Naval War College Review

Volume 48
Number 2 *Spring*

Article 3

1995

The Littoral Arena: A Word of Caution

Yedidia Ya'ari
Israel Navy

The Littoral Arena
A Word of Caution

Rear Admiral Yedidia "Didi" Ya'ari, Israel Navy

THE SHIFT OF NAVAL FOCUS TOWARD the littoral arena that has resulted from the dramatic changes in the geostrategic environment reflects a major rethinking of the role and objectives of sea power in the foreseeable future.[1] Clearly these fundamental changes will result in an adjustment of the relative weight of "green water" and "brown water" missions on one hand and the high seas, which have been dominant in naval strategic thinking throughout this century, on the other. This article raises the question, however, of whether the process of transformation is taking fully into account the scope of the adjustment, particularly the implications it has for prevailing concepts of ship design.

If it is not, it should. The movement into the littoral is much more than a mere change of mission. The constraints in that "ballpark" are quite different from the ones that shaped the development of most current naval force structures. In particular, the level of threat against surface ships—which has become significantly higher in general because of a number of developments of recent decades—has become especially high in the littoral.

This article isolates the case of the surface ship in that arena. It does so at the risk of apparent oversimplification; the factor of air support, for example, is deliberately set aside and barely touched upon. The intention, however, is to preclude any presupposition of synergism. I argue that when warships designed for the high seas enter the confined waters of the littoral arena, the fundamental

Rear Admiral Ya'ari is the Commander, Haifa Base. A member of the Israeli navy since 1965, his operational background includes special operations (SEALs) and missile boats; he is a former Director of Naval Intelligence. Rear Admiral Ya'ari holds a bachelor's degree in the history of the Middle East from Haifa University and a master's in public administration from the John F. Kennedy School of Government, Harvard University. He is a 1988 graduate of the Naval Command College of the U.S. Naval War College.

The views expressed in this article are entirely those of the author and do not reflect any official position held by the Israeli Navy.

Naval War College Review, Spring 1995, Vol. XLVIII, No. 2

relationships of maneuverability and firepower are upset, and the very notion of synergism comes into question.

If the ships we intend to deploy there are to be sufficiently survivable, we must revisit all our assumptions, starting with the most basic ones. Such a review yields some very interesting insights.

The Littoral Arena

Compared to the open ocean, the littoral is peculiar in a number of ways, most of which result from its geographical characteristics. The spatial nature of this arena's waters—relatively narrow, often very shallow and confined by the shoreline—dictates constraints on the employment of ships, sometimes so severe that certain types of vessels cannot be used in a given area. The limitations on the use of submarines inside the Persian Gulf is one example. Since by definition the rationale for staying in these confined waters is to exert influence over the coast and perhaps its immediate environs, most missions, to be quickly effective, require a constant and visible presence close to the shore.

The shore, however, is not a passive entity. In fact, in this regime the opponent on land enjoys quite significant advantages. One of them is the modern coastal defense system, comprising radar, electronic surveillance (known as "electronic support measures," ESM), antisurface missiles, high-speed surface combatants, and aviation. These defenses, constituting in effect a land-based fleet, are a new phenomenon; their strength matches, in principle, that of their opponents offshore without sharing the latter's inherent vulnerability. Further, the short distances within the littoral arena create for warships acute problems of reaction time and "threat bearing." That is, at any given moment the ship is deep inside at least one of several coastal weapon "envelopes." At the same time, the small size of the battle space enables the defender on the coast to coordinate and concert his various options—missiles, mines, special forces, and gunnery. INS *Eylat*, sunk in October 1967 by Egyptian Styx surface-to-surface missiles (SSMs) launched practically from within the harbor of Port Said, offers a perfect example of the relative advantage the defender holds in these circumstances. USS *Stark*, hit by an Iraqi Exocet in the Persian Gulf in 1987, is another. As for mines, Desert Storm provided a fresh reminder of how effective that measure can be, both in direct damage and in deterrence.[2]

The question, then, is not only of the *intensity* of the threat; in the littoral the threat is also peculiar in its *density*. Coastal defenses have the ability, simply by tracking the patrolling ship by radars and passive ESM, to target it without giving away any warning. The coastal defender's wide range of options and his freedom to initiate a strike practically any time he chooses to do so create a threat that is both continuous and immediate. In turn, an attack that could come at any

moment, around the clock, forces the ship to maintain a constant, all-dimensional state of alert, one much in excess of that required in any other operational environment. The closest equivalents that come to mind are from the Second World War—the Battle of the Atlantic, with its intense submarine threat, and the Okinawa campaign, with its kamikazes—and they were far less unremitting and less demanding of resources in their need for quick reaction and variety of means.

Moreover, unlike these cases, because perimeter defense has limited effectiveness in the littoral (as will be discussed), more is hardly better. Another factor is the "bystander" problem that is so typical of low-intensity conflicts in the littoral. Civilian tankers, freighters, fishing boats, and aircraft going about their daily business constantly clutter the situation. They make identification harder and more time-consuming, add more uncertainties to the process of building the tactical "picture," and impose constraints upon rapid engagement of suspected targets.

The overall result is a degradation of crews, equipment, and readiness that makes the ship particularly vulnerable. One of the major difficulties reported by units sweeping and hunting for mines in the Gulf war was a continuous and prolonged regime of battle stations.[3] Even more important is the effect that the littoral's special circumstances have on the commanding officer's decision making. The ship's lack of reaction time and the opponent's variety of options dramatically narrow the commanding officer's practical courses of action. USS *Vincennes* (CG 49), in mistakenly downing an Iranian Airbus over the Strait of Hormuz in July 1988, offers a prime example of this effect. The commanding officer—having too much data with too many ambiguities to evaluate in the little time in which he had to react, and probably having in mind the hit that USS *Stark* had received a year earlier in the same waters and similar circumstances—had no real option but to shoot at the incoming contact.[4]

Yet none of these general characteristics is necessarily new or even unique. Some singular properties aside, most points on the list of the littoral's difficulties can to a certain extent be attributed to other naval environments as well; and one might argue that the differences are a matter of degree rather than essence. Moreover, most maritime engagements fought since the end of World War II have been fought near to shore. The littoral *is already* where things are happening, and has been for quite a long time now.

Is, there, then, cause for alarm? Has the vulnerability of surface forces deployed in the littoral risen so sharply that the lessons of at least a half-century of operational experience must now be revised? If so, how?

The Maneuverability Problem

Two major factors are at the core of the new realities in the littoral. The first is the dramatic increase in the ranges at which targets can be located—that is, in

the size of search and detection envelopes. A navy's starting point in day-to-day operations is the spatial expanse within which it knows with immediacy, in "real time," the exact state of affairs. That expanse today is larger by an order of magnitude than it was for navies in World War II. The tactical picture available to the German defenses at Normandy, for instance, is an illuminating example; the surprise achieved on D-Day would have been impossible in the presence of a single, and quite simple, modern coastal defense radar, detecting the assembly of the huge landing fleet on the British side of the Channel.

The second factor is the entrance of the guided, or homing, missile into the maritime battlefield. World War II was essentially a gun battle, whether the guns were on the ground, seaborne, or airborne. Torpedoes and bombs, though heavier in explosive capacity, were essentially just slower bullets. The maneuverability in combat of a fleet or single ship, therefore, was a crucial element in every dimension of battle. The right maneuver would deceive enemy aircraft, lead them to miss their targets, or, often, contribute to their being shot down. Submarines were compelled to abandon attacks and run for safety or be chased and trapped by the much faster antisubmarine escorts. On the surface, maneuvering was the key to reducing the enemy's hit probability and enhancing one's own. The entrance of the homing missile totally changed things.

The surface ship is confronted now with a universal "smart" weapon, one that is so much faster and more agile than the ship—at least twenty or thirty times—that it is virtually unaffected by the ship's movements. The missile has practically annulled the surface ship's maneuverability.

Unlike the air battle, in which the aircraft (itself subject to continuous improvement) has until very recently maintained reasonable platform-to-threat speed and maneuverability ratios, the surface ship has remained essentially the same in these respects for the last fifty years. Thus, compare a Mustang or Spitfire of the 1940s to an F-15 or F-16. Then take a Second World War destroyer or frigate and compare its speed and maneuverability to what similar types offer today; they were no worse then, perhaps better. Oddly enough, this remarkable freeze in performance has never been made an issue. Throughout the last half of this century, the underpinning assumption has been that through the synergistic effect of combining several types of ships, with the capabilities of one compensating for the deficiencies of others, a balanced and survivable force could be created. The expanse of the open ocean, in which the main exemplar of this concept, the aircraft carrier battle group, would operate, and the maneuverability of its air assets, would offset the depreciated maneuverability of its surface ships. The battle group could establish surveillance and defensive barriers at great distances; its ships accordingly would have time to establish their tactical plots and calculate responses to possible threats. The ships' loss of maneuverability was

not on the agenda of force planners because it was masked by the idea of "defense in depth."

Even before the focus shifted from the open-ocean battle group to the expeditionary force in the littoral, however, a great deal of that compensating effect had been lost. An array of tactical and theater SSMs and ASMs had created what is in many situations essentially a one-on-one confrontation between the incoming missile and the ship in which no synergism can significantly offset the disadvantage of the latter.

Where missiles are concerned, the contest between the offense and defense is marked by a serious differential in starting points. In practical terms, the offense has a huge and nearly motionless target to hit and needs to hit it only once. One large missile warhead is equivalent to something like five or ten direct hits by a sixteen-inch gun.[5] The defense, on the other hand, is required to intercept an extremely fast and quite agile flying object, sometimes hardly detectable in the various phases of its trajectory, which can be launched from any operational dimension and often—for design purposes, *every time*—completely by surprise. The defense must deal with a weapon that can perform deceptive terminal maneuvers intended to outmaneuver hard-kill means (those attempting actually to destroy the missile); with a weapon equipped with any, or a combination, of a variety of guidance systems and homing devices designed to outperform a ship's "soft-kill" protective measures (which attempt, actively or passively, to cause the missile to miss); with a weapon that can be launched in salvos on multiple approach paths to saturate countermeasures of whatever kind.

Above all, the defense must constantly perform without error and without defect in an electronic environment so densely charged and a tactical situation so cluttered that they cannot be fully simulated. Uncertainties regarding the actual performance of defensive suites in a full-blown modern engagement are a cause for concern. Even limited experience has established, however, that whereas for the offense a mistake or malfunction means the loss of a missile, for the defense it means at least the disablement, and probably the loss, of a ship.

To be sure, defenses have certainly come a long way since the sinking of INS *Eylat* in 1967. Only six years later, during the Yom Kippur War, Israeli missile boats were able to survive more than fifty attacks by SS-N-2s without being hit even once. With the subsequent introduction of hard-kill systems—both guns and antimissile missiles—the defense has generated a very impressive set of capabilities. But so has the offense. The new generation of antiship missiles is very far from the primitive SS-N-2 of the 1960s. The Exocet Block II, for instance, is almost immune to current soft-kill means and poses a highly challenging interception and destruction problem.[6] The Russian SS-N-22 "Muskit" (or "Sunburn," as Nato knows it) is an operational Mach 2–plus sea-skimmer with a quirky (and at present incompletely known) maneuver in

its terminal phase that can probably penetrate any existing defense system, hard or soft-kill, especially when launched in salvos.[7] Optical guidance and laser beam-riding missiles require a whole new family of defenses for soft kill, which are only now emerging as prototypes, some ten years behind the threat they are designed to counter.

This gap is no accident. The difference in magnitude of the design problems and the fact that the defense is essentially reacting to innovations by the offense mean that the defense has no option but to make do with generic solutions. To produce a tailor-made response to a specific threat, that threat must itself be fully developed and real, and then be thoroughly studied, with all the typical intelligence uncertainties resolved—only *then* can design and testing get underway. Almost by definition, therefore, the defense lags behind. Moreover, as a practical matter, for each upgrade of its systems the defense must refit all affected vessels, whereas the offense has a much simpler task of implementation, sometimes the mere changing of missiles in the canisters. The gap in real life, then, is even larger than in theory. In the littoral the disparity between offense and defense is further amplified, to the great disadvantage of the ship. The constraints upon coastal defense are much less critical in terms of vulnerability than are similar constraints on the surface ship. The defender ashore has more redundancy; he can easily replace, resupply, and reinforce his assets—and his "platform" cannot sink. By contrast, to offset the fundamental imbalance of risk, the ship's capabilities must be pushed to their uttermost limits.

Take once again the example of the SS-N-22. In a coastal configuration, the missile, cruising at a speed of 720–740 meters per second, covers the distance of, say, fifteen miles to an offshore target in something like forty seconds.[8] Assuming that the ship is constantly tracked by coastal radar or ESM, targeting—that is, precise locating and aiming—can be done internally, without any emission detectable by the ship's sensors. The combatant, therefore, if it is to react effectively while the weapon is still a safe distance away, must be ready not only to detect it the instant it is launched but to have every countermeasure operating within the *first thirty seconds*. Setting aside the first five or ten seconds for resolving ambiguity in identification (due mainly to the missile's sea-skimming flight), the reaction time is reduced to some twenty seconds. Such a defensive posture must be maintained constantly, as long as the ship is within search and weapon range from the coast—and in the littoral, it practically always is.

This state of affairs is reason enough, in my view, for a major reevaluation of the most basic concepts of force structure and ship design, at least as far as the littoral is concerned. The scenario above is an extreme one, yet it is reasonable for a number of likely future theaters, the Middle East and the China seas in particular. It is a level of threat we cannot afford to accept, and should not, even

if ships' defenses had better probabilities of kill than they do. The problem lies in the simple fact that the surface ship is a constant target in the littoral. The surface ships now in commission were designed with the open ocean and distant defensive perimeters in mind; to keep deploying them to a playing field where, under the most optimistic assumptions, their survival requires as a normal operating mode the highest level of *everything, all the time*, is unhealthy and unrealistic in the long run.

Alternative Maneuverability

Though the decline in maneuverability as such has hardly been addressed in the naval community, the increase in vulnerability has been too obvious to miss, and quite serious efforts have been made in the last few years to meet it. The major direction of these efforts—apart from improvements to active electronic countermeasures, or ECM, and to the firepower and interception probabilities of hard-kill systems—has been in signature management. The idea is to reduce the vessel's "visibility" to enemy radar, thermal, and noise sensors in order to shorten the range at which they can detect the ship and make it easier for ECM suites to prevent an incoming weapon from locking on. So far, it appears, the results have been both too little and too late. The multitude of homing methods already available—specifically dual-mode guidance and target-verification technology—creates continual tradeoffs and contradictions for the defense that make matters, in both design and practice, highly problematic.

For instance, against radars, "stealthy" design conflicts with sensor and weapon system installation; that is, the very existence of antennas and topside launchers makes the vessel, however stealthy otherwise, more detectable.[9] The ship's own sensors, needed for its defense, are also the largest contributors to its radar cross-section (RCS). Thus the costly and difficult reduction of the ship's RCS is practically annulled by the use of radars to detect and track an incoming missile—at the very moment when that reduction is needed the most.

The same is true for thermal signature reduction, where a great deal is lost when the first barrage of chaff is fired and the canisters on the deck and superstructure become hot. As a matter of fact, any thermal-signature reduction will be worthless when the guns or missiles are used, and that, in the littoral, is common. USS *Vincennes* was chasing and shooting at Iranian fast attack boats just before the ill fated airliner appeared on its radars. Suppose the contact had actually been what the cruiser thought it was, or worse, an Iranian ASM? The ship would have had to counter it with no hope of lowering its thermal profile.

Dual-mode guidance, for example, is specifically designed to take advantage of such conflicts, capitalizing upon the defense's efforts to deal with one prong of its dilemma at the expense of the other. A salvo of two or more missiles with

different homing systems creates in essence the same effect. Combinations of active and passive radar seekers, infrared (IR) and IR imaging, and antiradiation and optical guidance are in various phases of development around the world, and the multi-type salvo was in the Soviet missile doctrine for decades.[10]

The advantage the offense has here is a substantial one. The measures the ship takes to counter one type of threat are used by the missile's secondary guidance system as homing inputs. Thus in every phase of the encounter the ship is exposed to at least one type of guidance or homing device, and in most practical cases in which something other than active radar is involved the crew will operate under significant uncertainty as to what type of homing it faces or will face. Finally, even if these design conflicts are resolved for the defense, the probability of visibility in daylight at close ranges in the littoral will remain. Optical guidance and laser beam-riding can be used by day, and at night there is IR imaging.

It is no wonder, therefore, that more and more resources are being put into the hard-kill approach, into designing guns and missiles to shoot down incoming missiles. The weapons of this type already in use, such as the Sea Sparrow missile, the Rolling Airframe Missile (RAM), and the Goalkeeper close-in gun system, are outstanding achievements of research and development, but because of the fundamental disparities involved, anything the defense can do the offense can do better. The technology for high-velocity interceptors, for instance, is already employed by the *offense*—it is in use today in the SS-N-22 and is being applied to the French-German ANS supersonic surface-to-surface missile now under development. The same can be said of "stealthy" design; "low-observable" threats will require yet another major upgrade for the hard-kill side, and it is an open question whether any nation will be able to afford the costs involved.

Signature management does have its benefits for short-term and specifically defined missions that require surprise and are aimed to create local advantage. A great deal of signature management's effectiveness, however, will be lost in long-term, routine presence in confined waters. By contrast, a coastal defender employing modern systems has all the time he needs to wear out the offshore targets, let them make mistakes, use up their limited magazine capacity, and make themselves more and more vulnerable. A ship's signature makes little difference to him.

If signature management does not take us far enough, what else is left to rebalance the situation in the littoral? We could certainly consider the costly and protracted process of developing a new generation of defensive suites. But this equipment would be installed on decks and masts that are already crammed, and as we have seen, it is likely to be out of date on arrival. Given the fundamental offensive advantage in this contest, the best we can expect is to freeze the current situation, hardly to achieve a substantial improvement. Again, and with the existing fleet, we can *outsmart* the coast in the short run, capitalizing on the

deficiencies of specific coastal defense systems. We can use massive ECM to neutralize their search and detection capabilities, for example, or sometimes simply destroy them altogether—and so on. But these are isolated cases; they might become rarer, and violently "outsmarting" them will not be so simple in the future. Political constraints and the proliferation of sophisticated weapon systems and technologies can combine to create situations in which such options might not be available. For low-intensity conflict an immediate clash is certainly not the rule; that environment requires a broad and flexible palette of means, some of which are less bold and nonprovocative, others clearly forceful enough to project power. One can certainly carry a big stick with today's surface ships; it is hard to walk softly, harder still to walk safely.

It appears, therefore, that not much can be done to change this state of affairs fundamentally unless we are willing to consider bold conceptual steps to regain maneuverability in the littoral. We must start to focus upon how we can adjust the surface fleet to these specific circumstances. Thinking in terms of the 2000s, the current exposure of surface forces must be addressed from much broader perspectives than it has been. These perspectives, however, require us to question one of the most basic tenets of naval philosophy in this century—the division between surface and subsurface.

Bidimensional Maneuverability

Submarines are essentially immune to most of the threats that surface ships face, in particular to current SSMs and ASMs. It is interesting how different the evolution of the submerged platform has been from the direction taken on the surface. Two elementary differences are very illuminating:

• Submarine design has focused primarily on optimizing the hull to increase speed, the essential part of maneuverability in the general sense. Indeed, since World War II, performance in these respects has advanced remarkably in the case of nuclear propulsion, and conventional boats have also improved dramatically. While the surface fleet, at least for littoral operations, has lost entirely its effective maneuverability and has been forced to rely solely on firepower and electronic warfare to survive, submarines have developed their maneuverability to the ultimate level, counting on it—quietness being another component of their maneuverability—almost exclusively.

• While the surface fleet has become, and has accepted being, a constant target, submarines have allowed themselves to be targets hardly at all, and ever more rarely. Surface warfare has become an extreme case of dependence upon firepower, electronic countermeasures, and split-second reaction. The submersible, on the contrary, has developed into an untraceable platform that uses its

weapons sparingly, reserving them for either the tactically or strategically optimal moment of kill, dropping back into silence immediately thereafter.

If what the surface fleet has become is an inevitable result of entry into the missile age, for the subsurface side it has been much more a matter of choice and philosophy. Modern trends in submarine development were first and foremost the creation of the Cold War, its bipolar geopolitical structure and its unique strategic circumstances. Submarines have been designed having in mind on one hand the strategic balance of mutual destruction, and on the other their ability to avoid and outmaneuver surface and airborne antisubmarine, or ASW, forces. Refraining from using firepower to confront the adversary's ASW assets—allowing him the option of a practically unhindered hunt—was essentially a choice based on that philosophy. Now that fundamental elements and assumptions of these Cold War realities are no longer relevant, however, anomalies are beginning to show up.

For example, it is considered perfectly ordinary for a P-3 maritime patrol aircraft, or a small ASW helicopter, to drive more than a billion dollars' worth of war machine into hiding, deep down, for hours. Looked at from a viewpoint innocent of the circularities of the Cold War's strategic sophistication, this is a striking absurdity. Even more astonishing is the complete difference in scales of risk and of operational standards that the two dimensions of naval warfare have come to accept. On the surface in the littoral, certainty that we are visible to the enemy is an unquestioned and inherent property of everyday operational reality; by submarine standards, the mere *possibility* of having been detected calls for immediate emergency procedures. For a surface ship, being detected means, in the worst case, the opening of a fight; for the submarine, it is an imperative to break off contact and hide.

These conventions, which are remnants from farther back than the Cold War, in fact from World War II, are so deeply rooted in our conceptual framework that we never stop to think about how valid they still are. Desert Storm was the first instance of submarine firepower being used against the land as an integral part of a campaign; all was done, however, as if the whole former Soviet ASW fleet were hovering above. Why cannot a platform that is in essence a submerged missile launcher—tactical, theater, or strategic—be fitted with additional antiaircraft means and play a more active role on the congested surface of the littoral? The farther we get from World War II and the Cold War conventions, and the closer the littoral realities become, this question gains more and more relevance.

On one hand there is the surface fleet, pushing itself to the limit in confronting a level of threat that renders nugatory the very notion of calculated response. Commanding officers who operate under constraints of reaction time and vulnerability that force total dependence upon automation find that their control over their ships' reactions is diminished and that they are continually uncertain

of the quality and adequacy of its defensive performance. Such a state of affairs essentially forces them to make the convulsive and hysterical the norm. Captain Will Rogers of the *Vincennes* and his innocent victims could have been luckier, perhaps, but he had an impossible decision to make. Overloaded with data he had no time to check, and lacking the option of maneuver-and-see, he did what the captains of HMS *Sheffield* (in the Falklands-Malvinas War) and USS *Stark* should have done—and "when in doubt, push all the buttons" was the only valid lesson one could draw from their tragedies. Indeed, what other choices are there for a surface ship in the littoral?[11]

On the other hand, submarines' inherent qualities make them essentially unaffected by the above constraints. Save for depth limitations, they can operate there remarkably more safely than surface ships can—and right here lies the focal point of the opportunity.

By simply making a *choice* to design submarines to confront ASW with firepower rather than improving their capability to hide from it, we can gain a whole new range of options for the littoral. Once this design choice is made, water depth, for example, is no longer a limitation—this new submerged ship has no particular need for it. On the contrary, its optimal operating niche is just below the surface, with sensors just above it and weapon systems ready to engage ASW patrols, air or seaborne. In this position, nearly hidden by the coastal radar's sea-clutter, it has the best signature management a surface combatant can ever hope to get. Too small in RCS for most missiles' seeker to lock onto, it also enjoys in effect the best ECM possible. In fact, with the option to dive once an incoming missile is detected, the submersible is, in general, indifferent to the current missile threat altogether. Submarines, confined until Desert Storm to minelaying, reconnaissance, and other "World War III" missions, have a tremendous potential for the littoral—once this mental change is made—and could make a major difference there. Used *bidimensionally*, their unique maneuverability can reduce their exposure dramatically while they maintain a constant, effective presence offshore, thus bringing the risk imbalance back to a workable equilibrium.

Bidimensional maneuverability looks like the most fertile and promising direction for closing the gap in this crucial arena. (It also has a great potential for the high seas, but that is a matter beyond the scope of this discussion.) It is possible, without too much difficulty, to merge relevant portions of the firepower of the surface ship with the excellent maneuverability of the submersible to produce a new breed of fighting ships designed for the next century. For some large navies, bidimensional maneuverability would be an avenue for reviving an extremely costly asset that is looking for a post–Cold War mission; for others, it reopens operational options that have ceased to be relevant due to the current state of vulnerability in the littoral. If indeed we are heading toward

a century in which the littoral is the primary playing field, few arguments for the current total split between surface and subsurface remain valid. As I hope the foregoing shows, there are quite a few good ones to be made to the contrary.

A Note on Airpower

One key factor of the littoral equation has been kept in the background of this discussion, and that is the role of naval airpower. Command of the high seas has been based, at least since World War II, on seaborne airpower. The aircraft carrier battle group, or CVBG, is surely the ultimate form of maritime might. It dominates the operational environment, and it is the conceptual basis for force-structure and ship-design assumptions—assumptions that affect every navy in the world, including those that have no carriers. However, the CVBG has never been tested against a modern, thoroughly professional, coastal defense system. None of the instances, including Desert Storm, in which this floating airfield with its powerful escort has been put into action since World War II give us a real appreciation of its ability to fight in the littoral. How would a combination of, say, SS-N-22 SSMs and SA-10 antiaircraft batteries on the defender's perimeter affect the carrier's performance? That specific instance might become the actual case, in fact, on the Iranian side of the Persian Gulf in the not too distant future; a determined defender there with such armament would be able to track and intercept air and surface targets within a span of more than a hundred kilometers, thereby simultaneously affecting both the carrier and its aircraft. What might be the cost of defeating such a system?

We are beginning now to face the results of the huge research and development effort first generated in the 1980s, on both sides of the bipolar world, by concepts associated with the Strategic Defense Initiative. SDI's last phase focused intensely upon the concrete problem of intercepting Scud-like ballistic weapons and cruise missiles. A product of that effort, for use against targets either in space or within the atmosphere, was the hypervelocity interceptor; with its introduction the manned aircraft faces, perhaps for the first time, a problem similar to that of the surface combatant operating close offshore. That is, it loses, in practical terms, its maneuverability. The effectiveness of the CVBG in the littoral might be an early victim of this development—which might, in fact, see the effectiveness of manned air platforms, as a whole, significantly reduced.

With such question marks, it is necessary for the planner to treat the surface problem in isolation. The range of uncertainty in planning for the 2000s requires a clear vision of how things stand with each and every element of the equation, alone, before we get to the business of putting them all together.

To Regain Maneuverability

An important fact to keep in mind about sea power generally is that it has not been truly tested since World War II. We have for evidence the few clashes of the 1971 Indo-Pakistani War and of the 1973 Arab-Israeli War, both of which essentially involved random missile boat engagements without substantial use of airpower. We have a few instances of maritime aviation in action on a wide range of intensity levels: Vietnam, the Falklands, individual raids on Libya and Lebanon, and the massive coalition operations of Desert Storm. There are quite a number of assault landings, from Korea on, and there are a number of single actions (some of them in the campaigns mentioned) that can stand alone. However, we do not have, to serve as a test case, a single instance of a large-scale maritime battle fought between substantial adversaries employing a full range of modern means. For the surface world, the paradigm is still the historic battles of the forties in the Atlantic and Pacific.

There exists, then, the quite peculiar situation in which nothing can be properly substantiated—neither commonsense-based adherence to the experience and convictions of sea power that we have long had, nor the intuitive feeling that the cumulative change is now of such magnitude that a radical rethinking of these convictions is of crucial importance. Yet the latter is a matter of more than intuition, at least in one sense—we are entering the next century, and also a dramatic transition from the open ocean to the shallow seas, with a severe lack of relevant experience. Too often in military history, at such moments of uncertainty old principles have hardened into beliefs that have been, among other things, the grounds for rejecting new, more adequate ones.[12] We have no option but to rely on an analytical process that subjects every conviction of the past, including the most fundamental ones, to unconditional examination.

The white paper ". . . From the Sea" marks a turning point in a century of world wars—a historic shift from the one-global-conflict model to that of two or more small-scale ones, and from the high seas to the littoral. It would be a mistake to assume that global conflict is no longer a valid scenario; the twenty-first century could be just as problematic in that sense as the present one has been. The capacity to gain control of the open ocean and the choke-points on its periphery is certain to remain a prerequisite of naval strategy.[13] It would be just as erroneous, however, to ignore the disturbing signs of inadequacy, as regards the littoral arena, in present ship-design philosophy. We have a fundamental problem in the balance of maneuverability and firepower: submarines that use only a small portion of their capability, and surface combatants that operate like the town sheriff of the nineteenth-century American West, walking the street and ignoring the riflemen on the roofs.

We must regain maneuverability if we are to be able to dodge the incoming missile instead of having to destroy or deflect it. We have to cease being a constant target, in order to regain control over the man-machine relationship in threat evaluation and response; we cannot allow to continue the present state of affairs, in which commanding officers must either expose their ships to a fatal hit or shoot at every unidentified contact. With so many new threats in the littoral, it is an open question whether even that gives sufficient protection.

A merger of surface and subsurface capabilities in a bidimensional fighting vessel has the potential to meet these requirements. It can combine the effective properties of each, while losing mostly those which the end of the Cold War and the transition to the littoral have rendered excess. For example, diving depth and silent operation could be traded for more firepower. There is no question of doing away with existing forces, certainly not in the short run. Bidimensionality does, however, imply the beginning of a new planning phase.

We must realize that dividing between surface and subsurface is, after all, a very costly *double* investment. In the littoral, it is also losing its operational rationale; in the Gulf war, for instance, the mission profile of submarines was essentially identical to that of the surface fleet, the carriers aside. This trend can and should be pushed farther, optimizing in favor of firepower options on the surface and trading off some of the more exotic capabilities of the subsurface.

There are no perfect solutions in our trade, but some are better than others. The basic concept of bidimensional maneuverability, with its commonsense rearrangement of existing capabilities in a new package, is in my view among the better and more promising ones. It opens a real avenue for development but is responsive and adaptable to the new realities of the littoral. In any case, we will probably have to make do with less in the 2000s. The next generation of ships is certain to be extremely expensive, whatever direction ship design takes. To continue risking them in an environment in which they do not belong will be even more problematic, politically and militarily, than it already is. Bidimensional maneuverability might be not only the preferable solution for the littoral, but the only one.

Notes

1. U.S. Navy Dept., ". . . From the Sea: Preparing the Naval Service for the 21st Century," Navy and Marine Corps White Paper (Washington: September 1992), esp. pp. 1–5.

2. The American warships USS *Tripoli* (LPH 10) and USS *Princeton* (CG 59) were each removed as fighting units for the entire Persian Gulf War by one mine. Just how much the random Iraqi mining affected the decision about landing from the sea on the northern flank of the coalition forces is still somewhat a matter of speculation—but it certainly did not help.

3. Captain (now Rear Admiral) Pieter C. Kok, commander of the group that the Royal Netherlands Navy deployed to Desert Storm, discussing lessons of the war in conversation with the author.

4. However, see John Barry and Roger Charles, "Sea of Lies," *Newsweek*, 13 July 1992, pp. 29–39.

5. This figure is based upon a rough estimate of the differences in warhead payloads. The sixteen-inch gun's armor-piercing round carries 18 kg of high explosive, while high-capacity ammunition has some 70 kg. Large Soviet-designed missile payloads begin at 500 kg (for the SS-N-2) and go up to some 1,000 kg (in the SS-N-19 Shipwreck). The SS-N-22 has 340 kg. Even Western missiles carrying payloads in the 200-kg range but employing delayed fusing are considered to double or even treble their effect by exploding inside the ship's hull.

6. The Block II family (the AM-39 and the MM-40 SSM) is reportedly equipped with a digital processing capability immune to current active electronic countermeasures. It offers a reduced radar cross-section during mid-course flight and a sea-skimming terminal phase, adaptable to sea state. Its sophisticated trajectory capabilities include "angular evasions" to deceive medium-range surface-to-air missiles and terminal agility against close-in weapon systems. It also provides a variety of salvo combinations for saturation attack.

7. The SS-N-22 has a range of 100 to 120 kilometers and a sophisticated guidance system. It is operational in a surface-launched version and has been shown in an air-launched version as well.

8. So far the only indications of the existence of such a configuration are brochures with artist's conceptions of the system. In light of 1993 Russian tests of the ASM variant, however, and the rather small modification required to produce a land-based version, we can safely treat a coastal SS-N-22 as a valid option for this analysis. See *Jane's Defence Weekly*, 22 August 1992, and *Aviation Week & Space Technology*, 24 August 1992, p. 64..

9. For a more detailed discussion of the design issues, see John W. McGillvray (Captain, USN), "Stealth Technology in Surface Warships," *Naval War College Review*, Winter 1994, esp. pp. 30–6.

10. Open-source references are scarce. The RAM is the first for which a true dual-mode design has been acknowledged; an upgrade has already been announced. See *Naval Forces*, no. 4, 1994, pp. 48–54. The AGM-119 Penguin Mark 4 and the Otomat 2 programs are also believed to be dual-mode weapons; see *Forecast International/DMS Market Intelligence Report* (Conn.: 1991), Tab E, s.v. "AGM-119," p. 3, and "Otomat," p. 5. The AGM-84 Harpoon home-on-jam option and the SS-N-22's active-passive guidance are designed to achieve essentially the same effect.

11. See Barry and Charles.

12. For examples see Sir John Winthrop Hackett, "Society and the Soldier, 1914–1918," Malham M. Wakin, ed., *War, Morality, and the Military Profession* (Boulder, Colo.: Westview Press, 1986), pp. 86–8.

13. For the views on this subject of the drafters of ". . . From the Sea," see Edward A. Smith (Captain, USN), "What '. . . From The Sea' Didn't Say," *Naval War College Review*, Winter 1995.

Ψ