

NAVAL SERVICE ROLES AND MISSIONS IN LITTORAL WARFARE

The end of the Cold War and the potential increase of worldwide regional conflicts have produced a significant change in U.S. military and maritime strategy. Many future conflicts will involve joint operations of all forces and will include situations that culminate in massive and highly coordinated power projection operations from the sea. Littoral operations present many stressing and unique challenges and require some rethinking of the broad range of naval roles and missions. This article examines the naval roles, missions, and implications of littoral operations, and identifies key technologies and capabilities required to meet the objectives with maximum effect and minimum losses.

INTRODUCTION

Since the late 1980s, with the breakup of the Warsaw Pact and the Soviet Union, the United States has been making significant policy, military, and budgetary changes to reflect its economic and military roles and security in a "new world order."¹ The transition is based on several circumstances. First is the perception that neither Russia nor the Commonwealth of Independent States promotes hostile intentions any longer. Although they still remain as the only entities that can actually threaten the existence of the United States, the national desire is to reduce the size and cost of the military. Second, with only one superpower remaining in the world, many additional "power vacuums" have been created that have caused, and will continue to cause, increased ethnic, nationalistic, and religious conflict.

The United States is expected to prepare for more frequent, but less violent, events rather than for global conventional or nuclear war. Such conflicts are now commonly called regional conflicts and are sometimes further categorized as major and lesser regional contingencies. In the future, they are likely to involve Third World or developing nations.

In response to the changed perception of the threat, the United States has developed a new military strategy.² The Chairman of the Joint Chiefs of Staff has promulgated a set of defense planning scenarios on which to base capabilities and force levels. At nearly the same time, a proposed reduction of forces to a "base force" level or lower is planned that would essentially keep the same kinds and mix of conventional forces, only fewer of them.

The U.S. Navy and Marine Corps have begun to align their strategy with the national military strategy. They have published a key white paper called . . . *From the Sea, Preparing the Naval Service for the 21st Century*³ that outlines how U.S. Navy and Marine Corps forces (i.e., the Naval Service) would shift from the various tasks of the recent past, which emphasized open-ocean or blue-water operations against the Soviet Union, to supporting joint expeditionary warfare tasks in regional conflicts. The Navy leadership identified six joint mission areas⁴ that are described in Vice Admiral Owen's

article in this issue: joint strike, joint littoral warfare, joint surveillance, joint space and electronic warfare and intelligence, strategic deterrence, and strategic sea lift and its protection. The concept of joint operations was to stress the combined and coordinated roles and participation by the Navy, Marine Corps, Air Force, and Army. Furthermore, additional nonmilitary or non-warfighting missions for the military are now being considered, including support for emerging democracies, environmental monitoring, and disaster relief both at home and abroad.

In addition, expanded roles of the military, especially of the Navy, are being considered, such as support of crisis management through forward presence (including the threat of rapid precision strike) and economic embargo enforcement. Undertaking additional missions and avoiding duplicate roles for budgetary reasons may necessitate different employment concepts and platforms. This contrasts with simply downsizing via a base force concept. The new Secretary of Defense has initiated a "bottom up" review of the military roles, missions, and force structure. This will lead to a new set of Defense Planning Guidance Scenarios in the Fall of 1993. The present climate of change and budget pressures will continue through most of the remainder of the century. Jointness is not just an idea, but a budgetary necessity.

NAVAL SERVICE ROLES AND MISSIONS

Even though it appears that . . . *From the Sea*³ represents a new approach to naval warfare, it is actually more of a shift of emphasis, and should be considered as work in progress that is likely to be refined. The United States, along with other nations such as the United Kingdom, is a traditional maritime power;⁵ as such, we have long had the ability to send land forces by sea to strike at the enemy at any chosen place along the enemy's coastal perimeter. The traditional naval missions are sea control and power projection, and they remain so today. Expeditionary warfare in the new world order as described in . . . *From the Sea*³ is similar to the Mediterranean and Pacific Island campaigns of World War II; only the focus has changed.

The new approach to naval warfare emphasizes the shift in the operational environment from the Cold War. For example, instead of fast attack submarines operating unilaterally in forward defensive roles and conducting deepwater antisubmarine warfare (ASW), they will now work with joint task forces and perform a broad range of operations, including those in shallow, littoral regions. Rather than reinforcing the NATO central front, the Navy must be able to provide responsive strategic lift to any littoral operating area. Further, instead of projecting power along the northern flanks of Europe and engaging in deep strikes, naval forces must be able to project power jointly, including precision strikes on land anywhere from the sea. The dependence on NATO allies to conduct mine countermeasure (MCM) operations off their coasts during the Cold War must yield to our self-sufficiency to perform MCM operations in forward areas.

. . . *From the Sea*³ provides general guidance about the revised approach to naval roles and missions by defining a set of four key operational capabilities: command/control and surveillance, battlespace dominance, power projection, and force sustainment (Table 1).⁴ The traditional warfare tasks of anti-air, anti-surface, anti-submarine, strike, space and electronic, amphibious, and mine warfare are still very much a part of the joint mission areas, as shown in Table 1. Battlespace dominance is the principal operational capability needed for joint littoral warfare because its warfare tasks focus on preventing or limiting conflict and minimizing losses. Command/control and surveillance and force sustainment enable all the mission areas, and power projection is a significant part of both joint strike and joint littoral warfare. Power projection in joint littoral operations emphasizes tasks associated with establishing entry points at the land/sea

interface, such as amphibious operations, mine clearing, and associated special warfare tasks. On the other hand, joint strike emphasizes tasks needed to assist in the follow-on support to achieve inland objectives once hostilities have escalated.

The remainder of this article highlights some of the changes in naval roles and missions and the implications of littoral warfare; both defensive and offensive perspectives are addressed. A broad range of levels of conflict and possible responses exists in regional and littoral warfare. Although their probability of occurrence is low, major potential conflicts and scenarios are discussed to address the more stressing operational and technological needs. A quote from . . . *From the Sea*³ sets the stage for what follows: "Our job during a regional conflict is to control the ocean adjacent to the littoral battlefield, the ground from the shore to our objective area and the skies above both."

IMPLICATIONS OF LITTORAL WARFARE

Naval and joint operations in littoral regions present many stressing and sometimes unique considerations, from both offensive and defensive perspectives, as shown in the boxed insert. For discussion, the issues can be grouped into four principal categories: (1) confined operating areas, (2) proximity to and unconventional characteristics of the adversary, (3) congested and confusing tactical situations, and (4) varying and complex environmental elements. The combination of conditions makes the mission and naval requirements in littoral warfare quite different in many vital respects from the global and more open-ocean requirements of the Cold War era, and requires different concepts of operations and advanced technology to assure operational success.

Table 1. The relationship of the four key operational capabilities to the joint mission areas.

Key Operational Capabilities	Joint Mission Areas					
	Joint Strike	Joint Littoral	Joint Surveillance	Joint SEW/Intelligence	Strategic Sealift/Protection	Strategic Deterrence
Command/Control and Surveillance	C ³ I, OS, SEW, NSW	C ³ I, OS, SEW, NSW	C ³ I, OS, SEW, NSW	C ³ I, OS, SEW, NSW	C ³ I, OS, SEW, NSW	C ³ I, OS, SEW
Battlespace Dominance	STK, ASUW, AAW, SEW, ASW, MIW, OS, C ³ I	ASW, AAW, MIW, SEW, AMW, ASUW, OS, STK, NSW, C ³ I	OS, SEW, AAW, ASW, ASUW, NSW, C ³ I	SEW, OS, NSW, ASW, C ³ I	ASW, AAW, ASUW, MIW, SEW, OS, NSW, LOG, C ³ I	Strategic, ASW, OS, AAW, SEW, MIW, AMW, ASUW, C ³ I
Power Projection	STK, ASUW, SEW, NSW, C ³ I	AMW, MIW, STK, SEW, NSW, ASUW, C ³ I	SEW, NSW, OS, C ³ I	SEW, NSW, C ³ I	LOG, ASUW, STK, AMW, SEW, C ³ I	Strategic, STK, AMW, ASUW, SEW, C ³ I
Force Sustainment	LOG, C ³	LOG, C ³	LOG, C ³	LOG, C ³	LOG, ASW, ASUW, AAW, AMW, MIW, OS, C ³	Strategic, LOG, C ³

Note: The shaded tasks are the principal tasks according to the Deputy Chief of Naval Operations for Resources, Warfare Requirements and Assessments (N8). The key intersection is that of joint littoral warfare and battlespace dominance. Fundamental warfare tasks are AAW, AMW, ASUW, ASW, MIW, and STK. Support warfare tasks are C³, I, LOG, NSW, OS, and SEW. AAW = anti-air warfare, AMW = amphibious warfare, ASUW = anti-surface warfare, ASW = anti-submarine warfare, C³ = command, control, communications, I = intelligence, LOG = logistics, MIW = mine warfare, NSW = special warfare, OS = ocean surveillance, SEW = space and electronic warfare, STK = strike warfare.

NAVAL IMPLICATIONS OF LITTORAL WARFARE

- I. Restrictive and Congested Operations
 - A. Differences in comparison with open-ocean operations
 - B. Air, surface, subsurface, as well as land surveillance and operations necessary
 - C. Restricted water space, depth, navigation, and operations
 - D. Potential barriers and choke points
 - E. Low/no task force speed of advance to enhance vulnerability
- II. Proximity to and Nature of Threat
 - A. Variety of potential weapons and defenses usable by adversary
 - B. Shorter tactical range, increasing exposure to weapons of opportunity
 - C. Concealment opportunities
 - D. Differing military objectives and success
 - E. Potential risk from unconventional weapons and techniques
- III. Complex Tactical and Threat Situation
 - A. Exposure to multiple conventional and unconventional naval threats
 1. moored, bottom, buried, and floating mines
 2. diesel, air-independent propulsion, and mini-submarines
 3. shore-based air raids with antiship cruise missiles (ASCM's)
 4. coastal missile batteries
 5. small craft/unconventional raids with potent antiship weapons (ASCM's, torpedoes)
- B. Complicated tactical picture
 1. mixture of friendly, neutral, and enemy contacts
 2. difficult identification, friend-or-foe and rules of engagement
 3. use of neutral sea/air traffic for cover and deception
 4. friendly fire avoidance
 5. own-force coordination
- C. Less early-warning horizon and increased potential for surprise
- D. Potential for collateral action/attack, e.g., from outside the littoral area
- E. Restrictive use of fire power except in all-out engagement
- F. Submarine operations and security
- G. Special forces deployment and security
- IV. Environmental Considerations
 - A. Considerable differences in comparison with open-ocean situation
 - B. Consideration of air, sea, undersea, shore, and land areas necessary
 - C. Special considerations
 1. radar ducting and changes over sea/shore interface
 2. shallow-water antisubmarine warfare
 3. electromagnetic interference from shore sources
 4. local fog, smog, and visibility problems
 5. confluence of sea and river water complicating acoustics/nonacoustics
 6. coastal/beach conditions

Another consideration in regional conflicts is the increased difficulty in minimizing losses to both personnel and equipment. The adversary's military objectives and the nature of operations will probably be quite different from those expected against more global threats. The adversary's goal is not likely to be to defeat the joint forces in a traditional military sense; rather, a much more limited but highly visible success may be sought to discourage further coalition resolve, such as the terrorist attack on the marine barracks in 1983 during the Lebanon crisis.

CONFINED OPERATING AREAS

By definition, littoral warfare involves operations near shore as well as in more confining sea regions, such as the Strait of Hormuz or the Persian Gulf. Near shore means close enough to bring force to bear on the adjacent land, and may range from a few miles for covert surveillance or naval gunfire support to hundreds of miles for aircraft carrier strike operations. The confinement and less familiar operating regions have several implications for naval forces, especially in regard to battle force defense. First, near-shore areas and choke points can present additional maneuvering and navigational hazards, particularly in far-forward areas or in otherwise foreign territorial waters where fleet experience and even chart

accuracy may be limited. More significantly, however, restrictive operating regions limit the disposition, speed of advance, and movements of the battle force, increasing the likelihood of localization and targeting by the adversary and limiting the opportunity for dispersion and evasive response. Speed of advance and maneuvering are often major considerations in minimizing vulnerability to attack, especially from submarines. Simply put, littoral operations reduce the battlespace available to the fleet while limiting its freedom of movement and disposition for battle.

PROXIMITY TO AND UNCONVENTIONAL NATURE OF THE ADVERSARY

Littoral operations take the battle to the adversary, but also expose the fleet to shore-based weapons and attack, including exposure to weapons possibly not designed for naval engagements or otherwise having the tactical range to encounter naval forces (e.g., shore-based gunnery and short-range missiles). In contrast to the open-ocean situation, the assurance of detecting and engaging the adversary beyond its weapons range is currently much less guaranteed in littoral settings because of possible concealment and mobility. Proximity reduces early warning and stresses tactical response against weapons.

An emerging concern is the potential vulnerability to mobile tactical ballistic missiles and shore-based cruise missiles, which can be concealed by the terrain or environment and launched from relatively short range. Cruise missiles launched from fast patrol boats pose a similar concern. Although Third World adversaries do not have the magnitude of military capability and technology that the United States has, state-of-the-art technology and weapons are becoming widely available to them through technology transfer and export. It is widely believed, for example, that the export of Soviet and now former-Soviet Union technology (as well as expertise) will significantly increase with the economic pressures and need for capital that exist in the former Soviet states. Furthermore, many other countries, such as China, North Korea, and some European and South American countries, are developing and exporting a broad range of advanced weapons and systems technology.

Mines are a major concern in naval littoral operations because they are a relatively low cost and easily deployed "poor man's" weapon that can present a real and perceived threat to naval expeditionary forces. In a recent article on future naval operations,⁶ Admiral Kelso reported that "during Desert Storm, Iraq's extensive minefields all but stymied a planned amphibious strike." At one time during the Gulf conflict, over 100 ships were reportedly anchored and unwilling to transit the Gulf because of the presence of mines. Especially complicating for surface combatants and amphibious forces are bottom and buried mines, as well as mines placed in the surf and beach areas, since they are the most difficult to detect. Even simple floating mines, possibly deployed from otherwise noncombatant ships or fishing boats, can be a threat to naval forces, especially in confined waters where they can drift toward targets. Mine technology continues to improve in regard to initial target detection and triggering sophistication, lethality, and counter-countermeasure resistance; the technology is essentially universally available on the international market.

The commercialization of space and the private sector's accessibility to services from government-owned space systems have led to the availability of communications, navigation, weather, imagery, and other remote sensing products with military applications. Any country can purchase or even intercept these products, some of which can detect large ships and provide the basis for a wide-area surveillance system. Thus, adversaries in the future may have not only modern or sophisticated weapons but also accessible surveillance and other capabilities that together represent a limited but significant end-to-end (i.e., sensor-to-shooter) capability.

Finally, in some scenarios, the joint forces will have to be prepared to defend against the potential use of weapons of mass destruction, armed with chemical and biological as well as limited nuclear warheads. It is conceivable that such weapons could be used in a radical or final assault against U.S. and coalition forces, especially if the forces were in an opportune or confined area where a single or small number of such weapons could be effective, for example, against expeditionary forces afloat or holding a coastal entry point. Such a threat could

greatly complicate the ability to amass forces such as was done during Desert Shield. Additionally, an adversary with weapons of mass destruction and the means to deliver them could threaten third party nations rather than U.S. or coalition forces. Theater defense against ballistic missiles is a growing joint priority, and naval forces are likely to play a significant role in the future.

CONGESTED AND CONFUSING TACTICAL SITUATIONS

The littoral battle scene, including the air, sea, and coastal picture, will be inherently congested and potentially confusing, requiring complex planning, communications, and coordination. The joint littoral warfare concept emphasizes the coordination of a wide variety of mixed forces to concentrate force on an adversary. The possibility of collateral damage to civilian and neutral parties, such as the inadvertent attack on a commercial aircraft that occurred in the Persian Gulf during Earnest Will, further complicates the tactical picture and decision making.

The likelihood of tactical congestion and confusion can lead to necessary but inhibiting rules of engagement that can delay or sensitize the tactical response. The risk of friendly fire to our own or coalition forces is a major concern. The adversary, however, may disregard such discrimination or civilian loss and may even exploit non-military traffic to conceal or launch isolated attacks to achieve a limited, but politically meaningful, success.

VARYING AND COMPLEX ENVIRONMENTAL CONDITIONS

Highly variable conditions can occur at air-sea-land interfaces, and the environment is a major element to consider in all aspects of littoral operations (e.g., in sensor performance, equipment operations, and even personnel stamina).

Many areas of potential regional conflict are in tropical regions. The environmental characteristics of these areas are considerably different from most places where operational experience and oceanographic data have been obtained in the past. Shallow water, as well as warm tropical water, can greatly influence acoustic conditions and thereby significantly affect ASW and other types of undersea warfare. Nonacoustic ASW operations may also be affected by such water conditions. Atmospheric anomalies, especially over the land-sea transition, can alter radar and communication propagation, causing either severe attenuation or enhanced propagation in anti-air warfare search and communications.

The environment can also affect equipment performance, maintenance, and reliability; for example, sand storms foiled U.S. operations in the ill-fated 1980 Iran hostage rescue operation.

Potential adversaries have the advantage of "local knowledge" in regard to the environment and its effects. They have trained and possibly fought in their local conditions, and have tactics and equipment tailored to operate under those circumstances.

KEY OPERATIONAL CAPABILITIES

As discussed earlier, the key operational capabilities required to successfully execute the future roles and missions of the Navy and the Marine Corps are command/control and surveillance, battlespace dominance, power projection, and force sustainment (Table 1). In general, these operations combine to address a fundamental requirement: projecting power from the sea while protecting various forces. In the context of littoral warfare, the key operations can be subdivided as described in the following sections, and reflect the timing or sequence of naval operations in a conceptual littoral conflict.

COMPREHENSIVE REGIONAL SURVEILLANCE

A complete and current tactical picture is essential to the successful execution of the overall mission, especially in littoral warfare because of the need for rapid and overwhelming power projection and force protection. Surveillance can provide the on-scene commander with accurate indications of the adversary's operations and possibly intentions, high-valued target location and force disposition, early warning of possible threats, assessment of force defenses and obstacles, and damage assessment. The complete, real-time situation can be obtained only through the fusion of information from many sources and platforms. Continued emphasis will be on space and electronic warfare systems and on the integration of netted sensors to provide timely and complete information to all platforms, with particular emphasis on covert surveillance early in the crisis.³

Naval elements of surveillance include submarines, surface ships, maritime patrol aircraft, carrier-based reconnaissance aircraft, and special forces. Among these, submarines are a unique asset, able to operate covertly in far-forward areas and conduct close-in visual and electronic surveillance, as well as deploy special forces to conduct reconnaissance, provide targeting support, and monitor enemy operations. Naval surface units and aircraft can conduct electronic intelligence and radar/visual surveillance.

Measuring and monitoring the local environmental conditions (in the air, on the surface, and subsurface) will be an important form of surveillance for properly estimating and predicting environmental effects on sensors and communications. Further, it will be necessary for forecasting severe or opportune weather circumstances that should be taken into account in tactical and operational planning.

Even if naval forces are the only forces in a littoral region, the command authority and sources of surveillance and targeting may come from national assets or systems controlled by other services. The achievement of these operations depends on joint capabilities coordinated through seamlessly connected (e.g., fully integrated) communications systems.

BATTLESPACE DOMINANCE

Battlespace dominance must be established to achieve one of the aforementioned requirements of regional conflict, that is, minimizing losses of expensive platforms

and especially people in proportion to the nature of the conflict. This requirement is one of the main differences from the historical projection of maritime power, especially amphibious operations such as those conducted in World War II, where total military and national commitment was assumed. It is also one of the biggest challenges of the future.

Battlespace dominance in a regional conflict, especially in lesser conflicts, assumes that the United States, with or without coalition partners, will be able to amass overwhelming force against potential adversaries to dissuade them from even attempting to interfere with missions in support of forces pursuing objectives on land. In this way, the United States hopes to achieve its military objective with significant reductions in casualties and hostages. Battlespace dominance can then be segmented into air, surface, and undersea roles and missions, as described in the following sections.

AIR DOMINANCE

Air dominance refers to attaining and sustaining air superiority ahead of and over the battle force as it approaches and operates in the littoral region. Of particular concern in littoral warfare are the threats of land-based air attack, sea-skimming antiship cruise missiles, land-based air defenses, and shore-based theater ballistic missiles. Unique or especially complicating elements in air dominance in the littoral setting are the short tactical horizon, with the attendant need for quick reaction, and the complex and possibly confusing tactical scene.

Key requirements in air dominance in the littoral setting therefore are continuous effective surveillance, including over-the-horizon early warning; early strike suppression of coastal batteries and enemy air defenses; sustained and layered air defenses, including combat air patrol, if available; area surface-to-air missile defenses (i.e., Aegis); and high-probability-of-kill close-in self-defense, including the use of countermeasures and deceptive techniques against any "leaker" aircraft or missiles that manage to reach their targets.

SEA SURFACE DOMINANCE

Enemy warships will be a concern in some littoral conflicts because some countries have modern and capable units, although limited in number. In addition to such major combatants, however, high-speed patrol boats armed with modern antiship missiles are an emerging concern in littoral settings (Fig. 1). They can abruptly emerge from concealed coastal inlets or weather-obscured regions and launch sea-skimming cruise missiles (or torpedoes) at close range. As with air dominance, complications include force proximity to the threat; short reaction time; possibly interfering surface traffic; identification, friend-or-foe (IFF); and local weather and environmental effects. The essential requirements, similar to those for air dominance, are continuous surveillance and early warning, initial force suppression, outer detection and engagement, and close-in defense.



Figure 1. High-speed patrol and attack surface craft, such as operated by the Turkish Navy (top) and by the Italians (bottom), are capable of launching torpedoes and antiship cruise missiles and thus present a potential threat to naval forces in littoral areas. The craft employ modern platform and weapons technology and are being designed and developed by several countries and exported to the Third World.



UNDERSEA DOMINANCE

The principal undersea threats to naval forces in littoral warfare are mines and diesel-electric submarines. Mines, as previously stated, are relatively easy to use and available to virtually all potential littoral adversaries. Diesel-electric submarines, and in the future more capable air-independent propulsion and possibly nuclear-powered submarines, are the other major undersea threat, albeit in widely varied numbers, capability, and operational proficiency.

A proactive, full-spectrum approach must be adopted to counter mines. First, every opportunity must be taken to monitor and preempt mine-laying operations and thereby preclude difficult and prolonged post-deployment mine-hunting and -clearing operations. A complication, however, can be constraints on the rules of engagement prior to hostilities, such as in Desert Shield, where mine laying was observed but not countered because of concerns of triggering an early attack by the adversary before the coalition forces were fully ready. A

broad array of mine-hunting, mine-neutralization, and mine-sweeping resources can be involved in mine clearance, including MCM ships, MCM aircraft, explosive ordnance disposal, naval special forces, and even a variety of unmanned underwater vehicles. These diverse assets must be employed in a highly coordinated and rapid action, as discussed later in regard to power projection.

Torpedoes and mines are the principal submarine weapons of concern in the near term. Submerged launch antiship cruise missiles such as Harpoon and Exocet will also be a concern in the future. Wake-homing torpedoes may become a special concern because naval forces may operate in confined areas with reduced avoidance and evasion/maneuvering opportunities, and these weapons require far less sophisticated approach and attack tactics by the adversary than do current procedures. Mine deployment by submarines may be a significant concern because of the possibility of covert deployment even with good air and surface surveillance. Some platforms may be equipped with external mine belts for increased pay-

load. Even minisubmarines (30–400 tons) could pose a threat to special forces in confined areas such as the Persian Gulf.

Early identification, tracking, and, in a clearly hostile situation, preemptive attack of submarine threats even before they leave port are major naval priorities and could be the primary roles for U.S. submarines. These tasks mitigate the substantially increased difficulty of uncued area ASW search in open seas and the risk of leakers achieving a close approach to high-value units (or targets of opportunity). As stated recently by Vice Admiral Owens, “In today’s world it may be just enough to know where the other submarines are . . . and avoid them.”⁷ The battle force, however, will probably need to maintain an effective “keep out” or assured ASW kill region in the vicinity of all surface units.

A combination of air, surface, submarine, and perhaps fixed/deployable resources using acoustic and nonacoustic sensors will be required for undersea dominance. Again, as stated by Vice Admiral Owens, “The more we have been faced with the challenge of diesel submarines and shallow water ASW . . . the more we have come to realize the importance of the multi-sensor approach to ASW.”⁷ Periscope detection and detection of shallow-running submarines, exploiting the current tendency of submarines to rely on visual approach and attack, are currently important. In the future, however, even Third World submarines may be able to adopt fully submerged approaches as improved sonar and tracking techniques proliferate. Low-frequency active acoustics (LFAA), which can provide broad area coverage in deep water using both monostatic and bistatic receivers, may be a uniquely valuable ASW asset. The performance of LFAA in shallow water is an issue, however, and is currently receiving significant attention by the Navy. “Bottomed” submarines, possibly positioned in the track of the battle force, must be considered and could be especially difficult to detect by acoustic and nonacoustic means.

In some conflicts in littoral environments, the involvement of third-party submarines must be considered and monitored. U.S. submarines or possibly maritime patrol aircraft will be essential for this task.

As previously stated, the environment and the need to operate in sloping and shallow depths and widely varying water conditions will be important in establishing undersea dominance in the presence of both mines and submarine threats. Shallow water will affect acoustics and especially active acoustics, where limitations by bottom and sometimes volume reverberation and clutter need to be overcome. Even more localized features such as river outflows or specific bathymetric features may affect both acoustic and nonacoustic sensor performance. Submarine targets can be expected to exploit these features tactically by operating in shallow areas to avoid detection. Shallow water, however, may enhance the use of nonacoustic ASW techniques, such as the use of optical sensors, by forcing the submarine nearer to the surface or increasing its contrast with the bottom.

Our own offensive mining operations may be a contributing method in undersea (and surface) dominance. Mines may be deployed, for example, at port entrances

or choke points to preempt entering and departing military, logistics, and supply ships.

POWER PROJECTION/LANDWARD DOMINANCE

Crisis management and deterrence or containment of hostilities by the threat of overwhelming power projection and landward dominance—that is, the direction of joint and combined forces and power to the adversary onshore and landward—are the fundamental objectives of expeditionary warfare. As stated in . . . *From the Sea*,³ the objective of the Navy and Marine Corps is to “support the decisive sea-air-land battle by providing the sea-based support to enable the application of the complete range of U.S. combat power.”

Major components of Navy and Marine Corps power projection are carrier-based strike aircraft armed with precision weapons, sea-launched land-attack cruise missiles, gunnery, and various combinations of amphibious forces such as the Marine air-ground task force. Less visible but important additional elements include counterterrorist, rescue, sabotage, and other combat operations by special forces, including Navy SEALs (Sea-Air-Land Teams); offensive mining operations as mentioned earlier; and possible submarine torpedo attacks against high-value port or coastal facilities.

Key requirements as indicated in . . . *From the Sea*³ are the need for highly coordinated precision fire power to overwhelm and quickly suppress the adversary; accurate and timely targeting information to direct attacks, minimize over-expenditure of weapons, and avoid unnecessary collateral damage; assured IFF to avoid friendly fire incidents and reduce decision time for attack; and accurate and timely battle damage information to assess attack effectiveness and reallocate subsequent resources.

Initial projection of power on land by expeditionary forces to enable the entry and support of joint land forces includes the possibility of opposed amphibious landings. To minimize losses, however, conditions have to be just right to achieve the element of surprise and the critical timing needs of an opposed landing. This kind of operation was not possible in Desert Storm, because technology did not allow the clearing of surf-zone and beach defenses in time to coordinate with the main assault and simultaneously keep the number of casualties low. Even so, amphibious landings, as planned for Desert Storm, make up a major element of power projection from the sea in many anticipated situations. Future amphibious operations are envisioned as highly coordinated and rapidly executed operations, initiated from an over-the-horizon staging position (e.g., 25 nmi offshore from the craft landing zone), as depicted in Figure 2, to minimize initial exposure to counterfire and overwhelm defenses. Mine countermeasure operations for providing secure access to the craft landing zone would be conducted as an integrated concurrent precursor operation by a variety of surface, air, and autonomous platforms. Surveillance, air cover, sea-control, and firepower would be provided by the naval and joint forces. Special forces could be employed for surveying and assisting in the clearing of the proposed landing zone. Overall, the intent is to con-

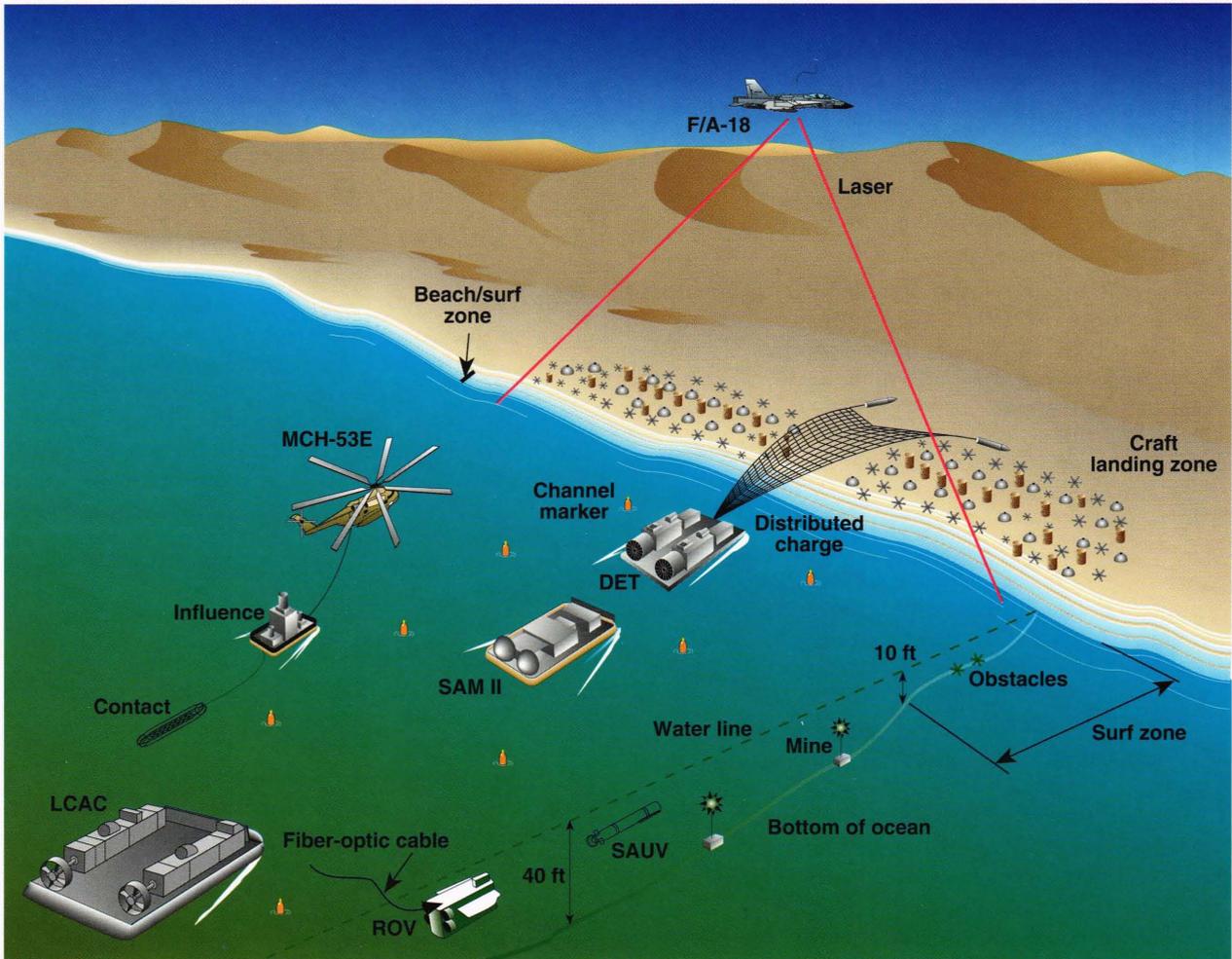


Figure 2. Future Navy/Marine Corps amphibious assaults will be initiated from over the horizon and will emphasize highly coordinated and flexible maneuvers, deception, tactical mobility, and advanced systems and technology to maximize tactical surprise and reduce the vulnerability to defenses, particularly mines and precision-guided munitions. The concept includes airborne resources to scan the near-shore and craft landing zone; remotely operated vehicles (ROV) and semi-autonomous underwater vehicles (SAUV) for mine and obstacle search; Swedish-American mine sweep (SAM II); distributed explosive array technologies (DET) for mine and obstacle clearing; and air-cushion landing craft (LCAC) vehicles for rapid approach and assault.

duct a massive, highly coordinated, and well-timed surge with combined forces to overwhelm defenses and achieve a secure landing and staging area in a short time.

FORCE SUSTAINMENT

An essential and challenging requirement in littoral warfare is the ability to sustain, maintain, and replenish forces, including all joint and combined forces, over the course of the operation. As stated in . . . *From the Sea*,³ force sustainment “requires a comprehensive and responsive logistics support system, including air and sealift, replenishment ships, mobile repair facilities, advanced logistic support hubs . . . (and) . . . open sea lanes of communication . . . not impeded by an adversary.”

Sustainability is determined simply by the magnitude and duration of the operation. During the preparation and execution of Desert Shield/Desert Storm, 90% of the supplies, weapons, fuel, and so on were transported in

ships. Given the potentially long transit requirements (e.g., approximately 10,000 nmi from the United States to the Persian Gulf via the sea), rapid sea lift and transport are increasingly important. A Third World adversary probably will not pose an open-ocean threat to sea lift, although the threat of mines and the need to pass through choke points could be inhibiting. Submarines, as in World War II, could present an isolated but unacceptable threat to replenishment forces; so could missile batteries and fast-attack craft employed in a strait or confined sea region.

IMPORTANT CONSIDERATIONS

In perspective, the combination of the varied roles and missions, threats, operational situations, and environments levies important if not unique system and operational requirements on the joint forces, as summarized in the following paragraphs.

Timely and Comprehensive Surveillance

Timely and comprehensive surveillance and early warning are prerequisites for successful littoral operations. All sources of information must be exploited and fused for the theater and tactical commanders to provide adequate "situation awareness."

Robust and Seamless Command, Control, and Communications

A highly effective, responsive, and flexible command, control, and communications (C³) network among the forces is essential in joint littoral warfare, especially because of the varied and changing forces involved, the uncertain and sometimes unconventional nature of the threat, and the overall intensity of the operations. The combination of different military services, platforms, and ever-changing elements requires that the C³ network be transparent to the user. It must be easily or automatically adjusted to the changing composition and status of the forces. The number of channels and their throughput must be substantially increased to meet the growing need for massive amounts of data, especially imagery.

All-Source Data Fusion

The joint forces must be able to integrate and assimilate all tactical and target information into a common, real-time "fused" scene, available to all essential users. The scene should include air, surface, and subsurface contacts. This information is needed to resolve and combine multiple contacts of the same target, to resolve false contacts, to interpolate or project contact location and intent, and to allocate resources. This fused scene must be current and commonly available to all principal force commands and elements.

Given the combination of not only multiple U.S. forces, but also the likely presence of Allied forces and neutrals, a highly reliable, covert, and preferably automated means of IFF is an essential element of a fused tactical picture.

Real-Time Environmental Scene Description

Because of the highly variable environmental conditions typical in coastal and littoral regions and the impact of the conditions on all aspects of operations, it is essential to acquire, assimilate, and provide timely and complete environmental information and data, including air, surface (land and water), and subsurface conditions, for example, terrain and bathymetric descriptions, the current state of the weather, sea state, and underwater conditions.

Shallow-Water Undersea Warfare

Unlike almost all other operations, littoral warfare requires that naval forces be able to operate effectively and securely in shallow water. Particularly demanding requirements in shallow water include counter-mine operations and ASW, as discussed earlier.

Surface Ship Self-Defense

The proximity to the adversary, and the accompanying reduced battlespace, reduced opportunity for early warn-

ing, possible contact-identification uncertainty, and the potential for unconventional surprise attack all increase the need for effective close-in defensive systems for surface units, including air and subsurface defense. Full-spectrum self-defense includes terminal defense against cruise missiles and torpedoes and the ability to detect and avoid mines.

Rapid Sea Lift and Forward Resupply

The unsettled geopolitical environment portends the chance for rapidly developing crises in widely differing parts of the globe, sometimes well away from U.S. resources and bases. Future conflicts are likely to occur where adjacent land bases and port facilities will not be available; Desert Shield/Storm was probably more the exception than the rule. This situation, combined with the diminishing force levels that would otherwise support simultaneously deployed forces across the globe, increases the need for having a rapid sea lift capability and forward sea-based resupply capability that are prepositioned.

Simulation-Based Rehearsal and Training

As priorities, missions, and force mixes change to meet the needs of regional conflict, computer simulation will be needed to provide cost-effective training and mission planning, especially for littoral operations. This type of simulation was used in preparing for Desert Storm. Computer simulations must be networked with actual systems, platforms, and command centers to create an "extended reality" combination that can produce a highly flexible, realistic, and cost-effective approach to mission planning, training, and systems and tactical development and evaluation.

SUMMARY

The shift of U.S. naval strategy to emphasize joint littoral warfare introduces significant operational and technical demands, especially in an era when resources are more limited and assets more costly. The fundamental role of the Naval Service in joint littoral warfare is to assist in securing the air-sea-land interface and contribute to the total power projection force ashore. Because an overwhelming proportion of the resources will arrive by sea, dominance of the air-sea-land littoral region is essential.

Although the adversary may not be as large and as competent in warfighting capability as was the former Soviet Union, the rapid growth and proliferation of technology and weapons can present naval forces with significant threats and requirements. A low loss of equipment and personnel, including the civilian population of the adversary, is now a fundamental requirement.

Success requires the highly coordinated, rapid response of an appropriately tailored joint force that quickly overwhelms the adversary and achieves full battlespace dominance. This goal, in turn, requires the broad application of advanced technology, particularly as related to surveillance, communications, air/surface/subsurface detection, precision weapons, data fusion, IFF, and rapid sea lift.

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