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## A Case for Maneuverability

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

**B**BRITISH NAVAL HISTORIAN JULIAN S. CORBETT was the first to point out, almost a century ago, a disturbing phenomenon concerning the future of the surface fleet: "The vital, most difficult, and most absorbing problem has become not how to increase the power of a battle-fleet for attack, which is a comparatively simple matter, but how to defend it."<sup>1</sup>

Corbett was referring to the newly developing threat of attack by flotillas of torpedo boats protecting their home waters. Obviously, some quite efficient answers were given to his concern as the century evolved. However, in the past few decades similar warnings have once again been voiced, this time regarding the introduction into the maritime arena of the guided missile. As with Corbett's torpedo boats, the issue is a particular constraint imposed by a newly developing threat to surface fleets in littoral waters.<sup>2</sup> Again like Corbett, this essay will argue that the primary answer to the problem is to enhance maneuverability, as—if in a somewhat different way than—Sir Julian had in mind in 1911.

### The New Kid on the Block

On the face of it, we have here simply the old problem of maintaining the fundamental balance between threats and responses—a problem as old as threats and responses themselves. For instance, surface ships found means to limit Corbett's torpedo threat at a level that imposed no significant restriction on their operations near the shore.

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

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## 126 Naval War College Review

New ships were built with armored hulls, “screens of cruisers” were replaced by aircraft, gunnery capabilities were improved; today, consequently, torpedo-boat attack—using torpedoes—is a thing of the past. Guided missiles, and precision weapons as a whole, are a totally different matter. We are facing today in the littoral the result of a major imbalance between maritime firepower and maneuverability, one that has developed since World War II and that missiles have dramatically exposed. Technically, the introduction of the missile into the maritime arena has created a differential between offense and defense, in which the latter is racing to match the opponent system-to-system but, in principle, constantly lags behind.<sup>3</sup>

Consequently, surface ships have been forced to become moving “weapon-islands,” while submarines now rely principally upon maneuverability for their self-defense, retaining for that purpose only their primary attack systems—and in the case of ballistic missile submarines, not even that. In other words, the surface fleet has been obliged to give up maneuverability altogether as a means to defend itself, and to depend upon firepower alone. Conversely, submarines have abandoned the option of challenging their adversaries actively, in favor of remaining stealthy.

The environment in which these radical dynamics operate features the modern coastal defense system, a new element in warfare that should be watched very carefully. It has a potential to play a significant role in the future. In fact, coastal defense systems today look disturbingly like a stationary surface fleet. They have highly developed identification capabilities, long detection ranges, and passive sensors, and they employ coastal versions of the very weapons their opponents offshore carry. Further, they have few of a fleet’s deficiencies: they do not sink, they are much less conspicuous and identifiable, and they have no inherent limits of resources, supply, ammunition, or manpower.

If the foreseeable future of maritime warfare is to be one of limited, low-intensity conflicts in the littoral, then an additional observation (a somewhat dramatic one) of Corbett concerning the torpedo threat is worth quoting: “Our most dearly cherished strategical traditions were shaken to the bottom. The ‘proper place’ for our battle-fleet had always been ‘on the enemy’s coasts,’ and now that was precisely where the enemy would be best pleased to see it.”<sup>4</sup>

We are not yet, to be sure, quite that far along; the nations involved have other options, and the process is still in its first stages. We should not miss, however, two points. First, judging by current trends and the obvious practical advantages the modern coastal defense system enjoys, it is likely to become the preferred solution for many littoral nations.

Second, and unlike Corbett's problem, the present imbalance between threat and response is not caused by a singular means—one kind of weapon system—countering which would maintain the battle fleet's superiority. Instead, we are looking at a threat that inherently tends toward comprehensive, across-the-board, competitive symmetry with the surface warships confronting it.

A modern coastal defense system—just like the fleet offshore—is controlled by a combat information center that integrates data from remote sensors, builds a tactical picture, and controls or coordinates the system's offensive and defensive assets. Most of those assets today are ground-based, mobile, widely dispersed, and camouflaged, benefiting from the fact that many seaborne sensor systems are not particularly effective for detection on land. In addition, a coastal defense system has its own dedicated air surveillance assets. Its aviation can be spread over a number of airfields and runways, with anti-aircraft batteries protecting against strikes from offshore. A system built along these lines is capable, in principle, of matching or exceeding the capabilities of a surface fleet offshore.

By and large, this trend is either downplayed by naval strategic thinking or even practically ignored. The common wisdom prescribes a bold softening-up of the coast before forces are committed, an approach based on the inherent, historical superiority of the battle group. But that is precisely the point: that very superiority is beginning to come into question, and the likelihood of success in the preliminary phase is getting low. After all, a surface fleet in the littoral is operating in the worst possible scenario. Surface ships are built to be seen. Today, constrained by this very visibility and the lack of maneuver options, they must count on their own defense systems and continuous air superiority to survive—and under these circumstances, neither are "givens" any longer.

### Options for Maneuverability

One possible answer is a major redesign of submarines aimed at making them fit for power projection and patrol missions near the coast, by becoming able, on the surface, to engage antisubmarine warfare platforms, especially airborne ones. It is mainly a matter of philosophy. This approach is in essence a simple one. It maintains the submarine's hull and propulsion design unaltered; in fact, it is a continuation of a process already underway.

In the Persian Gulf War, submarines participated in the land battle, operating within the littoral as substitutes for, or at least enhancements of, deep-penetration airborne strikes. Adding an active self-defense ingredient and relinquishing the traditional tendency to dive from a threat is, essentially, merely a matter of

## 128 Naval War College Review

degree. But submarines are costly; in practical terms it is not obvious that the submarine hull can be the littoral design paradigm for the next century. Perhaps it will be; however, we might also explore the opposite approach—to “lower” the surface ship.

That is to say, if one reduces the surface ship signature across the entire electromagnetic spectrum, the vessel becomes less of a constant target for the coastal defense system; its visibility to guidance systems of incoming weapons is reduced; and the amount and type of defensive means onboard can be lessened and changed. The result is a warship that can maintain a stealthy presence in “green” and “brown” waters.

Signature management, especially on all relevant spectrum bands, is a tough job on an existing ship. To use active means—to radiate or transmit—necessarily exposes the ship, whatever it does; even to install radar antennas increases radar cross-section (RCS); to launch or shoot weapons increases the infrared (IR) signature; and so on.<sup>5</sup>

The option of lowering the surface warship (as does, to a considerable extent, the U.S. Navy’s “arsenal ship” concept) offers a number of design benefits. First, we gain a basic cruising posture that is much less vulnerable to radar, IR, and optical detection.<sup>6</sup> The low silhouette of the vessel reduces RCS and thermal “footprints” dramatically and makes optical sighting likely only at minimal ranges. As a result, the adversary is forced to deal with greater difficulties in detection and targeting, and the ship has much better options for countermeasures against incoming precision weapons.

Unlike for the submarine, diving to dodge the threat is not an option; but the prospects for other ways of keeping a missile away from the ship (that is, “soft kill”) are significantly improved. In other words, although a surface ship cannot hope to outmaneuver modern precision weapons by speed or nimbleness, it may be able to do so by stealth. Stealth is indeed a form of maneuverability different from what Corbett was thinking of, but it is the only one at hand.

Other solutions proposed to offset the inherent disadvantages of surface ships, such as Admiral William A. Owens’s “system of systems,” are in essence a shift away from maneuverability entirely, toward a total firepower environment. Owens’s vision holds the long-range, exoatmospheric threat to be the relevant one;<sup>7</sup> it posits a theater ballistic missile defense array, with lower and upper tiers of interception capabilities, all integrated into a theater command system.

But it has no answer for an SS-N-22 supersonic sea-skimmer, which is likely to be the typical threat posed by a coastal defense system. The key problem in the littoral—the short-range, zero-reaction-time posture of the surface fleet—remains before us. Global systems do not answer it, and no existing

point-defense system effectively counters it to a degree that allows for continuous presence within the coastal defense system's weapon envelopes.

Thus the "system of systems" is essentially a continuation of the same rationale that led to the point where we are today, at least in that it does not deal with the core problem of maneuverability versus firepower. In the littoral at least, no sound solution can bypass the need to confront this problem.

### **The Semi-Submerged Surface Ship**

Certain elements are likely to remain unchanged in the naval force structure. Aircraft carriers, for example, will always remain surface platforms, and so will some other parts of the carrier battle group. Such ships, however, can and should be kept outside the littoral anyway. Those that must maintain presence, and project power from within a coastal defense system's range, have to be designed afresh.

First, such a ship must be built for two cruising modes. For covering distances in transit, a high-elevation, normal-cruising mode maintains the waterline at the optimum dictated by the traditional design factors for displacement hulls. For the "lurking mode," ballast tanks are filled, raising the waterline to the lower edge of the superstructure. In this mode the ship is floating on huge air cushions designed to maintain both stability and buoyancy. The thing is possible. Submarines do it, special operations craft do it, and there is no reason why a ship the size of a frigate cannot.

The second major new element is a specialized superstructure. The components that remain visible in Lurking Mode must be carefully chosen with respect to what systems can be done without, considerations of shape and size, and new options that now offer themselves, such as filament-thin fiber instead of armored coaxial cables.

Third, the design is purged of every existing system that the Lurking Mode makes redundant. With the present development of communications, for instance, the norm of self-sufficiency in detection is a blatant redundancy. Why not consider a ship without radar? It can get the "picture" from stand-off sensors via data links. Passive tactical picture-building can be a combined process, using data from remote sources and a ship's own passive arrays, which (as is already done for submarines) can be incorporated into the hull. Take off the radar antennas, retracting the ones that are used only when links are down or the picture has not been updated, and we immediately gain a significant reduction of RCS.

This approach, however, not only trims the ship of systems but also imposes new design parameters; masts and pilothouses, for example, have to be designed anew. Much the same happens with air intakes and exhausts, which must be

## 130 Naval War College Review

given a lower silhouette and repositioned well above the raised Lurking Mode waterline.

In terms of new options of exploiting sensor technology, the most interesting area is acoustic. Lurking Mode might make use of a passive "flank array sonar," if the noise level of the ship can be lowered. Quieting a surface ship might involve secondary electric propulsion, which can get, in principle, very close to the noise levels of conventional submarines today.

Again, by doing so one not only compensates for the sensors forfeited but also manages the ship's signature at all relevant frequencies. We will not create a submarine, but we will get a ship that is very capable, flexible, and stealthy compared to today's surface vessels.

There are two threats in the littoral to which both the submarine and the semisubmersible in the littoral are still vulnerable, however stealthy: mines and antisubmarine air. These two involve issues beyond the scope of this essay, but at the least a surface combatant in Lurking Mode can claim the same level of antiaircraft defense that ships have now, or very close to it, plus the benefits of its low overall profile, affecting the opponent's detection and targeting capabilities.

As far as mines are concerned, stealth opens possibilities for preventive anti-minelaying operations within the littoral. Also, the quieting of the ship for Lurking Mode provides protection against acoustic mines. An innovative approach in this area can give us dramatic improvement in counter-mine warfare and in survivability as well.

### The Broader Picture

Those who in 1911 attempted to respond to Julian Corbett's alarm had at least one benefit we do not have: fairly fresh, relevant, practical experience and precedents (in the Sino-Japanese, Russo-Japanese, and Spanish-American wars). Today, as far as full-scale war at sea is concerned (and in contrast with air and land conflict), we have nothing more recent to draw upon than World War II. The Yom Kippur War and the Falklands/Malvinas campaign have provided very important clues as to the scale and seriousness of the problem but essentially demonstrated only fractions of the entire picture, and both scarcely involved the littoral we now face.

This is an extremely tricky situation—reasons for change and reasons to maintain course may appear equally unsubstantiated by recent naval history. Nevertheless, there can be no mistake about actual trends in the development of coastal defense systems; they are perfectly obvious, for instance, in the Middle East and the South China Sea.

We are obliged to make some assumptions for the future. If we assume that it is possible to reach a symmetry of raw capabilities between a naval task force and a coastal system defending against it, then we have no alternative but to modify the task force's properties in ways that compensate for its inherent weaknesses.

The most significant vulnerability stems from the fact that surface ships operating in the littoral have no meaningful maneuverability options; they must depend entirely upon firepower-based protection, or its analogue, maneuverability by stealth, if they are to deploy there. In that realm, and however attractive firepower may seem, such options as the "system of systems" only diminish (and very expensively) the real problem, the fundamental degradation of traditional maneuverability.

In a sense, regaining the effective ability to maneuver is a precondition for the "system of systems" and other concepts arising from the apparent "revolution in military affairs."<sup>8</sup> It would ensure their cost-effectiveness, if not their outright feasibility, by reducing significantly the need to hide or provide cover for ships, and freeing resources for "falsifying" the enemy's picture of the realities.

The design of semisubmersible surface combatants seems to be a straightforward engineering problem—just as making submarines operate on the surface is one of philosophy. This is not to say that designing a semisubmersible surface ship is a simple matter.

There are quite a few serious difficulties to overcome, especially with respect to stability and sea-keeping. Also, how in practical terms a vessel might operate from day to day in Lurking Mode is still full of uncertainty. However, such matters should be very high on the priority list of navies everywhere, as they enter the twenty-first century. We had better do our homework before we embark on massive expenditures for yet another layer of traditional systems to shield blue-water navies from their future littoral adversaries.

## Notes

1. Julian S. Corbett, *Some Principles of Maritime Strategy* (London: Longmans Green, 1911), p. 122, reprinted, with an introduction and notes by Eric J. Grove (Annapolis, Md.: Naval Institute Press, 1988), p. 123.

2. See the author's "The Littoral Arena: A Word of Caution," *Naval War College Review*, Spring 1995, pp. 7–21. The arguments of that article are recalled at several points in the present essay.

3. *Ibid.*, esp. pp. 9–14.

5. John W. McGillvray, Jr. (Capt., USN), "Stealth Technology in Surface Warships," *Naval War College Review*, Winter 1994, esp. pp. 30–6.

6. See Reuven Leopold, "The Next Naval Revolution," *Jane's Navy International*, January/February 1996, pp. 12–20.

7. William A. Owens, *High Seas: The Passage to an Uncharted World* (Annapolis, Md.: Naval Institute Press, 1995), pp. 105, 148–9.



## 132 Naval War College Review

8. For assessments of the "revolution in military affairs," see, among many others, Colin S. Gray, "The Changing Nature of Warfare?" and James H. Patton, Jr., "The New 'RMA': It's Only Just Begun," *Naval War College Review*, Spring 1996.



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