserve that freedom for both the U.S. and its allies.[1] Inherent in the principle of freedom of the seas is not only denial of the sea to the enemy, but also the concept of protection of U.S. and allied merchant shipping.

THE NAVY'S ROLE

The protection of merchant shipping was the primary function assigned to the U.S. Navy Department when it was founded in 1798; its first major assigned task was to protect American shipping in the West Indies and the Caribbean during the nation's undeclared war with France. Perhaps the most famous action undertaken by the U.S. Navy for the protection of merchant shipping was that against the Barbary pirates as a result of harrassment of U.S. shipping within the Mediterranean. Although the War of 1812 was fought in part over British interference with American shipping, protection of shipping was neglected during

the Civil War; as a result, the Union relied heavily on neutral shipping to avoid interference by Confederate raiders.[2]

With little or no threat from the Spanish fleet during the Spanish American War, it was not until World War I and the deadly ability of submarines to target shipping with torpedos that there was a renewed interest in protection of merchant shipping. Once the war was over, concern waned and the lessons learned were forgotten. World War II again saw a significant threat to U.S. merchant shipping; had it not been for the Royal Navy's experience and assistance, the U.S. would have faced a virtually impossible task in protecting its merchant fleet.[3]

With the conclusion of war, interest and concern in the protection of merchant shipping was again lost; the lack of anti-shipping action in Korea ensured that the lessons learned from World War II were forgotten.[4]

Since its founding in 1798, political and military developments have resulted in the expansion of the mission assigned the U.S. Navy to include power projection and responsibility for strategic sealift. Because of the political nature of power projection ashore and nuclear balance considerations, there has been reduced emphasis on the protection of merchant shipping.[5] Current U.S. Navy contingency plans and exercise scenarios for the most part assume that allied merchant ships can safely sail as they do during peacetime, at least during the initial stages of war.[6]

NEED FOR REASSESSMENT

This assumption would appear to be in direct contradiction of both history and conventional military thinking; it also assumes that the Soviets have ignored the lesson of the Battle of the Atlantic when a relatively small number of German submarines came close to winning the war. Such an assumption also violates Karl von Clausewitz's basic dictum that one plans for an enemy's capabilities, not what one believes his intentions to be. However, even as the U.S. and its allies have applied the lessons learned from World War II to current military planning, so too have the Soviets.[7]

Just as the protection of shipping was of paramount concern to the U.S. in 1798, so too should it be today. As an island nation, the U.S. has an ever-increasing reliance on merchant shipping, both for strategic sealift and for economic shipping. Much has been written about the importance of U.S. flagged merchant shipping to the nation's war effort; the effects of the decline of that fleet on the nation's war effort have been clearly documented by the findings of the Denton Commission[8]. Interest, however, has yet to be awakened to the importance of the protection of economic shipping during contingency.

ENDNOTES

1. Philip Gold, "U.S. Flotilla Nearly Dead in the Water," Insight, June 6, 1986, pp. 8.

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4. Ibid., p.41.

5. Lcdr. Sankey L. Blanton, USNR, "Learning the Wrong Lessons," Proceedings, October 1987, p. 179.

6. Cdr. E. Cameron Williams, USNR, "Buying Time for the Merchant Marine," Proceedings, December 1988, p. 111.

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CHAPTER II

HISTORICAL BACKGROUND

Currently, more than 90 per cent of U.S. trade moves via the sea and more than half of that trade involves the nations of the Pacific Basin. Critical strategic minerals are imported to the U.S. from Asia and Africa, while oil is imported from the Persian Gulf, Nigeria and Venezuela.[1] The U.S.'s allies face the same reliance on sea transport. For example, it is estimated that 40 per cent of European and 70 per cent of Japanese oil imports transit the Persian Gulf.[2] Over 95 per cent of U.S. and Western European requirements for chromium are met through imports, while more than 90 per cent of their combined nickel requirements are imported.[3]

As an indication of the volume of economic shipping currently moving worldwide, estimates are that on any given day 1700 merchant ships cross the South Atlantic loaded with oil or durable goods.[4]

When estimates of the requirements for economic shipping are added to estimated requirements for strategic sealift, the numbers of merchant ships sailing the high seas during contingency are staggering. Estimates of shipping required to support military operations in a European conflict, despite the quantities of U.S. military equipment currently prepositioned, indicate that approximately 800 shiploads of military equipment would have to be moved from the U.S. to Europe per month; an

additional 1000 shiploads per month of food, fuel and raw materials would be required to keep our European allies functioning. Estimates of shipping requirements needed to support a major war effort on the part of the U.S. in other theaters of operation are just as great.[5]

During peacetime ships are defined as either vessels engaged in war (warships) or vessels engaged in commerce (merchant ships); these definitions change in time of war. Merchant ships support a nation's war effort logistically, either directly by carrying supplies required for deployed land and naval forces, or indirectly by carrying supplies to support the nation's industrial effort; they become therefor legitimate enemy targets.[6]

THE THREAT TO MERCHANT SHIPPING

Destruction or even delay of significant numbers of ships could conceivabley have a catastrophic impact on a modern war. Much has been written about the impact on the war effort in Europe during World War II as a result of ships lost to German submarines; the average merchant ship of that time was 12,000 tons as opposed to the average modern merchant ship of today which has a capacity of 40,000 tons.[7] Needless to say, the impact of the loss of a modern-day merchant ship in terms of cargo loss would be significantly greater than that of a merchant ship during World War II.

Vulnerability of Merchant Shipping

It is important that the vulnerability of merchant shipping to attack by enemy forces be recognized. Because merchant ships are, by their very nature and definition, unarmed, their only defense against enemy attack on the high seas is their ability to transit the seas undetected. Speed and size can be considered, therefore, to be protective characteristics. However, these two characteristics have historically proven ineffective.

CONVOYING IN WORLD WARS I AND II

As an example, in the month of April 1918, German submarines sunk 444 merchant ships. At that time, the Allies faced certain defeat as a result of the effectiveness of the German blockade. In an attempt to lessen these losses, the Allies instituted the centuries' old concept of convoying: sailing a number of merchant ships as a group accompanied by a small number of armed escorts. Six months later, only 10 ships out of over 1500 convoyed merchant ships had been sunk by German submarines.[8]

In 1942, approximately 40 per cent of Allied shipping was sailing in convoys; at that time, the Germans had only 30 submarines on station. By the end of the year, there were 150 enemy submarines on station and the percentage of merchant ships sailing in convoys had increased to 80 per cent. Throughout this

time period, the loss rate for convoyed merchant ships remained constant at 1.5 per cent, as opposed to 7.5 per cent for ships sailing independently.[9]

Successes

World War II provides many examples of the efficiency of convoying as a form of providing protection to merchant shipping. Perhaps the best known use of convoying was on what was known as the "Murmansk run," the shipping route from Iceland/the United Kingdom to Murmansk, the Soviet port on the Barents Sea. During the period from August 1941 to August 1944, only 57 of the total 775 ships sailed in convoy to Russia were lost despite German persistance. Even the return run losses were not significant, as only 21 of a total 707 ships were lost.[10]

Failures

There were of course exceptions. For example, Convoy P.Q. 17 sailed from Iceland on 21 June 1942 with a total of 34 ships, but only 11 survived the transit to Murmansk.[11] The reinforcement of Malta also provides a startling example of the difficulty of protecting merchant shipping even with convoying. During one eight-and-one-half month period, of 67 ships sailed, only six arrived; one, the SS Ohio arrived with only ten inches of freeboard. The staggering cost to the British of protecting

these ships included one aircraft carrier sunk and four damaged, as well as 19 cruisers and destroyers lost.[12]

Despite these dramatic exceptions, convoying of merchant ships proved overall effective during World War II. By the war's end, only 5 per cent of the total number of ships sailed had been lost. In terms of total cargo, less than 1 per cent of the total tonnage sailed failed to arrive at its destination. Surprizingly less than 1 per cent (approximately 4600 of the total 7,000,000) U.S. Army troops sent overseas during the war were lost as a result of enemy action on the high seas.[13]

SUMMARY

There can be no question but that convoying proved effective against the enemy threat in World War II. Prior to the implementation of convoying, merchant shipping fared very poorly against the enemy threat. Once convoying was implemented, however, a significant increase in merchant ship survivability was seen. As a result of its demonstrated success during World War II, it continues to be looked upon by many today as the ultimate answer to protecting merchant shipping.

ENDNOTES

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CHAPTER III

THE CURRENT THREAT

During World War II, of the total number of merchant ships lost, 69 per cent were lost as a result of enemy submarine action. Enemy aircraft were responsible for 13 per cent of the total, while mines and surface craft each accounted for 7 per cent of the total; the remaining 4 per cent of the total were lost as a result of marine hazards/unknown causes.[1] Clearly the most serious threat to merchant shipping was that posed by the diesel submarine. While convoying was successful in reducing losses, it was not fail proof.

Although the diesel-electric submarine posed a formidable threat to merchant shipping during World War II, its capabilities bear no comparison to those of the current generation of submarines. Radar and sonar were relatively primitive, while guided missiles were non-existent. Satellite surveillance had not even been dreamed of; as a result, the oceans provided an incredibly vast area in which transiting merchant ships could hide. Technology has made the threat environment of today significantly different from that of World War II.

MERCHANT SHIP CHARACTERISTICS

At the same time that military systems have been changing,

so too have merchant ships. Because these changes have been spurred, while at the same time constrained by economic considerations, they have evolved independently of the changes in military threat. Merchant ships of today are significantly larger (40,000 tons as compared to 12,000 tons[2]) and capable of greater speed (average of 20 to 25 knots as compared to "fast" ships sailing at 15 knots[3]) than those of World War II. Engineering, communications and navigation systems have become technologically sophisticated. However, few of these changes can be construed as protective.

To the contrary, some of these changes may actually have made merchant ships more vulnerable to enemy attack. The bigger the ship, the bigger the target; more importantly, the greater the loss in terms of quantity of cargo should the vessel be severely damaged or sunk. The increase in speed provides little in the way of improved survivability against missiles equipped with highly accurate targeting devices capable of speeds of hundreds of knots. Increased speed may in fact serve to identify the merchant ship as a desirable target for a missile or torpedo[4].

SUBMARINES

Modern nuclear attack submarines are capable of high speeds and unlimited submerged endurance. Their propulsion systems are relatively silent, making them exceedingly difficult to detect. When combined with highly sophisticated and accurate

antiship missiles and long-range homing torpedos supported by complex ocean surveillance systems, the result is a much deadlier submarine threat than that of World War II.

The threat posed by current generation diesel-electric submarines should not be understated, however. Although diesel-electric submarines have limited capabilities when compared to nuclear submarines, their effectiveness is enhanced by operating conditions similar to those experienced off the coast of Argentina. Operating at low speeds, using battery power only, they are unlikely to be detected by passive sonars at useful tactical ranges. The diesel noise generated when they snorkel makes them easily detected in open ocean conditions; when operating close in-shore or in shipping lanes crowded by neutral merchant shipping, they are relatively immune from detection. Such conditions as these exist in the Indian Ocean, the Caribbean or, even closer to home, within the Gulf of Mexico.[5]

Compounding the increased threat as a result of capability is the increased size of the submarine fleet with which merchant shipping will have to contend. During World War II, there were fewer than 10 submarines for every 1,000 Allied merchant ships at sea; today, the Warsaw Pact has approximately 50 submarines for every 1,000 ships in the NATO nations' combined merchant fleet.[6]

AIRCRAFT

The submarine threat, however, is not the only threat faced by merchant shipping in the current environment. Recalling that 13 per cent of the merchant ships lost by the Allies in World War II were lost to enemy aircraft, it must be recognized that today's highly sophisticated aircraft, with their increased long range capabilities, sophisticated sensors and incredibly accurate weapons systems pose a greater threat than did those of World War II. When linked with satellite surveillance of the oceans, tracking and targeting of merchant shipping by aircraft is made even easier. In addition, the ever-increasing endurance of modern aircraft, both as a result of propulsion developments and in-flight refueling capability, means that every corner of the oceans is accessible.

The end result of these changes in technology is that it has become extremely difficult for merchant shipping to avoid detection by determined aircraft. Future conflict will have to count aircraft as a major threat to the safety of merchant shipping.

SURFACE COMBATANTS

The threat from surface combatants has also increased. Not only do surface combatants have increased speed capabilities, but they enjoy the same increased benefits from technology that

submarines and aircraft do. Highly sophisticated and sensitive sensors, weapon systems with greatly increased accuracy and range, as well as significantly increased endurance, have all combined to make surface combatants a much more lethal threat to merchant shipping.

MISSILES

Current generation missiles constitute a significant threat to shipping with the ability to accurately target from literally hundreds of nautical miles. Merchant ships, which lack radar detection systems, have neither warning nor defense against incoming missiles.

MINES

An additional threat that bears consideration is that of mining. It may be recalled that during World War II an equal per centage of Allied shipping assets were lost to mines as were lost to surface combatants (7 per cent). What is often forgotten is that some of those ships were lost to mines on this side of the Atlantic.

During both World Wars I and II, the Germans were able to lay mines just off the coast of the U.S.. During World War I, German submarines laid mines approximately 60 miles off six east coast ports, resulting in the sinking of four merchant ships and the damaging of the batttleship Minnesota[7]. In World War II,

German submarines laid some 340 mines off the east coast, closing ports from Nova Scotia to Panama for up to 16 days and sinking 12 ships[8].

Mines were effectively used by the North Koreans during the Korean conflict. The mining of Wonsan Harbor resulted in the loss of several U.S. naval combatants. More importantly, had the North Koreans perceived the threat of General MacArthur's landing at Inchon earlier than they did, they could have effectively prevented it by closing the approaches with mines.[9]

The U.S. and its Allies have themselves effectively used mining against enemy shipping. The U.S., in what was called "Operation Starvation," used mining against Japan in World War II; over 1,000 Japanese merchant and naval ships were sunk or severely damaged. The British laid over 250,000 mines in World War II; 1,119 enemy ships were sunk and approximately 800 more were damaged.[10] In more recent times, the U.S. used mining to close Haiphong Harbor during the Viet Nam conflict[11].

The Iranians used mining in the Persian Gulf, effectively demonstrating the cability of mines to severely damage and sink merchant shipping. It is interesting to note that the mine which the SS Bridgeton (the lead ship in the first convoy to be provided U.S. Navy escort) hit in 1987, was a 1908 Russian designed bottom-moored, floating, contact mine[12]. Primitive by today's standards, this single mine proved nonetheless powerful enough to damage a 401,382 ton modern tanker severely enough to require lay-up in a shipyard for several months[13].

Just as technology has greatly increased the threat

capability of submarines, surface combatants and aircraft, so too has it changed mine warfare. More lethal now per pound than their predecessors, modern mines have benefitted in terms of kill capability from microminiaturization techniques. It is no longer necessary for a mine to come in contact with the hull of a transiting vessel; mines can now be programmed to seek out and destroy predesignated targets. Modern mines can be programmed with a virtual library of signatures (sound patterns), enabling them to wait for selected targets. Needless to say, technology has made modern mines more difficult to detect and sweep once they are detected.[14]

Perhaps just as valuable as their ability to destroy or severely damage ships, mines can be used to close strategic sea areas. Chokepoints, entrances to harbors, heavily traveled sea lanes --- all provide excellent targets for mine laying operations. The Suez and Panama Canals and the Straits of Malacca and Gibralter constitute critical chokepoints for U.S. and European shipping. For the Soviets, the Dardanelles and the Skagerrack represent critical chokepoints.[15]

Closure of ports, especially at the beginning of a war, could prove catastrophic. In order to support current plans for a European war, reinforcement cargos must move from U.S. ports within the first 10 days of conflict. It is estimated that 70 per cent of the reinforcement cargo that must sail within the first 60 days of conflict (surge shipping) will originate from U.S. Gulf ports. This will require passage to the Atlantic through the Florida Straits or the Yucatan channel, both natural

chokepoints and ideal for mining.[16]

Mines represent an efficient and effective threat to shipping. Most importantly, as has been demonstrated by mining of the Persian Gulf, the use of mines does not require super-power status to be effective.

CONFLICT OTHER THAN GLOBAL WAR

Clearly the events of the last decade provide proof that global war is not necessary for merchant shipping to be endangered by enemy attack. The Falklands Crisis in 1982, mining and harrassment of shipping in the Persian Gulf, ongoing pirateering in the Staits of Malacca, as well as the increase in terrorism worldwide should all be viewed as potential dangers for merchant shipping. Even though all out war in Europe may prove to be a consideration of the past, the U.S. needs to look closely at the full range of conflict and recognize that the safety of its merchant shipping is just as difficult to guarantee at the lower levels of the conflict spectrum as it ever was during war.

Falklands Crisis

The predicament in which great Britain found itself with the Falklands Crisis well illustrates the type of conflict in which the U.S. could easily find itself. Although Argentina lacked the profusion of high-tech military systems found in the arsenals of the super-power nations, the Argentines were still able to inflict considerable damage on British naval and merchant

shipping. With supply lines extending over 8,000 nautical miles of ocean, more than 70 per cent of the ships deployed by Britain were merchant ships; of these, 30 per cent were tankers[17].

When hostilities broke out, Argentina had only two diesel-electric submarines that were deployable. One of these submarines was able to penetrate the escort screen around one of the two V/STOL aircraft carriers Britain had deployed to the area; it also fired torpedos at an unidentified large target. British combatants reportedly spent some 20 hours hunting with no success for the submarine.[18] This episode gives evidence of the threat that diesel-electric submarines can pose to shipping.

Argentina also demonstrated that the missiles to which Third World countries have access, while perhaps not held in the same quantities as do the super-powers, are just as lethal. As an example, the Argentines fired an Exocet missile at the British aircraft carrier, the HMS Hermes, which the carrier was able to deflect through the combined use of chaff and active jamming. Unfortunately, the missile then locked onto the SS Atlantic Conveyor, which was located some five to six nautical miles away from the HMS Hermes.[19]

A combination roll-on/roll-off containership, the Atlantic Conveyor had been modified to serve as a makeshift aircraft carrier, capable of carrying a total of 14 V/STOL Harriers. When hit by the Exocet missile, 13 of those helicoptors, as well as her entire load of stores and equipment sank with her.[20]

Persian Gulf War

The Third World country which has wreaked the most havoc on merchant shipping within the last decade is Iran. Using a variety of weapons systems, running the range from the relatively primitive to the highly sophisticated, Iran has damaged and sunk a significant number of merchant ships transiting the Persian Gulf. These systems have ranged from pre-World War I moored contact mines to highly sophisticated and technologically advanced shore-based Silkworm anti-ship cruise missiles with a range of 50 nautical miles and carrying 1100 pound warheads[21]. Iran has also used high speed, heavily-armed, small attack boats which have been equipped with various offensive weapons including bow-mounted machine guns and Soviet made rocket propelled grenades[22].

Merchant ship losses in the Persian Gulf in 1985 alone were greater than the total of merchant ship tonnage lost since the end of World War II[23]. Total losses from 1981 through 1987 included nine tankers sunk out right and more than three dozen ships declared total losses[24].

It must be remembered that the threat to merchant shipping exists in the enemy's capability not only to damage and destroy merchant ships, but also in his ability to severely curtail their operations. This was demonstrated in 1987 when Kuwait reported that it was unable to meet some of its crude oil contracts as a result of Iranian attacks on neutral flag crude carriers[25]. Based on this, the U.S. provided naval escorts for convoys of reflagged tankers.

The U.S. committed more than 30 combatants to escort 11 reflagged Kuwaiti tankers and to provide deterrence against threatened Iranian use of Silkworm missiles. In addition, another 26 naval combatants were deployed by Britain, France, Italy, Belgium and The Netherlands to assist with escort and minesweeping duties. This made a total of 56 naval combatants deployed to the Middle East to provide protection for merchant shipping transiting the Gulf.[26] The costs to the U.S. alone were estimated to be $69 million for fiscal year 1987 and an estimated $10 to $15 million per month in fiscal year 1988[27].

SUMMARY

It must be remembered that merchant shipping can face serious threat at conflict levels well below that of full scale war. Although modern technology has provided extensive and far-reaching advances in the lethality of submarine, surface and air threat for merchant shipping, recent events have shown that weapon systems unchanged from the beginning of the century retain their ability to significantly damage or destroy merchant ships. Spurred by economic considerations, merchant ship design, while increasing speed and size, does not provide for increased security against these threats. Nor, would it appear, have naval forces been able to provide much protection above that enjoyed as a result of conventional convoying.

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1. Anderson, Op. Cit., p. 887.

2. DeStefano, Op. Cit., p. 36.

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8. Scott C. Truver, "Weapons That Wait...and Wait...," Proceedings, February 1988, Vol. 114/2/1020, p. 34.

9. Beck, Op. Cit., p. 19.

10. James D. Hessman, "In Search of "The Weapon That Waits,'" Sea Power, July 1984, p. 41.

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13. Adm. Wesley L. McDonald, USN-Ret., "The Convoy Mission," Proceedings, May 1988, Vol. 114/5/1023, p. 37.

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15. Merle MacBain, "Mines: The Forgotten Weapon," Sea Power, May 1980, p. 32.

16. Truver, Op. Cit., p. 34.

17. Pettavino, Op. Cit., p. 48.

18. R. J. L. Dickers, "The German Submarine Industry: Will the Success Continue?," International Defense Review, Vol. 16 No. 9/1983, p. 1292.

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CHAPTER IV

COUNTERING THE THREAT

The previous chapter discussed the character of the threat to merchant shipping which exists today. It is important to remember that merchant shipping does not have to be sunk for a threat to be viable or successful; significant delays to the arrival or departure of shipping can be just as detrimental to trade or resupply as the actual destruction of shipping, while severely damaging a merchant ship means the loss of its usefulness for as long as it takes to repair it.

It is equally important to remember that merchant shipping can be threatened under conditions other than those of full-scale war. It is not necessary for the U.S. or its allies to be actively involved in a conflict for their shipping to be threatened. Conflicts between Third World nations can easily result in accidental or indiscriminate hazard to merchant shipping. Examples of Third World conflicts which have resulted in hazarding of shipping despite non-involvement include mine-laying operations in the Indo-Pakistan war in 1971, mining by the Egyptians in the Red Sea in 1983, Argentine mining and submarine operations around the Falklands in 1982, Libya's mine-laying in the Red Sea in 1984, and recent Iranian actions in the Persian Gulf[1].

At the same time that past events have demonstrated that merchant shipping can be endangered throughout the spectrum of

conflict, history has also provided examples of various means of protecting merchant shipping. Ranging from the centuries old concept of convoying to the arming of merchant ships with both passive and active systems, these methods have enjoyed varying degrees of success, depending on the threat faced.

CONVOYING

Historically convoying has been the most widely used method of protecting merchant shipping. By sailing large numbers of merchant ships in company with relatively few numbers of escorts, convoying is still viewed by many as the best method of providing protection to merchant shipping. History provides numerous examples of its use, from ancient times to the present. Phoenician traders routinely sailed in convoy; the Athenians sailed convoys of grain ships from southern Russia to Greece; Spain used convoys to protect its ships sailing between its American colonies and Europe[2]. In this century, convoying was used successfully in both World Wars and has been used by the U.S. Navy to protect merchant shipping in the Persian Gulf.

Convoying has been successful for three reasons; first, it provides a concentration of force by stationing armed escorts at that point most likely to be attacked by enemy forces. Secondly, convoying provides for the most economical and efficient use of available escorts. And thirdly, convoying forces the enemy to close with escorts in order to attack merchant shipping.[3]

Convoying, however, does have disadvantages. A convoy is

speed constrained, in that it can proceed no faster than the slowest of its members. Shipping must wait idle either in approaches to ports or within the port itself, increasing vulnerability to attack. Both in arrival and departure from port, convoying makes inefficient use of port facilities and contributes significantly to port congestion.[4] Convoying also provides a concentration of targets for the enemy.

Future Utility

While successful in the past, convoying does not necessarily provide the answer for future merchant shipping protection. It must be remembered that past experiences with convoying have occurred under conditions of relatively unsophisticated threat and with large numbers of escort vessels. Unfortunately, both of these conditions have changed significantly and can be expected to continue to change in the future.

First, the threat to merchant shipping has increased as a result of significant advances in technology. The submarine threat, both from the newest of Soviet nuclear submarines to the current generation of diesel-electric submarines is far different from that faced by merchant shipping during World War II. Some 21 Third World countries currently possess submarines, ranging from relatively unsophisticated 1960 vintage diesel submarines to highly sophisticated and quiet Soviet Kilo class and West German diesel-electric Type 209s[5]. The submarine threat must be considered to exist throughout the range of conflict, not just

within the context of all-out war.

In addition, the world's population of submarines has increased significantly. In 1943, which was the worst year for Allied shipping losses in World War II, the Germans had a total of 212 submarines[6]. It is currently estimated that the Warsaw Pact has more than 225 attack submarines alone[7], while Third World nations collectively own over 250 submarines[8].

As has already been discussed, the threat to merchant shipping includes much more than just submarines. Current generation aircraft, coupled with increased surveillance and intelligence gathering systems, as well as the expanded missile threat, have significantly increased the threat to merchant shipping, not just from super-powers, but also from Third World nations. Super-power status is not a perequisite to the possession of sophisticated and highly accurate missiles: Argentina has Exocet missiles; Saudi Arabia has Chinese-made missiles with 1500 nautical mile ranges; Iran has purchased and is able to deploy Chinese Silkworm missiles[9]; the list goes on and will grow, as more countries enter the lucrative arms market.

Secondly, the numbers of escort vessels available for convoy use has changed significantly since World War II. Even though the enemy threat to merchant shipping was far less sophisticated then than it is now, large numbers of escorts were needed to ensure the safety of merchant convoys. As an example, in 1943, when British transatlantic convoys were incurring crippling losses from the German fleet of 212 submarines, Britain and Canada were able to deploy a combined force of 457

escorts, as well as 507 maritime patrol and anti-submarine aircraft to protect convoys. By 1977, the total Allied escort force numbered 336 surface combatants, 160 aircraft and 85 nuclear powered "hunter-killer" submarines[10], and has continued to decrease. By 1985 it was reported that NATO had a 50 per cent shortfall in frigates and destroyers and a 25 per cent shortfall in maritime patrol aircraft.[11]

Depending on who is discussing convoying determines the number of escorts estimated as a requirement for convoying to be successful. Estimates vary from "a couple of destroyers," to "a couple of destroyers and a couple of submarines," to much more extensive requirements. As an example, one source has suggested that, if the convoy escort is to be effective against both the threat of long and short range missiles, as well as attack by torpedo, then the escort force should be composed of long-range anti-submarine warfare (ASW) maritime patrol aircraft (MPA), carrier-based fixed wing ASW aircraft (VS) and ASW helicoptors, direct support nuclear attack submarines (SSNs), as well as surface escorts, some of which should have light, multi-purpose system (LAMPS) helicoptors[12].

This array of forces is justified on the basis that it would be needed to provide a screen defense designed to provide in-depth ASW defense from close-in torpedo attack as well as defense out to submarine-launched cruise missile-firing ranges. Such an array of escorts would indeed cover the full range of the sophisticated technological threat that merchant shipping could face. Indeed, this same source goes on to suggest that ASW-

configured carriers (CVs) could be assigned to convoy escort duty to provide direct support and anti-ship missile defense, while at the same time providing for ASW operations within the sea lines of communication. An alternative suggestion is the configuring of amphibious assault ships for convoy ASW operations, thereby enhancing convoy protection and, at the same time, relieving a portion of the requirement for the CVs.[13]

While this scheme represents a wish list rather than a proposal based on availability of assets, it serves to demonstrate the magnitude and the complexity of threat a determined enemy possessing reasonably sophisticated systems could mount against merchant shipping. In actuality, in order to ensure safe arrival of a convoy, an escort force of this type may be required. Bearing in mind the quantities of cargo that modern merchant ships are able to carry, a convoy of 40 to 50 fully loaded merchant ships would provide an extremely lucrative target for a determined enemy[14]. Although only 28 per cent of the Allied merchant ships sunk during World War II were sailing in convoys, most of those were sailing in convoys which were recognized at the time to have had inadequate protection, with adequate defined as constant air and surface escort[15]. Add to this the fact that the Allied High Command was able to read German code throughout most of the war and often knew not only where their submarines were, but where they were going. In view of this, the extent of the danger facing merchant shipping takes on a greater impact[16].

The NATO navies have faced the same budgetary problems as

those faced by the U.S. Navy; the result has been a continual decrease in the number of combatants available to NATO forces. For the U.S., the recent decommissioning of 16 frigates of the Brooke and Garcia classes (10 ships in FY 1988 and six ships in FY 1989), as well as the directed decommissioning of all 32 DDG-2 and DDG-37 class ships during FY 1990 through FY 1993, has meant a significant reduction in the destoyer fleet. Combined with the placing of 24 Knox class frigates (FF-1052) into the Naval Reserve Force, the U.S. fleet alone is faced with a total reduction of 72 surface combatants.[17]

The impact of the decommissioning of the 16 frigates of the Brooke and Garcia class provides an insight to another aspect of the escort problem, which is the willingness of the Navy to commit resources to the protection of merchant shipping. Originally intended to be used to protect merchant shipping against the submarine threat, "frigates" were introduced to the fleet in 1941 but were called "destroyer escorts." These "DEs" reportedly had some of the best anti-submarine warfare capabilities of their time. After the war, the DE classification name was changed from "destroyer escort" to "escort vessel," to "escort ship," to "ocean escort," until finally in 1975, the DE ocean escort became the frigate (FF) in order to conform with the designation used by most of the world navies for similar ships. As the threat to merchant shipping expanded to include aircraft and missiles, the Navy introduced the DEG, which has since become the FFG.[18]

While the mission assigned the class has never officially

been changed, FFs and FFGs have come to be used by the fleet to escort underway replenishment ships and amphibious groups, as well as carrier battle groups[19]. Little mention is made of using these ships for their original mission, that of escorting merchant shipping.

Current U.S. Navy plans are to shift some of the older cruisers (CGs) and destroyers (DDs), beginning with non-AEGIS ships, to the "less demanding" role of protection of shipping as they are replaced by DDG-51 Arleigh Burke class destroyers[20]. Such a shift in mission will only occur if sufficient assets are available to provide adequate escort for fleet requirements; in this case, that means carrier, amphibious and battle ship battle groups.

THE NAVY'S ATTITUDE

The history of the frigate points up what may be the real reason why convoying may not be a feasible means of protecting merchant shipping either now or in the future. The problem of a genuine lack of naval escorts is compounded by the almost cavalier attitude on the part of the Navy towards the protection of merchant shipping. It has been suggested that, as a result of this attitude, Navy procedures for the protection of shipping are not only out of date, but are seldom practiced at sea[21].

Historically, naval authorities have tended to resist convoying, as evidenced by the reluctance to implement it during both World Wars. This reluctance may be as a result of a perception within their ranks that convoying is a purely

defensive and passive measure, alien to the offensive nature of war[22]. Whatever the basis, there appears to be what has been called "a lack of interest"[23] in protection of merchant shipping, as evidenced by the lack of planning, much less training provided the fleet through exercises[24].

Although the historical need for a navy was first and foremost the need to protect merchant shipping, political and military developments during this century have added power projection ashore as a primary task of the U.S. Navy. Coupled with the need to maintain the nuclear balance, the result has been a tendency to reduce the emphasis on protection of merchant shipping[25]. This tendency has been reinforced by the current Maritime Strategy, which, by its focus on major conflict with the Soviet Union, relys on power projection. Calling for the containment and destruction of Soviet submarine forces in their home ports, it thus precludes the need to seriously contend with protection of merchant shipping.[26] As a result, the Navy sees no reason to give this role a great deal of attention, particularly when allocating diminishing assets which would be needed for "...higher priority assignment elsewhere."[27]

It may very well be that this disinterest in the protection of merchant shipping stems from nothing more than the reluctance of the Navy, and of the nation as a whole, to accept the merchant marine industry as a fourth arm of defense. Although the Navy has long recognized the value of merchant shipping in wartime[28], it has historically failed to recognize that importance in peacetime and has traditionally refused to

contribute assets towards its development[29].

Regardless of the reason, the mission of protection of merchant shipping fails to receive the attention it requires in terms of peacetime planning. When coupled with decreasing numbers of naval escorts specifically committed to the task of providing protection to merchant shipping, it should be clear that merchant shipping will face significant problems should a conflict scenario require military protection.

ALTERNATIVES TO CONVOYING

The convoying of merchant shipping, however, is just one means of providing protection from submarine, surface or air threats. In response to the chronic problem of insufficient naval escorts, alternatives to convoying have been developed, some of which do not rely on naval combatant escort.

NAVAL CONTROL OF SHIPPING ORGANIZATION (NCSO) ROUTING

Under certain conditions, routing by the Naval Control of Shipping Organization (NCSO) can provide a viable alternative to convoying. Using information provided by the Navy, NCSO would provide routing to merchant ships, sailing either in convoy or independently, along established safe ocean routes. Permitting safe shipping operations, without requiring the direct committment of naval assets, it nonetheless requires control of the sea lines of communication in order to ensure non-penetration by enemy submarines, surface vessels or aircraft. Unfortunately,

it has historically not proven as effective as convoying when used against a major threat.[30]

USE OF PROTECTED LANES

A variation on this is the use of protected lanes. This method involves sanitizing specified ocean areas by naval combatants, followed by the implementation of barrier operations. Protective forces, assigned to specific ocean areas or zones, are stationed along a transit route or along the perimeter of the designated ocean area and are responsible for preventing penetration of that area by enemy forces. Merchant shipping, either independently or in convoy, is then routed along or within this area and is "passed" from one defensive zone to the next. Although this method of protection maximizes the use of combatant forces while providing maximum safety to merchant shipping, it would be extremely difficult to implement, considering the capability of the current threat. It would not take an enemy long, using current surveillance capabilities, to discover the location of the protected lanes. It would then become a simple matter for his forces to lay in wait for a target.[31]

It is interesting to note that Navy Tactical Publications (NTPs) provide very little detail on alternative means of protecting merchant shipping. Although AXP-5, a NATO publication on experimental tactics, offers some direction and discusses some possibilities, it is reportedly unclear and vague in its direction. It has been suggested that most of the methods

discussed in the publication are in fact virtually unmanageable.[32]

MINESWEEPING

Just as the there has been a lack of realistic planning for the protection of merchant shipping from the active threats posed by torpedos and missiles, so too has there been little attention devoted to planning for the protection of merchant shipping from enemy mining operations. Historically, the U.S. Navy has relied on its Allies to provide mine warfare assets; however, as events in the Persian Gulf have shown, this policy may require rethinking.[33]

Despite effective use both by and against the U.S. in World Wars I and II, as well as Korea and Viet Nam, active planning for mine warfare has been virtually ignored by the U.S. Navy. Alfred Thayer Mahan, who is recognized as the father of U.S. Navy doctrine, called mines the weapons of "inferior naval powers;" this attitude would appear to sum up the current Navy view of mine warfare. As a result, the development and use of mines appear to have taken a back seat to torpedos and missiles.[34] This same attitude has extended to the development of minesweeping capabilities.

CURRENT NAVAL CAPABILITIES

In 1960, the U.S. Navy and the Royal Navy had a combined minesweeping force of almost 200 ships[35]. Currently there are

three minesweepers in the active U.S. fleet, with an additional 18 assigned to the Naval Reserve fleet. Of the minesweepers assigned to the Reserve fleet, the newest was commissioned in 1958.[36] Current force planning calls for the U.S. Navy to have a total of 31 mine countermeasures vessels (MCMVs) total of 35 minesweeping helicoptors, while the British Navy will have about 30 MCMVs within the next few years. Despite the lessons learned in the Persian Gulf about the efficacy of mines against both naval and merchant ships, the U.S. intends to relegate its entire fleet of minesweepers to the Naval Reserve Force (NRF) after completion of one year of active duty operations.[37]

To augment this small reserve fleet of minesweepers, the U.S. intends to activate a Craft of Opportunity Program (COOP) within U.S. commercial ports. This program will provide mine detection and sweeping systems for selected commercial vessels in ports on both the U.S. east and west coasts. Should the need arise, these ships will be recalled from their commercial operations and will be assigned minesweeping duties. problem with this program, other than funding, is manning. Because of the ongoing requirements for training, the use of Naval Reservists to man these vessels is almost mandated; however, this would require taking assets from other reserve programs.[38]

As has been discussed at length in a previous chapter, mining is perhaps the threat most likely to be faced by merchant shipping in conflict below the level of all-out war. It is cheap, easily implemented, and deadly. As was demonstrated in the Persian Gulf, a mine need not be hi-tech to be effective.

However, the more sophisticated the mine, the more difficult it becomes to detect and to sweep. It should also not be forgotten that the simple threat of mining can be very effective in delaying merchant shipping and can in effect close ports, canals and chokepoints until such time as the threat can be dealt with or disproved.

NAVAL VIEW

In view of geographic vulnerability to mining, coupled with the demonstrated willingness of Third World countries to use mines, it would seem prudent for the U.S. and its NATO Allies to maintain effective peacetime mine countermeasure forces. As has been discussed, however, this is not happening. This lack of planning and committment has occurred not only as a result of Navy doctrine and a resultant attitude towards the use of mines, but also economic and political reasons. Mine countermeasure ships are expensive; the USS Avenger, the first of the U.S. Navy's new class of MCMVs was budgeted at close to $100 million in 1982, while Great Britain's latest class of MCMV's is estimated to cost about $60 million each.[39]

Minesweeping tends to be a "boring and unglamorous" job, which has traditionally held little value for naval careers. More importantly, because mine warfare is not viewed by the Navy as a major threat, it is difficult to generate interest in committing funding or assets to mine warfare.[40] Despite the demonstrated need for minesweepers during the Persian Gulf crisis, funding for the remaining three minesweepers of the 14-ship MCM class was cut

from the 1989 budget [41].

INDUSTRY'S VIEW

It is interesting to note that not only the Navy, but also the commmercial community seems to be willing to down play the threat to merchant shipping posed by mines. Based on incidents in the Persian Gulf, where tankers hit mines but were not sunk despite severe damage, there seems to be a prevailing view that modern merchant ships can survive mines. Not only that, but most authorities agree that merchant vessels may actually be more survivable against mines than naval combatants[42].

The example most often used to support this argument is that of the SS Bridgeton. As previously discussed, the tanker was the lead ship in the first convoy escorted by U.S. naval combatants in the Persian Gulf in 1987 when it hit an Iranian mine; although powerful enough to send shrapnel several decks, as well as the main deck some 90 feet above its impact point, the mine did not sink the ship. As a matter of interest, the naval combatants escorting the SS Bridgeton actually pulled in behind the tanker, in effect using it to protect themselves from other mines that may have strayed into the path of the convoy.[43]

What is often forgotten when discussing this incident is that the SS Bridgeton was in ballast (empty) at the time it hit the mine. As a result, its cargo tanks were nothing more than enormous voids. While there can be no question that voids such as those that exist in giant crude carriers when their cargo

tanks are empty add to their survivability[44], tankers are not always in ballast. More importantly, they are not the only type of merchant ship necessary for a nation's survival. Additionally, it must be remembered that it is not necessary for an enemy to sink a ship for it to be lost; severely damaging or significantly delaying a ship loaded with badly needed cargo can be just as detrimental to the war effort.

Discussion thus far has concentrated on the Navy's ability to provide protection to merchant shipping. Because the U.S. Navy tends to view protection of merchant shipping as "...alien to (the) Navy's tradition of daring "offensive" action..."[45], it has been argued that the Navy has historically ignored the need for peacetime planning and exercising of protective procedures[46]. Furthermore, the Navy, while widely declaring the importance of merchant shipping to national security in both peace and war, does not willingly commit assets to merchant shipping concerns[47]. It is therefore surprizing that the Navy is now willing to admit that under "certain scenarios," there would be insufficient naval escorts to adequately protect merchant shipping[48].

SPEED

The Navy has also come to recognize that strategic sealift, particularly those assets which must meet surge (defined as initial movement of combat and support forces and their unit equipment to the theatre of operation) requirements, as well as

those assets which must meet sustainment (reinforcement and resupply) requirements[49], must be afforded protection. This is counter to the Navy's original belief that increased speed capability would afford sufficient protection to strategic sealift assets[50].

However, the results of a study conducted to determine the feasibility of building ships with high speed capability (30 to 50 knots) indicated that cost would prove prohibitive, particularly in view of the need to ensure adequate cargo carrying capability. Then Secretary of the Navy, William H. Ball recommended disapproval of such a program because such ships would not add significantly to the Navy's capabilities to fight and win at sea.[51]

The validity of the increased speed-increased protection argument must be questioned. Not only does increased speed provide an indication of a significant target to the enemy, but noise generation is significantly increased, enabling easier targeting. Most importantly, however, is the question of just how much protective value is gained from a ship with a speed capability of 30 to 50 knots when threatened by torpedos and missiles capable of speeds of hundreds of knots.

"SEALIFT SHIP SURVIVABILITY PROGRAM"

The argument upon which this recommendation has been based is that the faster the ship can go, the less time it is on the seas and thus vulnerable to enemy attack. An additional benefit of increased speed capability is the ability to provide more

rapid reinforcemnt and resupply, a requirement which will become increasingly important as a result of the expected withdrawal of forward deployed troops and assets[52].

The Navy has come to realize, primarily because of the cost factor, that purchasing and building fast sealift ships does not ensure the ability to meet strategic sealift requirements if the arrival of these ships at their destination cannot be guaranteed. As a result, the Navy has started looking at providing what it terms "high value shipping" with defensive protection systems. Ships which carry large concentrations of reinforcemnt equipment or which perform missions deemed critical to the Navy's ability to fight and win are those which are viewed as high value. The definition of high value ships includes the Maritime Prepositioned Ships (MPS), Fast Sealift Ships (FSS), Prepositioning Ships (PREPO), selected U.S. flag merchant ships (undefined), as well as auxiliary crane ships (TACS), aviation logistic support ships (TAVB), and fleet hospital ships (TAH).[53]

Known as the "Sealift Ship Survivability Program," this program was the result of a 1985 tasking by the Assistant Secretary of the Navy for Shipbuilding and Logistics (ASN(S&L)). The Deputy Chief of Naval Operations (Logistics) (OP-04) tasked the Strategic Sealift Division (OP-42) to head a Sealift Survivability working group which included represenatives of the Naval Sea Systems Command (NAVSEA), David Taylor Research Center, Maritime Administration (MARAD), Military Sealift Command (MSC), and the Center for Naval Analysis (CNA). This working group

recommended that an evaluation of non-developmental weapons systems, both active annd passive, to include weapons carried as cargo on seagoing platforms be conducted as Phase I of the program; Phase II would comprise the procurement and installation of damage control equipment. ASN(S&L) approved the Survivability Program as recommended in 1986 and authorization was given to CNO to commence installation of enhancements subject to the availability of funding.[54]

SYSTEMS TESTED

In 1988, the first at sea test of off-the-shelf weapon systems was conducted aboard ship; a second test was conducted in March of 1989. These tests evaluated weapon systems such as 105mm Howitzer, 20mm Vulcan Air Defense Weapon, M19 40mm grenade launcher, M29 81mm mortar, M224 60m mortar, EMI ESM system, and the Thorn thermal imager. All of these systems were found to be useable at sea except for the mortars. The tests conducted in 1989 found the MK38-Mod 0 25 mm Naval gun, the ASP 30 mm cannon, the Chaparral Air Defense missile, as well as the Mast Mounted Site acceptable under at-sea conditions. The Naval Surface Warfare Center has since been tasked to complete threat assessment and mission analysis for the strategic sealift ships; when completed, a Tentative Operational Requirement (TOR) will be prepared to initiate system acquisition.[55]

In addition to this, OP-42 has recommended validation of the Compressed Air Masking System (CAMS) for installation on the eight fast sealift ships (FSS). The purpose of this system is to

provide protection from enemy surface and sub-surface detection systems by masking the noise generated by the ship as it moves through the water.[56] Interest in installing such a system on the FSSs, which have been called ideal for strategic sealift because the Navy felt that their 33 knot speed capability would provide all the protection necessary to ensure safe arrival at their destination, is a strong indication that the Navy may be reevaluating the efficacy of speed.

ECONOMIC SHIPPING IGNORED

Although the Sealift Ship Survivability Program is a major step towards providing protection, it illustrates the parochial attitude of the Navy towards merchant shipping. This program recognizes the vulnerability of non-combatant shipping to enemy threat, but is designed to provide protection for U.S. Navy owned sealift assets only. There are neither provisions nor interest in extending this or a similar program to cover merchant ships[57]. The Navy attitude continues to be that the Naval Control of Shipping Organization and convoying will provide adequate protection[58].

ARMING MERCHANT SHIPPING

The Navy's decision to install off-the-shelf weapon systems on the strategic sealift ships highlights another method of protecting merchant shipping: arming merchant ships so they can protect themselves. As old as convoying, the idea of providing

merchant ships with a means of self-defense has historically enhanced their ability to survive enemy attack. The British, during both World Wars, felt that equipping merchant ships with defensive weapons increased their chances of survival. A side benefit of the arming of merchant ships was an increased opportunity to attrite the enemy.[59]

DEFENSIVELY EQUIPPED MERCHANT SHIP ORGANIZATION

To this end, the British at the start of World War II, created what was called the Defensively Equipped Merchant Ship (DEMS) organization, which was tasked to equip, man and train personnel in the use of a number of anti-submarine and anti-aircraft weapons that were installed on merchant ships. By early 1941, DEMS had installed several thousand three and four inch guns, as well as smaller calibre weapons, on over four thousand merchant ships. This number grew substantially as the war continued. Despite the cost of the program, the British government felt its success warranted its continuation throughout the war. By the end of the war, DEMS had trained some 24,000 naval personnel and 150,000 merchant seamen to operate and maintain defensive equipment.[60]

The current threat, however, is significantly different than that faced by merchant ships in World War II. Just as the threat has become technologically more sophisticated, so too have the means of countering it.

ARAPAHO

An example of this was the development by the U.S. Navy during the 1970s of a prefabricated portable aviation facility. Known as ARAPAHO, this system was specifically designed for the deployment of V/STOL aircraft aboard container ships. Using 60 or so commercial containers, it provides for flight deck, hangars and fuel storage, as well as crew quarters.[61] The system requires between 18 and 24 hours to load, assemble and test. ARAPAHO decreases cargo carrying capacity of the host ship by approximately 20 per cent[62].

The advantages of a system such as ARAPAHO are many. Relatively inexpensive, the estimated cost of the original system was between $16-17 million (FY 1982 dollars)[63]. Contained in International Standards Organization (ISO) 40 foot containers, the system is comprised of modules that can be mixed and matched as needed. Because it is self-contained, no advance notice or refit is required for installation of the ARAPAHO system.[64]

Used by the British during the Falklands crisis, the system was installed on the ill-fated SS Atlantic Conveyor, which was sunk by an Exocet missile. Prior to the missile attack, the system had successfully demonstrated its ability to turn a commercial container ship into a V/STOL aircraft carrier.[65]

Although both the British and the Soviets are using the ARAPAHO concept, the U.S. has not procured the system in any significant numbers for installation on U.S. flag vessels. There

are a number of reasons for this, just one of which is the issue of funding. Perhaps the most important reason has been that, because the U.S. Navy has significant numbers of both aircraft and helicoptor carriers, as well as helicoptor capability on the majority of its ships, there has not been a perceived need for ARAPAHO to support fleet operations.[66] As a means of providing protection to merchant shipping, again the lack of a perceived need has precluded interest in procuring the system. The bottom line is that the Navy is reluctant to commit assets (personnel and helicoptors) to a program not directly associated with Fleet operations.

There are other weapons systems that can be successfully deployed aboard merchant ships quickly and cheaply. Deck guns and similar ordnance, as demonstrated by the British DEMS program and recently tested by the U.S. Navy as part of the Sealift Ship Survivability Program, can be quickly installed and have proven feasible for this use. In addition to ARAPAHO, the British have developed and tested a catapulted-fighter aircraft system that can be assembled and installed aboard a merchant ship without interfering in its cargo carrying ability.[67]

PASSIVE DEFENSIVE SYSTEMS

In addition to active defensive measures such as these, there are various passive defensive measures which can be installed onboard merchant ships to provide protection from an enemy threat. Some of these measures were installed on tankers

transiting the Persian Gulf during the Iranian-Iraqi war. These measures included such things as radar absorbent materials and reflectors designed to reshape a ship's radar profile, boiler protection systems, electronic disorientation equipment designed to complicate close range target acquisition, and passive radar warning equipment.[68]

These systems proved surprizingly effective. By 1987, four tankers had been outfitted with a combination of radar-absorbant materials and reflectors, boiler protection systems and electronic disorientation equipment; two of them successfully avoided being hit by missiles. Although the SS Free Enterprise was hit on two seperate occasions by Exocet missiles, the installed systems have been credited with diverting both missiles from critical shipboard areas. As a result neither of the missiles immobilized the ship; total repairs as a result of both hits did not exceed $1 million. The SS Achille's protective systems were not fully operational as a result of an electrical and propulsion failure suffered prior to targeting by an Exocet missile. Even so, although the ship suffered significant damage, it was neither destroyed nor sunk.[69] Both of these examples are in stark contrast to the SS Atlantic Conveyor which was hit and sunk by an Exocet missile deflected by the HMS Hermes during the Falklands conflict.

Two sets of passive radar warning equipment were installed onboard a Greek tanker and proved effective. Designed to enhance crew survivability, the system provides warning of the direction of a missile attack. At the same time that it enables the crew

to select the best shelter, the system is designed to engage the ship's automatic fire fighting systems.[70]

A containerized towed array, called the Towed Accoustic Tactical Underwater Warning System (TATUWS) has been developed. This system, which is air transportable, is designed to be installed on combatants lacking ASW capability[71]; it could also be installed on merchant ships. The system is designed to be towed far enough astern of the ship to avoid interfe- - -rom noise generated by the host ship[72].

A system such as this, if used in conjunction with an active defensive system, or better yet, in conjunction with a naval combatant, would contribute significantly to merchant ship protection. The major disadvantage of such a system is the need for highly trained personnel to operate it. Capable of providing warning of submarines, surface combatants, as well as torpedos, it requires a high level of system specific training and familiarity to accurately interpret the acoustic information it gathers.

SUMMARY

The methods available to provide for the protection of merchant shipping can really be broken down into two sub-groups: those means which require naval combatants and those which do not. Of the first group, convoying is the most escort intensive, while various methods of routing are less so.

Those methods which do not require escorts range from

equipping merchant ships with armament systems to sophisticated electronic sensors and protective systems.

Regardless of the system or method of protection selected, it should be obvious that a single protective means may not be adequate. To ensure merchant ship survivability, it is necessary to provide sufficient protection to counter the sophisticated and complex threat which even Third World nations can mount.

What should also be evident is that a commitment of funding must be made, either by the Navy or by the commercial sector, in peacetime in order to provide the system/systems deemed most appropriate.

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CHAPTER V

CONCLUSION

Despite the lessons learned concerning the vulnerability of merchant shipping to enemy attack during World Wars I and II, as well as from the numerous lesser conflicts which have occurred during the last 30 years, the U.S. and, perhaps to a lesser extent, its NATO Allies appear to have forgotten that modern wars require more than simply attacking enemy naval forces on the high seas. Although admitting that merchant shipping will play a critical role in contingency, the Navy seems to have failed to recognize that unless the safe arrival of that merchant shipping at its destination can be guaranteed, there will be no merchant shipping to support the contingency. For island nations like the U.S., the protection of its merchant ships must be an important concern.

SUMMARY

Although sailing merchant ships in convoys has historically proven to be the most effect means of protecting merchant shipping, this has been true only when adequate protection has been available. Because convoying makes the most efficient use of escorts, and has proven itself in the past, the Navy has tended to view convoying as the ultimate solution to the problem of protecting merchant ships without giving serious consideration

to the requirement for adequate protection.

The issue of adequate protection must take into consideration current threat capability. As a result of technology, the threat environment is far more sophisticated and multi-faceted than that faced during World War II. Submarines, surface combatants, aircraft, torpedos, missiles --- all are capable of selecting and tracking targets without visual sighting. Modern surveillance systems, rangeing from satellites to submerged acoustical arrays, have shrunk the ocean areas to the point where transiting vessels are no longer able to easily disappear from an enemy by simply sailing away. Implicit in this recognition of increased threat capability is recognition of a parallel need for increased protection.

Merchant ships have themselves changed over time. However, because those changes have occurred as a result of economic demands and not in response to changes in threat capability, those very changes have made merchant ships more vulnerable to enemy attack. The increased size of today's merchant ships, with their resultant increased capacity, make them attractive and valuable enemy targets. The impact on a nation's industrial base and war effort is significantly greater when the equipment and stores carried on a 40,000 ton ship are lost as when the equipment and stores carried on a 12,000 ton ship are lost. Added to this is the diminshed size of the U.S. and Allied merchant fleets. The result is that merchant shipping has become an increasingly attractive target for the enemy in the time of conflict.

The current situation is no different than that which existed after both World Wars when the Navy turned its interests and concerns for the protection of merchant shipping towards more glamorous tasks. Exacerbating this tendency have been decreases in budget which have resulted in difficult decisions as to fleet size and capabilities.

As a result, not only have assets originally designed for protection of merchant shipping been channeled towards other taskings in support of fleet operations, but many of those assets have been decommissioned without assurance of replacement. Unfortunately, there has also been little effort spent in developing measures designed to provide for the protection of merchant shipping. The Navy has admitted the vulnerability of merchant shipping to enemy attack and estimates that as many as 50 per cent of the initial ships sailing to Europe in support of a NATO war would be lost[1]. While the possibility of global war with the Soviets appears to be lessening, the possibility of Third World conflicts involving the U.S. has not lessened. It has been estimated by the Denton Commission that even a single theater low-intensity conflict could possibly result in "extremely significant attrition" of merchant shipping[2].

But a nation need not be actively involved in a Third World conflict for its merchant ships to be endangered. The indiscriminate attacks on shipping in the Persian Gulf in the 1980s should provide a clear indication of just how possible this is. Of the many lessons to be learned from the situation which existed as a result of the Iranian-Iraqi conflict, perhaps the

most important for the U.S. and its NATO Allies is that Third World countries can and will use whatever means are at their disposal to challenge nations that are are technologically superior to them. The use of mines by the Iranians is a case in point.

Despite historical lessons to the contrary, the U.S. Navy has tended to ignore the importance of defensive actions against mine warfare. When the SS Bridgeton hit the mine in the Persian Gulf despite escort by four naval combatants, positive proof was provided that mines not only can pose an indiscriminate threat to shipping, but do not need to be hi-tech to pose a serious threat to shipping. Long recognized by the Soviets as a significant warfare capability, but for the main somewhat ignored by the U.S., the mere threat of mine laying is sufficient to close ports and chokepoints. Merchant shipping unable to depart or enter port might just as well be sunk for all the good it does a nation's war effort.

The Persian Gulf war, as the Falklands conflict earlier, also provided proof of threat capabilities enjoyed by Third World nations as a result of technology transfer. Third World nations have access to many of the same sophisticated weapon systems, including submarines and missiles, as do the more technologically sophisticated nations. As a result merchant shipping has little defense against this threat except that which can be provided either by naval combatants or technology itself.

Various types of systems have been used by merchant ships to provide protection against enemy attack. From earliest time

it has been well understood that arming of merchant ships in combination with combatant escort provides increased chance of safe arrival. The British demonstrated during World War II that providing small arms to merchant ships could provide increased protection against enemy attack. Merchant ships operating in the Gulf were fitted with a variety of sophisticated systems that provided increased protection from missile attacks. The U.S. Navy has recognized that speed alone is not the answer and is starting acquisition of armament systems for its strategic sealift ships.

But strategic sealift forms only one half of the sealift equation. Economic shipping is as vital to a nation's survival during conflict as it is during peacetime. Third World conflicts in the last twenty years have demonstrated that economic shipping is just as vulnerable under conditions of limited conflict as during actual war. The crises in the Falklands and the Persian Gulf provide examples of just how vulnerable merchant shipping is. In 1988, there were 154 navies among the Third World countries; this would suggest that conflict at sea could easily occur in any of many unstable areas of the world[3] and merchant shipping could logically become a target.

As the U.S. becomes more and more of a user nation, and grows increasingly dependent on trading partners for natural resources and finished products, economic shipping will become more and more essential to national survival. As the U.S. flagged merchant marine fleet decreases, U.S. merchant shipping assets will come to represent an increasingly valuable and scarce

resource. The need to ensure adequate protection of that shipping must become an issue of genuine concern, backed by the commitment of national policy to provide dedicated assets.

There can be little argument that adequate protection of merchant shipping can best be provided through a coordinated combination of self-defense measures and naval combatant escort. In response to this seemingly obvious requirement, both the merchant marine and the Navy will eloquently, accurately and justifiably argue that neither has the resources available to commit to this requirement. Predictably, each will point to the other and state, with cause, that the responsibility lies there. The merchant marine, in the face of escalating operating costs and its well documented inability to compete on the world market[4], cannot afford to invest scarce resources in systems or features which do not add to economic efficiency and which may not be required during the operating life of the vessel. The Navy, faced with a decreasing budget, will strenuously resist allocating scarce resources for protective measures for ships which are not part of its fleet (and therefore do not fall under its purview).

Although protection of merchant shipping has historically rested with it, the Navy, following the lead of the nation, has failed to view the merchant marine as part of the defense organization. Historically, the nation and the Navy have concerned themselves with merchant marine issues only during times of conflict; times of peace have seen interest in the merchant marine diminish and disappear.

Unfortunately, neither the nation nor the Navy has learned from history that the protection of merchant shipping requires a commitment of both interest and resources in peacetime in order to be adequately prepared in wartime. Through default, it is clear that the responsibility falls on the Navy to act as the peacetime advocate for the merchant marine for matters pertaining to protection of shipping.

RECOMMENDATIONS

To accomplish this, the Navy needs to relook the issue of providing protection to merchant shipping within the environment of today's threat. This will require a thorough and complete assessment of the probable threat posed to merchant shipping throughout the spectrum of conflict, coupled with a thorough and objective review of existing plans and procedures established to provide protection to merchant shipping.

But this assessment by the Navy, if it is to be realistic and meaningful, cannot be performed in a vacuum. The Navy must work closely with the Maritime Administration to ensure that merchant shipping vulnerabilities as well as inherent defense strengths are fairly assessed. As the agency tasked with responsibility for maritime matters, it is critical that the Maritime Administration be actively involved, particularly when

developing and evaluating protective procedures.

The successful allocation of assets to the peacetime planning for the protection of merchant shipping will require a commitment by both agencies to the strategic importance of merchant shipping assets to this nation's war effort. This will require the active support of the Department of Defense, as the governmental agency responsible for overall defense issues, as the Navy and the Maritime Administration as they attempt to find solutions that are viable both economically and operationally to the problem of protecting merchant shipping from enemy attack.

Such a commitment, however, will not occur until the Department of Defense and the nation as a whole recognizes that economic shipping is as vital to the defense of the nation as are submarines, sea launched cruise missiles and aircraft carriers. How serious a commitment this is will be evidenced by the willingness of the Navy, the Department of Defense, and the nation to commit resources in peacetime to ensuring the protection of merchant shipping throughout the spectrum of conflict. The espousal of commitment is simply not enough; only the commitment of actual assets will ensure that protection and protective measures are available whenever they may be needed.

Sir Walter Raleigh may have provided, in the following words, the best reason for a national commitment to ensuring the survivability of merchant shipping:

> "Whosoever commands the sea commands the trade --- whosoever commands the trade of the world, commands the riches of the world, and consequently the world itself.[6]"

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