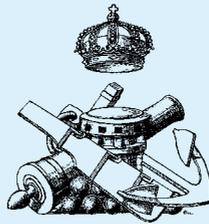


# *On Naval Warfare*

*By Milan Vego*



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## The Fellow (Ledamoten) MILAN VEGO

*Dr. Milan Vego is Professor of Operations at the U.S. Naval War College, Newport, RI. He served for 12 years as an officer in the former Yugoslav Navy and for four years as 2nd officer (Deck) in the former West German Merchant Marine. He then obtained political asylum in the United States in 1976 and he obtained a Ph.D. in Modern History from the George Washington University in 1981. Dr Vego is the author of the textbook *Joint Operational Warfare: Theory and Practice* and seven other books plus numerous articles in professional journals.*

### On Naval Warfare

*Inaugural speech (inträdesanförande) held at the Royal Society of Naval Sciences' extra meeting at the Swedish National Defence College on the 4<sup>th</sup> of March, 2010.*

***The first navies were established by the ancient Cretans and Egyptians. The first record of a naval battle was in 1210 BC when the fleet of the Hittite King Suppiliuma II burned the ships of the Cretan fleet. The naval vessels reportedly took part in the siege of Troy (near Dardanelles today) conducted by the Achaeans and their Greek allies against the Trojans and their allies in 1194–1184 BC. That conflict was fought over who would control the only route linking the Mediterranean and the Black Sea. The destruction of Troy removed hostile control of the Hellespont and probably provided an outpost for the greater security of the Greek trade. The beginnings of the more organized actions at sea were during the Persian Wars (492–449 BC).<sup>1</sup> One of the first and the most decisive naval battles was at Salamis (island in the Saronic Gulf, near Athens) in 480 BC when the Greek fleet of about 365 triremes destroyed some 200 (out of 600–800) Persian ships. This great victory ended the Persian invasion of Greece and changed the history of the world.***

### Purpose

In the past, the navies were primarily employed for control of sea communications used for either military or commercial purposes. An attack on the enemy's seaborne commerce was an indirect way of striking at his national life. A naval victory was considered useless if it did not result in changing the conditions for the conduct of seaborne trade of the victor.<sup>2</sup> Today, the main roles and the missions of

a navy are more diverse than they were in the past. In generic terms, the navies essentially exist to provide support to the armies and to weaken the enemy's military-economic potential at sea and secure uninterrupted flow of friendly maritime trade. Their main operational tasks are to obtain/maintain control of a given part of a maritime theater or deny the same to the enemy, sustain friendly forces ashore, and prevent invasion by the enemy.

## Nature

In general, “nature of war” refers to those constant, universal, and inherent qualities that ultimately define war throughout the ages, such as dominant role of policy and strategy, psychological factors, irrationality, violence, uncertainty, friction, fear, danger, chance, and luck. The nature of war is essentially unchangeable regardless of the changes in the political, social or economic environment, or technological advances. For Carl von Clausewitz (1780–1831) war was not merely an act of policy, but a true political instrument, a continuation of political intercourse carried out by other means.<sup>3</sup> Hence, a war must serve the aims of policy, not the reverse.<sup>4</sup> The highest political leaders should never lose sight of the war’s ultimate objectives.<sup>5</sup>

Successful conduct of a war in modern times required the employment of all services of the armed forces. Thus, war at sea cannot be considered as something in isolation from the war on land and in the air. Experience gives practically no example where a war was solely conducted by the navies. Perhaps, the closest to purely naval war were the Anglo-Dutch wars in the seventeenth century (1652–1654, 1665–1667, 1672–1674). The political objective determines the role and relative importance of each service in a war.<sup>6</sup> A successful outcome of war requires the closest cooperation among the services (“jointness”). Because the outcome of the war is on land, the navies and air forces play a supporting role. At the same time, experience in the modern era shows that a high-intensity conventional conflict cannot be ultimately won without control of the sea and the air.

Like warfare in general, naval warfare

is shaped by human nature, the complexities of human behavior, and the limitations of human and physical conditions. The material and psychological aspects of a war form an organic whole. They are inextricably linked.<sup>7</sup> In contrast to war on land, war at sea (and war in the air) is directed to a greater extent against the enemy’s materiel. Nevertheless, to paraphrase Clausewitz, war at sea cannot be considered in purely material terms. The employment of one’s naval forces is never directed against material force alone but is always aimed simultaneously at moral forces.<sup>8</sup>

Naval warfare is in its very essence identical to the nature of war as described by Clausewitz. Yet there are also some significant differences in emphasis due to the characteristics of the physical environment in which war at sea is conducted. The sea is barren of humans. Hence, for the most part the elements of the situation at sea are physical (tangible) or quantifiable in their nature. Correspondingly, the role and importance of intangible (“abstract”) or hard-to-quantify elements are generally smaller than in war on land. However, this is generally less true in the littorals, where the sea/ocean and the landmass with its human habitat intersect.

Like any war, war at sea is full of friction. Friction consists of the infinite number of unforeseen things, large and small, that interfere with all activities in war.<sup>9</sup> It encompasses uncertainties, errors, accidents, technical difficulties, and the unforeseen, and their effects on one’s decisions, morale, and actions.<sup>10</sup> The principal causes of friction in naval warfare are more often materiel related. Because of the high complexity of modern warships and naval aircraft the chances that

something will not work as designed, such as the malfunctioning or complete breakdown of machinery or weapons and their associated sensors and equipment, are rather high. In addition, the high unpredictability of oceanographic occurrences, and the effect of weather/climate, accentuates the factor of friction. The human-related sources of friction in naval warfare include wrong assumptions about the enemy's intentions and actions/reactions, inaccurate and/or untimely information, inadequate logistical support and sustainment, poorly protected lines of supplies, incompetent higher and/or subordinate commanders, unclear and ambiguous orders, and clear orders misinterpreted by subordinates or superiors. Other factors that contribute to friction in combat are personal animosity between commanders and poor relationships between the commanders and their subordinates.

In general, advanced technologies today can timely detect and track movements of large surface ships and aircraft on the open ocean. Detection of submarines and mines is generally a much greater problem. This is especially the case in the littorals and in shallow water. Technology is of little or no help in obtaining information that really matters, such as the enemy's intentions and actions/reactions, willingness to fight, state of combat readiness, morale and discipline, and many other hard-to-quantify elements of the situation. The uncertainties and imperfections in the knowledge of the situation on which the commander has to base his decisions and actions can never be fully mastered, no matter how advanced technology is. Also, uncertainty in a war at sea is not only a result of a lack of information, but is often the

result of what one does not comprehend in a given situation.

Chance and pure luck are an integral part of war at sea. They cannot be anticipated in terms of either place or time. Likewise, the enemy's intentions and actions/reactions cannot be predicted with any degree of certainty. Among other things, the enemy can react unpredictably and even, in one's view, irrationally. The timing and scope of irrationality cannot be anticipated either. The irrational decisions by the enemy or even friendly commanders can have considerable effects on the course and outcome of a war at sea.

## Character

The nature of war and its character are not identical things, as is all too often erroneously believed. "Character of war" refers to those transitory, circumstantial, and adaptive features that account for the different periods of warfare throughout history.<sup>11</sup> It is primarily determined by the prevailing international relations, domestic politics, and economic, social demographic, religious, and other conditions in a certain era and also last but not the least the effect of the new technological advances. Hence, in contrast to its nature, the character of war is ever changing.

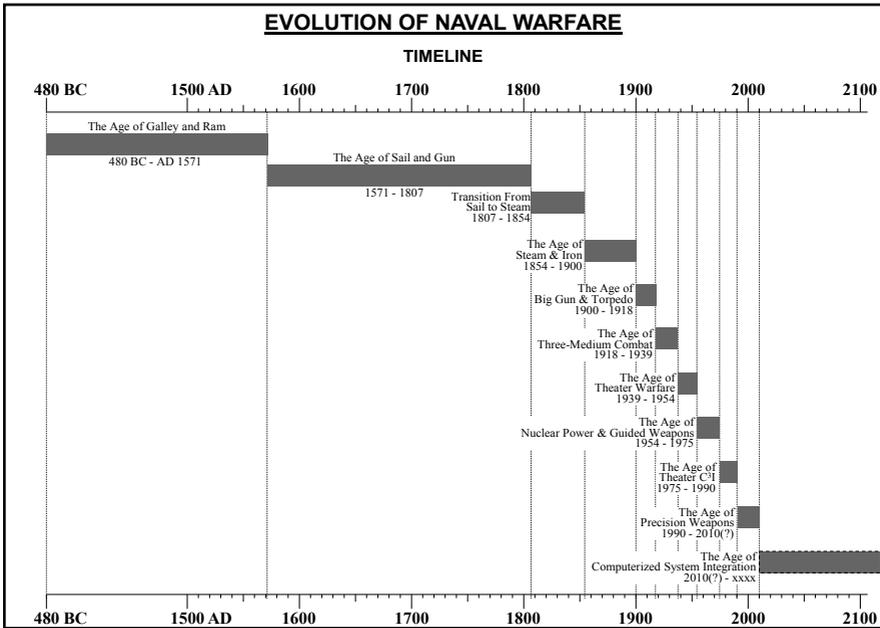
One of the major changes over the past 20 years is ever-increased political, social, economic, and military importance of the world's littorals. Out of 190 member states of the UN some 150 border the sea.<sup>12</sup> About 95 percent of the world's population lives within 500 miles of the sea.<sup>13</sup> Some 40 percent of all the world's cities with populations of 500,000 or more are located on a coast.<sup>14</sup> More than 80 percent of the world's capitals are within 300 miles of the shore.<sup>15</sup> About 60

percent of the politically significant urban areas around the world are located within 60 miles of the coast, and 70 percent within 300 miles.<sup>16</sup> The world's urban population is expected to double, from the present 2.5 billion to about 5.0 billion, by 2025. By then, 60 percent of the world's total population will live in cities, most of which will be in littoral areas. Hence, one's naval forces are expected to provide support to friendly forces fighting in the cities. The military operations on urban terrain (MOUT) greatly limit maneuver of one's forces. They more often than not result in protracted and attrition warfare. A substantial part of the world's economic and political activity is conducted in a narrow strip of land on average no wider than 300 miles. Littorals are also economically significant because all sea-borne trade originates and ends in them. About 80 percent of trade in goods is carried by ships.<sup>17</sup>

Since the ancient times, the conduct of war invariably has involved the use of weapons and equipment. The pursuit of military ends has always been determined by the inherent potentialities or limitations of the machines with which the war is waged.<sup>18</sup> A war at sea (and also in the air) is in relative terms much more affected by the technological advances than is war on land. The main reason for this is that naval warfare revolves around platforms, and their associated weapons and sensors. The changes in the character of warfare have been due to several major and numerous smaller inventions. An invention that revolutionized war does not mean that it also changed its basic purpose. It may only mean that the ways of employing one's combat forces were radically changed. At the same time the technological advances change little in the

main elements of the human nature or the basic mores of a culture. The very word "invention" suggests a process of change. However, sometimes it might imply the opposite. In some cases, the original purpose of an invention could be changed to something very different. For example, the initial purpose of the iron armor was to provide protection to the ship's crew from the enemy shells. However, after the advent of a gun capable of perforating the ship, the purpose of the iron armor was changed to provide protection to a ship as a whole. A military invention cannot be isolated either in time or in relation to other military instruments. The improvement of an accepted weapon may result in the appearance of an entirely new one, terrible in its potential. For example, the airplane was initially intended for conducting scouting but later became a bomber.<sup>19</sup> Likewise, a submarine was initially intended for defense of naval bases/ports and the coast, but during World War I, it became one of the most effective and terrifying platforms for attacking merchant shipping.

Despite claims to the contrary, the developments in the design of ships and aircraft in modern era tended to be evolutionary rather than revolutionary. For example, in the nineteenth century, the advent of steam propulsion, internal combustion engine, iron hulls, long-range guns, mines, torpedoes, and electric telegraph revolutionized naval warfare. Since then, there have been few revolutionary technological advances, with the exception of the submarine, airplane, guided missile, nuclear propulsion, and analog/digital computers. Since then, the key was to concentrate on the integration of the existing and diverse technologies to obtain much greater combat potential.



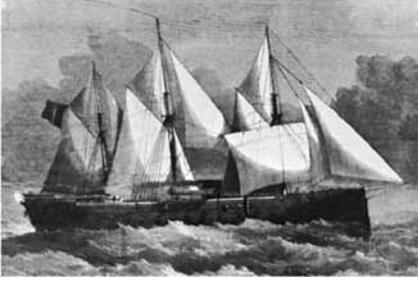
For example, the advent of dreadnought in 1906 was due not to any revolutionary technological advance but to a proper integration of the existing technologies. The result was a huge increase in the combat potential of the British battle fleet so that other major navies of the day had to meet the new standards in the battleship design or remain hopelessly ineffective.

Naval technological advances affected all components of the art of war at sea. However, their effect was invariably much greater on naval tactics than on strategy. For example, the advent of steam propulsion revolutionized naval tactics. Steam-powered warships had a higher speed than the sailing ships. They were also independent from wind. The ship's ability to move in almost any direction also led to the greater complexity of tactical evolutions. The higher ship's speed required quicker thinking and de-

cision making by the commanders than in the era of sail. Superior skill in seamanship came to count for less as a tactical factor in the era of steam than it did in the sailing era.<sup>20</sup>

Steam propulsion greatly increased chances of contact between two opposing fleets. This, in turn, made it far more dangerous for a weaker force to remain at large within effective range of the stronger force. Hence, the amount of control by the superior force in the areas within range of its bases was also increased.<sup>21</sup>

Steam propulsion greatly increased tactical mobility of warships, but initially, the strategic mobility of naval vessels was greatly reduced. The endurance of steam-powered warships was measured in terms of days, not in terms of months as the sailing ships' had. For example, coal carried on board a warship in the mid-nineteenth century was adequate for only 10 or 11 days of sailing.<sup>22</sup> This was



*The French Ironclad La Glorie, the first oceangoing ironclad battlehip, in commission between 1860 and 1879.*

the reason many steam-powered warships also retained sails.

Steam propulsion imposed new restriction. Without fuel a fleet was unable to move. The fleets became more dependent, as the armies were, on their lines of supply. The problem of logistical support became more complex because the steam-powered warships also needed to carry munitions, lubricants, and spare parts.<sup>23</sup>

The rudiments of the modern operational level of war at sea emerged in the mid-nineteenth century due to the new and dramatic naval technological advances and changes of the character of war in general, combined with great changes in society, international relations, and economy. Initially, the most important technical advances that had a major impact on war at sea were steam propulsion, the iron-hulled ship, the breech-loading gun, the armored turret, the electric telegraph, and the undersea cable. The greater probability of contact at sea between enemy fleets within range of each other also meant that an inferior fleet had to be more cautious about disputing command of the sea by extensive cruising. The threat value of a fleet remaining under the protection of its bases—or fleet in being—and

taking to the sea only sporadically was greatly enhanced. Steam increased the degree of control exerted by the stronger fleet in the area surrounding its base and even expanded the area of potential attack. However, by introducing dependence upon fuel, it isolated that area regionally to a degree that had not previously obtained. While a fleet of sailing ships the strongest sea power could make its superiority felt practically anywhere in the world, under steam it was able to do so only within range of its major bases.<sup>24</sup>

The advent of steam also had considerable effect on the conduct of naval blockade. The warships became dependent upon fuel supply, which was available only at certain fixed points. This, in turn, made blockading squadrons far more flexible in their movements, thereby increasing the chances of contact between two enemy fleets operating in a given maritime theater. A stronger fleet was always certain that the enemy fleet limited in absolute terms must return to a base adequate to its supply within a limited time. It was able to interpose its forces so as to maximize the chances of contact. The fleet's scouting range was extended, because steam-powered ships could move outward in any direction or converge upon a common center. Steam made close blockade more difficult but not impossible. The need for fuel aggravated the problem of supply.<sup>25</sup>

By the late nineteenth century, the new technological advances dramatically increased the capabilities of the large fleets. A series of technical innovations transformed the battleship into a blue-water gun platform. The invention of the internal gasoline combustion engine (1876) and the diesel engine (1892) led to proliferation of small warships. The intro-

duction of mines and torpedoes posed a serious threat to the survivability of large surface warships. The major navies of the day consisted not only of battleships and cruisers, but also large numbers of destroyers, torpedo craft, gunboats, and auxiliaries. The invention of the wireless telegraph (radio) 1897 allowed for the first time rapid transmission of information between shore and ships at sea.<sup>26</sup>

Throughout the history of naval warfare, technology has played a major if not the most important role in the adoption of new methods of combat employment of naval forces. For example, in the era of sail and until the late nineteenth century, the principal method of combat employment of one's fleet to attain an operational and sometimes strategic objective was a "decisive naval battle." Some of the "decisive battles"—for example, the battle of Trafalgar in October 1805—led to a drastic change in the situation at sea. The methods of combat employment of naval forces gradually changed because of the effects of the new technological advances in the mid- and late nineteenth century. The blue-water navies had the capability to conduct actions almost continuously, over large areas, using diverse fleet forces and weapons. The very size of the major navies of the day, with their widely dispersed home bases and installations, made it increasingly difficult to accomplish decisive results by fighting a single or even several "decisive battles" (also called general fleet actions). For example, in the Russo-Japanese War of 1904–1905, naval actions took place in the Yellow Sea, the Sea of Japan, and part of the Pacific Ocean. The accomplishment of the operational objectives by the Russian and Japanese fleets required conducting a series of related major and minor naval

actions based on a common idea. The first rudiments of major naval operations emerged during that conflict at sea.<sup>27</sup> In retrospect, the battle of Tsushima in May 1905 was the last "decisive" naval battle in history.

## Characteristics

Naval warfare has certain characteristics<sup>28</sup> or uniqueness compared to warfare in general. The successful conduct of naval warfare depends on one's ability to obtain and maintain or deny control of a part of the maritime theater. All the actions of either side in a war at sea must necessarily be projected from the land because it is on land that humans live. The principal objectives in naval warfare are control of the sea or denial of the same to the enemy. This, in turn, is accomplished by destroying or neutralizing the enemy's naval forces. In the littorals, the armies might play a major role in obtaining sea control by destroying the enemy forces defending naval basing areas.

In general, war at sea can be conducted using offense, defense, or a combination of these. However, the overall posture and progress of the war on land will determine whether one's naval forces would be on the strategic offensive or defensive. A side on the strategic offensive on land and having a stronger navy would try to obtain and maintain sea control at the strategic level. At the same time, the weaker side on land would be forced on the strategic defensive at sea. Clausewitz wrote that "defense is not an absolute state of waiting and repulse" and that it always includes "pronounced elements of offensive. At the strategic level, there is a "constant alternation and combination of attack and defense."<sup>29</sup> He insisted that "it follows that every attack has to take into

account the defense that is necessarily inherent in it.”<sup>30</sup> These views also apply to naval warfare. A strategic defensive at sea should always include elements of offensive. A weaker side at sea should not be passive; just the opposite—it should try to exploit all the opportunities and act offensively at the tactical level in order to create preconditions to eventually go on the strategic offensive. The greatest danger in remaining on the defensive—in order to conserve one’s strength for a future counteroffensive—for too long is that it may kill the spirit of dash and daring so necessary for success. From a morale standpoint alone, the side on the strategic defensive at sea should always try to achieve minor tactical successes. The true spirit of the offensive means to be constantly ready to meet the enemy but to risk losses only when there exists a reasonable chance for commensurate gain.<sup>31</sup>

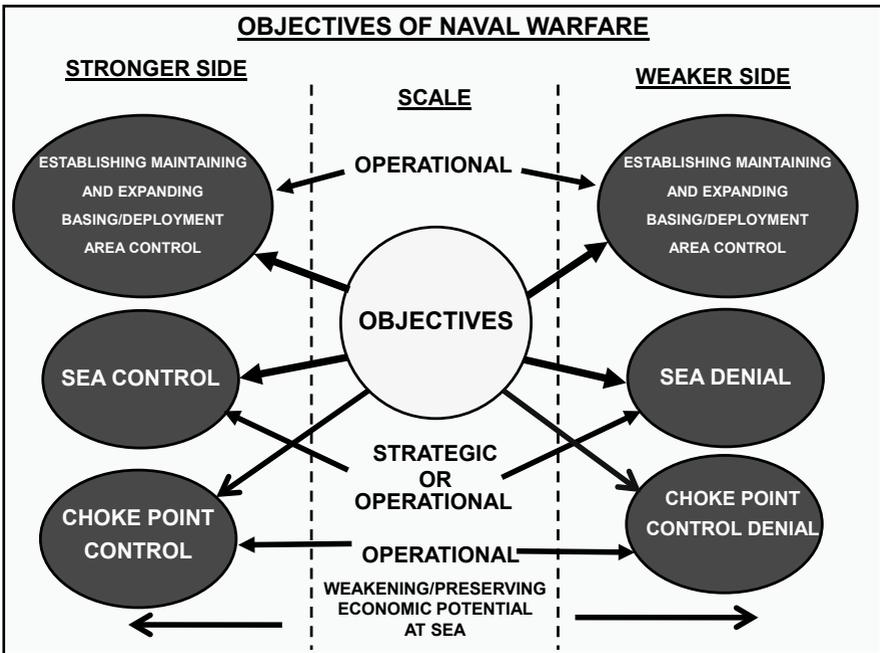
Clausewitz believed that the superiority of strategic defense was based on the fact that the attack itself cannot exist without some measure of defense.<sup>32</sup> His dictum that “attack [is] the weaker and defense the stronger form of war” is not fully applicable to naval warfare.<sup>33</sup> For one thing, the physical medium in which naval combat is conducted is vastly different from terrain on land. In war at sea, there are no lines to be defended. The sea is flat and except for islands in the littorals is free of obstacles. Today, war at sea is conducted in three dimensions, while war on land is two-dimensional.

The process of bringing the enemy to the strategic or even operational point of culmination is very difficult and much more protracted in naval warfare than in war on land. Among other things, the major clashes between the opposing naval forces are rare. They are also only spo-

radically in contact. Hence, friction with the enemy is not as pervasive a factor as in land warfare.

Naval warfare is a combination of decisive actions and force-on-force encounters or attritional warfare. Fleet-versus-fleet encounters that result in the overwhelming victory for one side are often more decisive than similar encounters in war on land. The reason is that a major part of a fleet is almost impossible to reconstitute due to very long time for construction of large combatants. Major amphibious landings, whether successful or not, tend to have major effects on the course of war at sea. However, for the most part war at sea consists of minor tactical actions. This is especially the case in antisubmarine warfare (ASW), attack on and defense/protection of maritime trade, and mine warfare. Tactical naval actions conducted outside the framework of major naval operations are inherently attritional in their character.

Naval warfare is conducted both on the open ocean and close to the shores of the world’s continents or large islands. However, most major naval battles have taken place not on the open ocean but close to the shores bordering the open ocean and in adjacent seas. Likewise, the majority of losses of merchant ships, as well as submarines in both world wars have occurred near focal areas of maritime trade and at the approaches to major commercial ports. In the future, war at sea will be predominantly fought in the littorals. Naval warfare in the littorals has much in common with that conducted on the open ocean. At the same time, there are also considerable differences because of the features of the physical environment. In the littorals, the waters and airspace are often confined. Many offshore islands,



shoals, and reefs, combined with strong currents and high tides, make navigation in the littoral waters extremely difficult and dangerous. In many littorals, it is commonplace to operate in the presence of multilayered, possibly sophisticated, defenses. The weaker opponent may not operate in the way one thinks and he may use asymmetric responses to neutralize or even nullify the advantages normally enjoyed by a blue-water navy. Waters in a typical narrow sea are cluttered because of the presence of not only the enemy's and friendly forces but also of the neutrals. In a typical narrow sea, density of maritime traffic is generally high, especially in the straits/narrows and the proximity of large ports. It is difficult to differentiate between friend and foe, because of the presence of a large number of commercial vessels, ferries, and fishing boats.

Littoral warfare differs considerably from war on the open ocean because of the small size of the area and corresponding short distances, the prevalence of shallow water, and the proximity of the continental landmass. In a typical narrow sea, short distances between various points, the presence of a large number of islands/islets, shallow water, the changing character of the seabed, and the influence of various oceanographic features in the employment of surface ships/submarines and their weapons/sensors. In general, the coast endowed with numerous islands facilitates greatly covert and quick deployment/redeployment and concentration/dispersal of one's naval forces. Numerous sea passages in the archipelago type of coast offer a great choice of routes for selecting ambushing positions to attack the enemy's large surface combatants or merchant shipping.

At the same time, the archipelago type of coast provides a greater degree of protection for local maritime traffic than does a coast with few or no offshore islands. The passages between islands can be mined to enhance protection of one's coastal traffic and approaches to naval bases and commercial ports.

The existence (or absence) of offshore islands greatly affects the conduct of war in narrow seas. In general, a multitude of islands and islets enhances the defensive value of the coast. The islands provide refuge for ships in bad weather. In general, large numbers of offshore islands allow a greater depth of defenses against attacks from across the sea or from the air. The more numerous the islands, the more difficult the detection of small surface combatants by airborne surveillance and reconnaissance. Also, aircraft must fly more sorties to sweep effectively along an open coast in a typical narrow sea than they do on the open ocean. The presence of a large number of islands greatly facilitates the basing of one's naval forces. The multitude of protected bays or channels offers refuges for ships. Small surface combatants can change their bases or anchorages quickly. A larger number of offshore islands provides many possibilities for covertly deploying one's forces, especially these small surface combatants.

The islands situated relatively far off the mainland coast can provide timely early warning of an impending attack, especially from the air. If several rows of islands run parallel to the mainland's coast, they facilitate surveillance of the adjacent coastal waters by one's forces. They also simplify control and defense of one's shipping. If the islands extend transversely to the coast, the channels separating the adjacent islands are of-

ten wider and deeper, thereby allowing quick, concealed, and relatively easy deployment and redeployment of one's ships. Yet at the same time the attacker has a greater chance of penetrating the outer defenses to attack targets along the mainland coast. The archipelago type of coast allows greater flexibility in the selection of lines of operations and easy and secure "castling" (leapfrogging) of naval forces. It also provides excellent opportunities to use mines to protect one's naval bases, commercial ports, and sea traffic. A long coast without offshore islands is highly vulnerable to enemy attack from the sea.

Landform and relief in the coastal area affect combat employment of naval forces. A low-lying coast is generally favorable for developing both longitudinal and lateral networks of roads and railroads. This, in turn, makes it easy to transport troops and materiel and generally reduces the need for local coastal traffic that makes it difficult to interrupt one's transport for any extended period. Such a coast also facilitates the speedy advance of an enemy's forces into the country's interior. A coast with poor land communications requires a greater reliance on coastal traffic to transport troops and materiel. This land traffic can easily be interrupted for long periods, especially if the principal roads or railways run close and parallel to a coast backed by steep, high mountains.

A coast with only a few lateral communications usually favors the defense, because it offers few access routes into the country's interior for an army that has successfully landed on the coast. On an elevated or mountainous coast, communications are often entirely lacking or extremely scarce. If a mountain chain runs close and parallel to the coast, then

the roads and railroads usually run in the same direction. A steep, rocky, and highly indented coast, or one with fjords separated by rocky headlands and numerous rivers, makes longitudinal communications difficult, while the lack of beaches makes it difficult to carry out conventional large-scale amphibious landings. In general, a flat coast with few or no offshore islands complicates the defender's problem in repulsing enemy amphibious assaults. In contrast, a high, rocky coast offers few places for enemy landings. Coral reefs and shallow waters favor defense against conventional amphibious landings. Swamps and marshes in the coastal area can significantly inhibit or channel vehicular traffic, especially the movement of heavy armor and mechanized forces.

The most significant factors directly influencing the employment of one's surface ships and submarines, and their weapons, in littorals are the water's depth, the characteristics of the seabed (or sea bottom), the tides, and the water's transparency. Most small enclosed and semienclosed seas (popularly called "narrow seas") are characterized by the prevalence of shallow waters. The water depth in a typical narrow sea directly determines the optimal size of ships and submarines to be employed, the ships' speed of advance, the use of underwater weapons, and the effectiveness of ASW sensors. Shallow water in a typical narrow sea restricts considerably the maneuverability of aircraft carriers, large surface combatants, and nuclear-powered attack submarines (SSNs). The speed of large surface ships must be considerably reduced when transiting very-shallow-water areas, because the proximity of the seabed causes waves to break. In addition, many narrow seas

often have numerous shoals, reefs, strong tides, and currents, which make safe navigation very difficult. Deployment of naval forces on the open ocean is conducted over long distances. Transit times for surface ships and submarines are usually measured in days if not weeks. Hence, strategic mobility is a much more important factor than tactical mobility. This is just the opposite for a force operating in the littorals. The transit times for the ships and submarines are usually short. The short distances allow one's ships to change their respective areas of deployment within hours. Because of the short air distances, not only fixed-wing aircraft but also helicopters and unmanned aerial vehicles (UAVs) can be successfully employed in the littorals. The air strikes can achieve surprise because aircraft can approach their targets at low altitude. A damaged aircraft has a much better chance of reaching the safety of its base than if operating over the open ocean.

War at sea on the open ocean normally does not encompass the entire maritime theater. The only exception to this is the actions of one's submarines and to some extent also aircraft. The situation is much different in the littorals, and narrow seas in particular. Because of the short distances and range of modern weapons combat actions in a typical narrow sea are conducted over a major part of the theater. The changes in the tactical and operational situations are drastic and sudden. Combat actions at sea in the littorals are conducted mostly at night and in bad visibility. The predominant method of combat employment is major or minor tactical actions, while major naval operations are conducted only occasionally.

The short distances in a typical narrow sea allow the side stronger in the air to

dominate the theater to a far greater degree than would a similar ratio of forces in a war on the open ocean. Their high degree of readiness and maneuverability enable aircraft to concentrate their strikes against transports, warships, or aircraft covering enemy ships at sea. The aircraft pose perhaps the single greatest threat to the survivability of one's surface combatants and merchant ships in a typical narrow sea. They are capable of operating at day and night and in almost all kinds of weather. The threat posed by the land-based aircraft alone could severely restrict, or even preclude, the use of major surface combatants such as cruisers and destroyers in a typical narrow sea, unless these ships operate under a strong air cover—although even then they should not operate too close to the enemy coast and mine-infested waters.

In contrast to the war on the open ocean, one's naval forces cannot be successful in the littoral waters without close cooperation with other services ("jointness"), and air forces in particular. In many cases, one's naval forces would require close cooperation of the allied navies and the navies of the coalition partners. The employment of multiservice forces offers many more options than if forces of a single service are employed. Shortcomings in the employment of one service are balanced by the asymmetrical capabilities of other services. For example, missile-armed surface combatants can attack a variety of targets on the enemy coast, while land-based aircraft can strike enemy warships and merchant ships at sea or in their bases and ports. Friendly ground forces can seize enemy naval bases/ports and airfields and thereby greatly facilitate the task of obtaining sea control and air superiority. By one's having forces oper-

ating in all three physical mediums, the enemy would face a multidimensional threat for which he might not have an effective counter. Properly synchronizing actions of combat arms of several services in terms of place and time will result in a much greater degree of synergy than if only a single combat arm is employed.

The employment of multiservice and multinational forces also comes at a certain cost. Among other things, command and control of major joint operations is more complex and more centralized than in the employment of single-service forces. The differences in service cultures and their doctrine are often difficult to reconcile. Poor personal relationships among the high commanders are often a great obstacle to cooperation. The use of various systems is often difficult because of the great differences in their designs and procedures used by various services. This is an especially difficult problem in employing multinational forces. Logistical support and sustainment in combat also pose much greater challenges than in the employment of single-service forces.

## **War at Sea versus War on Land/Air**

War on land and war at sea have many commonalities but also some important distinctions. For one thing, the sea is common to both belligerents and neutrals. Maritime theaters are individual parts and usually large in size. In contrast, the land theaters are limited to the boundaries of the states in conflict.<sup>34</sup> Maritime theaters bordering the open ocean are also separated by long distances due to the intervening continental landmass. Geography greatly affects the conduct of war at sea. The importance of maritime positions and distances on

naval warfare is not diminished nor can it be wished away. War at sea cannot be conducted without the control of some land areas. The relative locations of the continents and important islands dictate the lengths and the number of the world routes of maritime trade and transportation. The configuration and physical features of land determine where the major ports are to be built and the locations of focal areas of maritime trade.<sup>35</sup>

At sea/ocean, interests of the belligerents and neutrals are interwoven and any combat action can affect or damage these interests.<sup>36</sup> One's attack on the enemy's maritime trade invariably leads to losses of commercial shipping by the nations that are not parties in a conflict. Sir Julian S. Corbett observed that "it may be taken as law of maritime warfare, which cannot be omitted from strategical calculation with impunity that every step toward gaining command of the seas tends to turn neutral powers into enemies."<sup>37</sup>

The sea usually serves as a country's protective shield against any would-be invader. It also acts as a barrier to armies, because it greatly restricts their movements. At the same time, the sea is also a "highway"—a means of communications. However, unlike other highways, it belongs to no one. On land, a highway is usually owned by one or the other side. In contrast to land, most of the ocean and sea is not an obstacle to transportation.

In war on land, terrain plays an extraordinary role. In war on land, physical space is usually limited. One's land forces are also more or less tied to a specific terrain in which they move and fight. Terrain on land is essentially linear, while the sea is three-dimensional. Which part of the theater one's army controls depends on the army's strength and the de-

gree of enemy resistance. The sea has no positions to be captured and held. Even the victorious fleet must withdraw to its ports. It cannot, as in war on land, remain on the territory it conquered.<sup>38</sup>

The army can cover friendly territory, while the fleet cannot provide safety to the sea/ocean area as long as the enemy fleet is not completely destroyed. The sea/ocean cannot be fully controlled. It has no master. In contrast, a war theater on land is limited in terms of space and does not affect the interests of the neutrals. A maritime theater is much larger and open. The army provides protection to the country's economy from attack by the enemy army. The army can defend and protect the country's transportation system. In contrast, the fleet can provide protection only to selected parts of maritime transportation. Combat actions at sea are in most cases short and the opportunities for attack must be quickly exploited. Employment of one's naval forces can take place close to a friendly coast and thousands of miles away and close to the enemy coast. Control of a given sea/ocean area cannot be secured.<sup>39</sup>

Until the end of World War I, land forces' movements are usually carried out relatively slowly. In contrast, naval forces operating on the open ocean, moved much faster and covered much larger physical space than armies did.<sup>40</sup> However, this situation dramatically changed after the armies became motorized in the 1930s and afterward. Their mobility was further increased in the aftermath of World War II after the introduction of transport and attack helicopters. Yet despite remarkable increase in their mobility, they remain tied to the ground. The vehicular movements remain subject to often great limitations because of the

terrain obstacles. Unless they operate in the open and flat terrain or deserts, the armies can move on foot or motor vehicles only in certain direction. In contrast, naval forces operating on the open ocean can move practically in any direction and at relatively high speed. For example, the aircraft carriers and large surface combatants (cruisers and destroyers) could change their locations by up to 1,000 miles within 72 hours.

The army is usually almost continuously in contact with the enemy army. In contrast, the fleet cannot so easily detect the enemy and then stay in contact. The enemy's fleet has always the possibility to avoid contact and withdraw to its bases.<sup>41</sup> In war on the open ocean, two opposing fleets can be widely separated geographically. Very often, there is no available overland access between the sides in a war at sea. This separation may also be caused by intervening land areas of such an extent and character as to make it difficult or impossible for either belligerent to exert its full strength against the other's key sources of power. While ground forces can destroy an enemy army and seize territory, it is not always possible for naval forces to achieve a comparable result at sea. The enemy coast is usually difficult to seize and hold for a sustained period.<sup>42</sup>

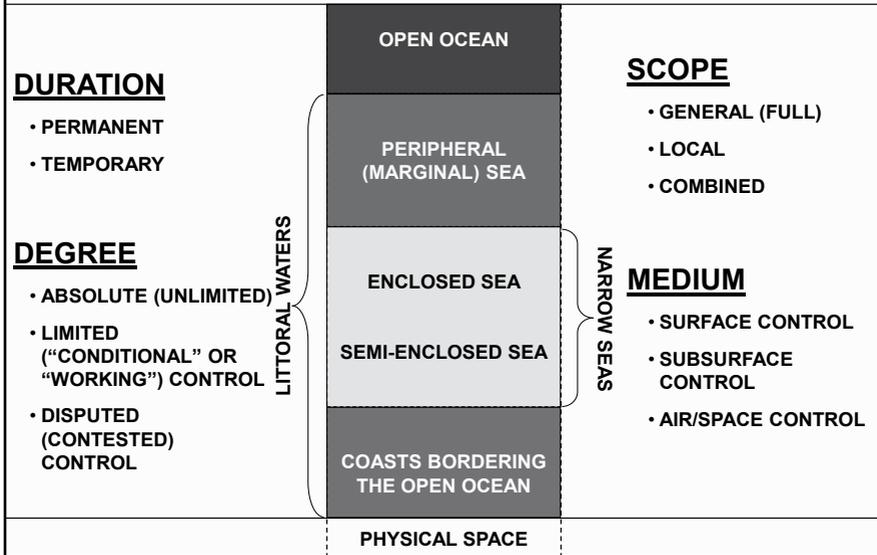
Armies are more manpower-intensive than navies. They are usually numerically much larger than are navies. The combat potential of a navy is to a greater degree dependent on the quality of its ships and weapons than is the case with armies. The navies in general, but blue-water navies in particular, rely on relatively small numbers of highly capable but high-cost ships. In case of loss or serious damage, modern ships cannot be easily and/or

quickly replaced. It takes a very long time to build modern ships, especially aircraft carriers and nuclear-powered submarines. In contrast to war on land, war at sea is fought with platforms that are in service before an outbreak of hostilities.<sup>43</sup>

The concept of reserves in war at sea, with the exception of amphibious warfare, was rarely used even in the past. Because of the much smaller numerical size of the navies today, all available ships and aircraft will be employed at the outset of the hostilities. A defeated army may often be rebuilt with reinforcements or reconstituted with freshly mobilized troops. In contrast, a fleet or a major part of one cannot be so easily or quickly reconstituted, because of the time required to build new ships and train their crews.

The employment of air forces differs considerably from the employment of land or naval forces. The space in which aircraft operate extends deep over friendly and enemy territories and the adjacent sea/ocean and to altitudes of several hundreds of miles above the earth's surface. Theoretically, there are no geographical boundaries to limit freedom of action for aircraft. However, aircraft are more limited than naval forces because in the absence of hostilities they cannot operate in the airspace of other sovereign countries. Both naval forces and air forces operate in a physical medium that is not fully controlled by either side. Neither of them can choose terrain to maximize the chances of success as land forces can. Combat in the air occurs at a much higher speed than at sea. The factor of time has a different quality in air warfare than in wars on land or at sea. Yet an aircraft cannot remain indefinitely in a given airspace, because of high fuel consumption. It must return to a base for refueling and maintenance.

## DYNAMICS OF SEA CONTROL



It consumes the same amount of resources (excluding ammunition) whether it is in a combat sortie or not.<sup>44</sup>

Airpower proponents insist that the Clausewitzian view of the inherent advantages of defense does not apply to airpower. In their view, airspace has an eroding effect on both offense and defense; hence, there is no advantage in waiting, as Clausewitz observed in discussing the advantages of defense. They insist that airpower is inherently offensive.<sup>45</sup> One’s aircraft can be used to accomplish a range of objectives in support of ground and/or naval forces that are either offensive or defensive or a combination of both defensive and offensive in their basic purposes. The tempo of combat in the air is much higher than that of combat on land or at sea.

The high speed of aircraft, when combined with low flying altitudes, facilitates

achieving surprise. It also considerably reduces the threat from the enemy’s action.<sup>46</sup> The quick arrival and buildup of one’s naval forces and aircraft near or in a crisis area provide visible and extremely potent signs of one’s military presence and intent. In contrast to land forces, air forces can shift from offense to defense rapidly. The high responsiveness in the employment of aircraft is the result of their inherent ability to go anywhere.<sup>47</sup>

One of the most serious drawbacks of air forces compared to land forces is that they cannot occupy the ground. Aircraft can exert some control over events on the ground, but in a very limited way. Only ground forces can occupy terrain when it becomes necessary to do so. The effects from the employment of airpower might be quite dramatic, but they are inherently transitory. Air forces have an enormous capacity to destroy things but are

extremely limited as a tool for stopping hostilities or resolving a conflict. Aircraft can damage the enemy's morale, but unless one follows up rapidly with further air or surface attacks, the enemy morale will recover.<sup>48</sup> Aircraft can dominate a part of the airspace only for the duration of their flight.<sup>49</sup> Despite all the advances in technology, aircraft cannot stay airborne indefinitely. Their ability to operate successfully is still subject to rather severe limitations in bad weather. One's aircraft also might be denied the use of airspace for overflight or the use of airfields. This would make their operations not only expensive but often more difficult, if not impossible.

## The Future

The future of naval warfare cannot be considered separately from the future of land warfare. The causes of wars will most likely be more diverse in the future than they were in the past. The likelihood of global conflict looks remote today but the threat of major regional and high-conventional wars will remain. The causes of war in the future include religious totalitarianism. Some theoreticians even believe that wars between civilizations may become the main form of conflict in the twenty-first century.<sup>50</sup> Virulent nationalist ideologies will also represent a potential source of war in some parts of the third world. Other sources of potential conflict and war will be boundary disputes; the proliferation of weapons of mass destruction (WMD); the struggle to control oil, gas, and water resources; overpopulation; and a combination of these and similar causes. Shortages of water supplies in the future will most likely increase the danger of conflicts or even wars between neighboring coun-

tries.

The future war at sea will most likely take place predominantly in the littorals rather than on the open ocean. The primary antiaccess capabilities in the littorals derive from land-based fixed-wing aircraft and helicopters; quiet, conventionally powered submarines; small surface combatants armed with antiship missiles, torpedoes, or guns; antiship cruise missiles (ASCMs) launched from ships, submarines, and shore; mines; UAVs; coastal missile/gun batteries; and tactical ballistic missiles (TBMs). In addition, small stealthy surface craft armed with low-technology small-caliber guns, short-range rockets, or even suicide bombs can threaten not only one's commercial shipping but in some cases even larger surface combatants.

In the future, the factor of time will be further compressed. Naval combat actions and decision cycles will be much shorter than they are today. Changes in the dimensions of space and time will considerably increase the tempo of events at sea.<sup>51</sup> The importance of cyberspace will further blur the boundaries of the theater. Some critical elements of one's sources of power that rely on computer networks will be physically located in space or many hundreds or thousands of miles away on the ground. The enormous advances in information technology in recent years have elevated information as a common link among the factors of space, time, and force. Information will increasingly affect each of these factors, both individually and in combination.

Advances in computer processing, precise global positioning, and telecommunications will provide the capability to determine accurate locations of friendly, and enemy forces, and to collect, process,

and distribute relevant data to thousands of locations. Simultaneously, the new information technologies will have the capability to absorb, evaluate, use, transmit, and exchange large volumes of information at high speeds to multiple recipients. Diverse sources of data will be correlated faster than ever.

A potential danger in the information age is that one's emphasis on obtaining a complete picture of the situation is highly unrealistic. Such a picture is not only difficult but in most cases impossible to achieve, and the expectation of it is fraught with many dangers. Impressing one's commanders with the need to have information dominance would most likely breed caution and, at worst, unwillingness to take high but prudent risks. One of the distinguishing traits of the successful commander is the ability to act quickly on incomplete knowledge of the situation and, in the process, be willing to take some high but prudent risks. This is especially the case at the operational and higher levels, where one's commanders are forced to make some assumptions about not only the current situation but also trends several weeks or even months ahead. The operational commander will rarely have the luxury of waiting for perfect knowledge of the situation, but will be forced to seize fleeting opportunities—or the enemy will force his hand.

Netting of one's naval forces seems to offer the most benefits to those warfare areas that require the employment of diverse forces and platforms and are deployed over relatively large areas of the sea or ocean. Specifically, this pertains to defensive warfare areas such as air defense and theater ballistic missile defense, defensive mining and mine countermeasures (MCM), and defense of

one's coast. Netting of forces could also be used to great effect for obtaining a continuous and commonly shared picture of the tactical and operational situation in conducting attack on the enemy's maritime trade and defense and defense/protection of friendly maritime trade.

Technological advances will probably have the greatest effect on the methods of combat employment of one's naval forces. Longer-range, more lethal, and highly precise weapons will further enhance the importance of strikes, which will most likely replace naval battles or engagements as the principal methods of force employment to accomplish major tactical and even operational objectives at sea. Netting will allow one's forces to carry out a series of powerful strikes by geographically widely dispersed platforms against targets many hundreds or even thousands of miles away. Major naval operations in the littorals will be normally conducted by multiservice and multinational forces.

Command and control (C2) of one's naval forces in the littorals is more challenging than in war on the open ocean. Because of the small size of the area and the high intensity of action on both sides, changes in the tactical and operational situations are rather sudden and drastic. This implies that C2 should be highly decentralized, giving maximum freedom of action to subordinate tactical force commanders and individual ship commanders. If not properly and timely resolved, the problem of excessive centralization of C2 might prove the weakness of the entire network-centric warfare (NCW) concept. This problem can in fact largely nullify any possible gain shared awareness brings to one's combat power.

Predictions on the future war at sea

can be only tentative. No one has a magic lamp that can illuminate accurately how current and emerging technologies and tactical and operational concepts will affect naval warfare as a whole and its individual aspects. The trends over the past two decades were clearly in shifting the focus from the open ocean to operations in the littorals. The blue-water navies are becoming smaller but more capable in terms of their ability to operate further from their home bases and project power far into the interior of the littorals. The new and yet still-unknown technological advances will considerably enhance the blue-water navies' capabilities in all fundamental warfare areas. At the same time, the new technologies will allow the weaker side in the littorals much greater antiaccess capabilities than in the past. The blue-water navies will find it not easier, but more difficult, to operate successfully in some parts of the littorals, because of the ever-increasing threats posed by the enemy quiet submarines, antiship

cruise missiles, and mines. The vision of the future war at sea is difficult to know with any degree of certainty. What is needed is to avoid certainty and dogmatism. Whenever the vision conflicts with reality, the necessary lessons should be derived and corresponding changes made. Even more serious is to make long-range programmatic decisions based on flimsy or contradictory evidence and unproven assertions. History conclusively shows the danger of having a vision of war or tactical and operational concepts that are in serious disconnect with operational realities. Despite the claims to the contrary, advanced automated decision aids cannot and will not replace humans. Warfare at sea is too complex and unpredictable an activity to be taken over by machines. Only the human brain is fully capable of reacting timely and properly to the sudden and unanticipated changes in the situation at sea and successfully countering the enemy's actions and reactions.

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**Editor-in-chief: Rear Admiral (L.H.) Thomas E. Engevall**

**Editors address: Junibacken 9, S-135 54 TYRESÖ, SWEDEN**

**Telephone: +46 8 798 7139, alt. + 46 70 588 7589, E-mail: editor@koms.se**

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