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# TECHNOLOGY AND NAVAL BLOCKADE

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## Past Impact and Future Prospects

*Roger W. Barnett*

*Anyone who wishes to cope with the future should travel back in imagination a single lifetime . . . and ask himself just how much of today's technology would be, not merely incredible, but incomprehensible to the keenest scientific brains of that time.*

ARTHUR C. CLARKE

**T**hrough the centuries major changes have taken place in the ability of states to prevent the movement of ships or particular goods over the sea lanes of the world.<sup>1</sup> Some of the changes have been wrought by technological evolution, some by increasing importance of seaborne trade, and some by alterations in the structure of international relations. The combined effect has profoundly affected both the way maritime blockades are conducted in the twenty-first century and the means employed for them. In large measure, it has also rendered the traditional law of blockade obsolete.

### BLOCKADE OPERATIONS

Until World War I maritime blockades were undertaken by states seeking to prevent the movement of ships or cargoes that would assist in the ability of adversaries to conduct international armed conflict. Blockade law evolved in the

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nineteenth and early twentieth centuries to regulate how states conducted blockades while concurrently safeguarding the rights of neutrals to use the open seas to conduct nonproscribed trade.

The appearance in the last half of the nineteenth century and first decades of the twentieth of sea mines, surface and submarine torpedo-attack craft, long-range rifled guns with exploding projectiles, and eventually aircraft meant that the traditional form of blockade—in close proximity to the adversary's

coastline, where ships could be kept under surveillance and discouraged from departing their ports—could no longer be sustained.<sup>2</sup> Thus maritime blockade evolved into long-range operations or blockade zones, and the rules that had been laid down for the conduct of blockade were for the most part ignored or rationalized away.

New technologies had required blockading states to move farther from the adversary's coastline, and at the same time they promoted the use of submarines and mines as instruments of blockade, because they were relatively immune to countermeasures by the blockaded party. In both the First and Second World Wars the law-imposed requirements to visit and search ships, before attacking them, in order to determine whether they were carrying contraband and to provide for the safety of people on ships attempting to breach the blockade were massively violated.

A prescient *Yale Law Journal* article over a decade ago declared,

In the future blockade may become even more important as the need of a blockading state to stop every merchant ship grows more vital. The recent willingness of ostensibly neutral states to supply not simply technical know-how and materials for weapons construction, but also ready-for-use missiles and other decisive weapons, to the highest bidder portends such a future. As the negative consequences of allowing even one ship to pass uninspected grow more severe, blockading states will become more willing to use the new blockade forms [long-range blockade and blockade zones] at the expense of neutral interests.<sup>3</sup>

What the writer could not have foreseen happened on 11 September 2001—events that changed the world, and in ways not yet fully comprehended. What was extraordinary about the events on that date was that a nonstate entity had succeeded in conducting a coordinated attack against a sovereign state on its home territory with a hitherto unappreciated weapon of mass destruction, a fully fueled airliner. Historically, weapons of mass destruction (WMD)—such as nuclear, chemical, radiological, and biological weapons—have been under the strict control of sovereign states, their manufacture, storage, and use carefully constrained physically by security measures and strategically by deterrence and international law.<sup>4</sup> The message conveyed on 11 September was that henceforth weapons of mass destruction could be controlled, distributed, and perhaps used by nonstate entities or even individuals. This was an unanticipated, and very unwelcome, extension of the envisioned “negative consequences.”

After 9/11 the central security problem, for the United States at least, became how to ensure that no weapons of mass destruction could be used by nonstate entities against American citizens in the homeland. Thus the Homeland Security Department was created, and new initiatives to prevent the international

transfer of such weapons and of launching and support mechanisms for them were instituted. Because no WMD use against the United States could be tolerated; because nonstate entities are difficult—and perhaps impossible—to deter; and because no retaliatory measures could repair the damage that the use of WMD could wreak, a new policy of preemption was announced and codified in a new national security strategy in September 2002.<sup>5</sup>

It is far better to seek to control shipping or the shipment of contraband at the source rather than at the destination. This has long been a guiding principle of blockade, recognized and enunciated by Alfred Thayer Mahan in his seminal

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*States have been rather inventive in conducting blockade operations but calling them something else to evade the legal requirements.*

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article “Blockade in Relation to Naval Strategy”: “Whatever the number of ships needed to watch those in an enemy’s port, they are fewer by far than those that will

be required to protect the scattered interests imperiled by an enemy’s escape.”<sup>6</sup> In Mahan’s time ships carried all of the international trade that took place between states separated by water. Cargoes might be liquid or bulk, but they were not containerized.

Since Mahan wrote, however, international trade has mushroomed. The value of U.S. imports and exports in 2002 was a thousand times what it was in 1900. Roughly 80 percent by volume of all international trade travels the sea lanes of the world, and some 90 percent of that portion is transported in cargo containers. Nearly nine million containers arrive annually in the 301 American ports of entry. Any form of WMD could be shipped in a container, and any use of such a weapon could be politically and economically catastrophic for the United States.<sup>7</sup>

Whereas a blockade is a “belligerent operation to prevent vessels and/or aircraft of all nations, enemy as well as neutral, from entering or exiting specified ports, airfields, or coastal areas belonging to, occupied by, or under the control of an enemy nation,” and the belligerent right of blockade is “intended to prevent vessels and aircraft, regardless of their cargo, from crossing an established and publicized cordon separating the enemy from international waters and/or airspace,” a belligerent right of visit and search “is designed to interdict the flow of contraband goods.”<sup>8</sup> In today’s context, contraband WMD can be shipped from states, nonstate entities, or individuals, or consigned to any of the three. The form of blockade operations, accordingly, has changed dramatically from close blockade through distant blockade and blockade zones, to prevention of movement of specific items at, or as close as possible to, their source.

The better to control the international movement of WMD, their associated delivery systems, and related materials, the United States announced a

Proliferation Security Initiative (PSI) in the spring of 2003, complementing the Container Security Initiative (CSI), which had been announced a year earlier. The PSI is indicative of the form the modern-day “belligerent right of visit and search” has taken. The context is one of global armed conflict against terrorists, sovereign states that would support them, and other WMD proliferators; the focus is on preventing the shipment of “contraband” WMD.

The PSI commits its over sixty participating states to:

- Undertake effective measures, either alone or in concert with other states, for interdicting the transfer or transport of WMD, their delivery systems, and related materials
- Adopt streamlined procedures for rapid exchange of relevant information
- Work to strengthen their relevant national legal authorities to accomplish these objectives and to strengthen international law and frameworks
- Not transport or assist in the transport of any cargoes of WMD, their delivery systems, or related materials to or from countries or groups of proliferation concern
- Board and search any suspect vessels flying their flags in their internal waters, territorial seas, or areas beyond the territorial seas of any other state
- Consent under the appropriate circumstances to the boarding and searching of their own flag vessels by other states and to the seizure of WMD-related cargoes
- Stop or search suspect vessels in their internal waters, territorial seas, or contiguous zones and enforce conditions on suspect vessels entering or leaving their ports, internal waters, or territorial seas
- Require suspect aircraft that are transiting their airspace to land for inspection and seize any such cargoes, and deny to these aircraft transit rights through their airspace
- Prevent their ports, airfields, or other facilities from being used as transshipment points for WMD-related cargo.<sup>9</sup>

The CSI has a narrower focus—containers that are being shipped to the United States—and the following elements: security criteria to identify high-risk containers; prescreening of containers before they arrive at U.S. ports; technology to prescreen high-risk containers; and “smart” secure containers. As of November 2004, the CSI had twenty participating countries, with some thirty-seven ports committed. These include the world’s twenty largest ports, accounting for almost two-thirds of containers shipped to the United States.

As can be seen, over time the *ways* maritime blockades have been accomplished and the *means* for conducting them have changed dramatically. The objective of maritime blockade operations has remained constant, however: to prevent the movement of particular ships and aircraft, or of particular cargoes in ships and aircraft, on or over specified waters of the world—excluding inland rivers and seas.

In view of the foregoing, this article takes a broad view of what constitutes a “blockade.” For our purposes “blockade operations” encompasses not only actions embraced by the traditional legal definition of “blockade” cited above but also all others having the same objective—to prevent the movement of ships or aircraft in maritime sea areas or in the skies above them, or of particular cargoes (including people) of the blockaded party. Clearly, this approach widens the scope of what constitutes a “blockade” beyond the strict legal sense. States have been rather inventive over the years in conducting blockade operations but calling them something else in order to evade the legal requirements of blockade law. Accordingly, this article rolls up what have been called quarantine operations, close or tactical and distant or strategic blockades, pacific blockades, exclusion zones, and maritime intercept operations as simply “blockade operations.”

In this sense, blockade operations encompass both the objective of the blockading force and the enforcement mechanisms it employs. In contrast, “embargoes” or “economic sanctions” refer only to objectives. According to one expert, for example,

Between 1993 and 1998 alone, the United States imposed sanctions 61 times—out of a total of 125 cases since World War I. Sanctions eventually targeted 75 countries and some 42 percent of the world’s population for reasons ranging from support for terrorism, proliferation of weapons of mass destruction or other sensitive technologies, to concerns over human rights and the environment and even the mislabeling of tuna.<sup>10</sup>

Moreover, “blockaded party” includes both states and nonstate entities, such as terrorist organizations. This takes on additional relevance in the wake of reports of the operation of merchant ships by the terrorist organization al-Qa’ida; such a vessel might have delivered the explosives used in the embassy bombings in Africa.<sup>11</sup>

Some additional elucidation of terms is necessary. The *effectiveness* of a blockade as used here refers to the degree to which it accomplishes its objectives. This is an operational sense of the term, as opposed to the legal usage, which harks back to the words in the Paris Declaration of 1856: “Blockades, in order to be binding, must be effective, that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy.” The idea of legal effectiveness,

adopted in order to delegitimize unenforced, or “paper,” blockades, was generally regarded to require the presence of at least one surface warship in or near the area that had been declared as blockaded. This is an “input” measure of effectiveness, established by a legal regimen, and its relationship is tenuous at best to the accomplishment of the blockade’s objectives, which is an “output,” or operational, measure.

### TECHNOLOGICAL REQUIREMENTS FOR MARITIME BLOCKADE OPERATIONS

Technology has historically played a key role on both sides of the question of maritime blockade operations. The imposer of the blockade requires special types of technology in order to make the blockade effective, and the target of the blockade has certain technological needs in any effort to breach the blockade. The right of visit and search requires its own separate category of technology.

In the future, then, technological requirements for maritime blockade operations will generally fall under four headings: ship propulsion; reconnaissance (finding) and surveillance (watching) techniques and devices; weapons with which to threaten or to attack ships and aircraft; and methods to inspect for and detect specific cargoes (contraband).

#### *Ship Propulsion*

Ship propulsion is an important category because of the effect it can have on the capability and the number of ships necessary to mount and sustain traditional blockade operations. When galleys were the primary form of warship blockade was rarely attempted, because of their short endurance and poor sea-keeping ability. The advent of much more seaworthy sailing ships meant that extended blockades could be undertaken; their effectiveness, however, was influenced significantly by the speed and direction of the wind. Prevailing westerly winds aided the English in their blockade of French Atlantic ports, for example; for the same reason, blockade of the eastern seaboard of the United States was difficult for sailing ships. Sailing ships could operate outside the range of shore batteries and still maintain surveillance of the blockaded port. For sailing ships the endurance limit tended to be not technological but human—victuals and the health of the crews. For example, in the age of sail far more British sailors died of disease on blockade station than were killed in battle.

When ships powered by fossil fuel (coal and then oil) appeared, the limiting logistic factor became the supply of fuel rather than the well-being of crews. Higher patrol speeds could be employed, and transit times from home port to blockade stations became shorter, but provision to refuel the steamships at or near their blockade stations had to be made. At first colliers and coaling stations

were used, and later—when oil was adopted, in the early twentieth century—refueling tankers were developed. Submarines were used in both world wars as blockading forces not only because they were stealthy but also because they had very long unrefueled range; they could remain on distant patrol station for many weeks without refueling. In World War II the German navy even deployed reprovisioning submarines, known to the Allies as “milchcows,” so that torpedo submarines could remain on patrol longer. Nuclear power for surface ships and submarines restored crew endurance rather than fuel as the limiting factor.

For hydrodynamic reasons, the speed of oceangoing ships has not changed appreciably in the past century. Prospects for significant increases in surface ship speed in the future are not rosy. The *effective* speed of ships, however, can be greatly enhanced by the embarkation of aircraft—either fixed-wing aircraft in the case of aircraft carriers or helicopters for many other types of ships. With embarked aircraft, ships can scout much greater areas and project their presence hundreds of miles from their actual positions.

### ***Reconnaissance and Surveillance***

Reconnaissance and surveillance are critical to the maintenance of effective blockades. At the same time, reconnaissance and surveillance have become both more important and in some ways more difficult: “The need to track thousands of civilian ships worldwide has intensified given the potential for seemingly harmless shipping to be involved in nuclear, chemical or biological terrorist operations. It was easier to track Soviet warships than a far larger number of civilian ships with unknown cargos and crew.”<sup>12</sup>

Once again, technology has played a key role. From the time of the ancient Greeks, who conducted the first maritime blockades in the fifth century BC, until the appearance of aircraft, reconnaissance and surveillance were limited by

#### **DISTANCE TO THE HORIZON**

Height in Feet	Nautical Miles
10	3.6
50	8.1
100	11.4
250	18.1
500	25.6
1,000	36.2
10,000	114.4
30,000	198.1
50,000	255.8
100,000	361.8

Source: Nathaniel Bowditch, *American Practical Navigator: An Epitome of Navigation*, HO Pub 9 (Washington, D.C.: U.S. Navy Hydrographic Office, 1958), table 8, p. 1254.

visibility and the curvature of the earth. Thus, even on a clear day one cannot see forever—only as far as the horizon (or to some object beyond it, like a mast or mountain, tall enough to extend above a line from the observer tangent to the horizon). The distance to the horizon depends on the height above the surface of the observer. The table illustrates the relationship.

Surface ships typically have a “height of eye” between fifty and one hundred feet, so their horizon distance is roughly ten miles. Low height of eye (especially for submarines), night, weather, and distance make reconnaissance and surveillance for blockading nonairborne forces difficult. The absence of wireless communications until the



early part of the twentieth century, moreover, meant that collaboration among ships on blockade station was also limited to the line of sight, and then only at the very low data rates provided by flag hoist and flashing light.

From the table it is evident that the way to expand the reconnaissance and surveillance horizon is to put a sensor aloft. High-frequency line-of-sight communications systems would experience a concurrent boost in their ranges as well. Not only did aircraft extend the horizon for detection and tracking, but their high speeds compared to ships allowed, as we have seen, significantly larger areas to be scouted, and more quickly. It was due to their height of eye, then, as well as their speed, that aircraft—especially ones that could be carried on ships—represented a major improvement in the ability to find, track, and report the movements of potential blockade runners. When ship- and air-borne radar became available during the Second World War, detection capability experienced a further major advance, since it mitigated the effects of darkness and weather; the human eyeball was supplemented with electronic imaging.

The ultimate reconnaissance and surveillance platform—a geostationary satellite that could stare at the planet below—is impractical, because of the altitude at which it would have to orbit, some 22,300 miles. Satellites in somewhat lower orbit use radar, electronic, or electro-optical sensors and can perform reconnaissance, but except for radar their surveillance capability is poor. Satellites in low earth orbits have their own limitations; for example, clouds and darkness limit photographic satellites that use the visual spectrum, while other reconnaissance techniques (passive electronic intercept and infrared) require detectable

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emanations by the target. Satellites with active radar are extremely expensive because of weight and power requirements; good capability for both recon-

naissance and surveillance requires large constellations—on the order of twenty-four to forty-eight satellites—compounding the expense. In this regard it has been asked, “Will any technology similarly [to nuclear weapons] transform war in the next 25 years? . . . Some have suggested that space technology, currently providing reconnaissance and communications support to military operations, is in the same relative position that aviation technology was in 1919. The high cost of producing and orbiting satellites may, however, prevent such a pervasive transformation.”<sup>13</sup>

A variety of new small and inexpensive (compared to satellites or manned reconnaissance aircraft) unmanned aerial vehicles (UAVs) is appearing. Some are lighter-than-air systems, either floating or steered-floater platforms; others are classified as high-altitude maneuvering systems. These new capabilities, in

various stages of development, are projected to have operating cycles of from two days to five years and cost from a thousand dollars per eight-hour flight to five million dollars in the case of a high-altitude airship with multiyear endurance.<sup>14</sup> Interest in such new technology is high within the United States. Interest abroad has been keen at least since 1996, when it was reported that “30 other countries also make UAVs of varying degrees of sophistication. . . . Given their special capabilities, UAV sensors can identify an object, when sensors on a satellite can only spot it. . . . Unlike stealth aircraft, UAVs are useless if not communicating.”<sup>15</sup>

### ***Weapons***

Weapons for enforcement of blockade operations have become virtually global in range and potentially unlimited in power. They range from sea mines, which are inexpensive and effective, to long-range stealth bombers with sophisticated air-to-ground weapons, at over a billion dollars apiece. Fixed-wing aircraft, of course, are incapable of visit and search, but with air-to-ground weapons they have the means to stop or turn around would-be blockade runners. Submarines likewise, while very deadly, as history has demonstrated, have severe limitations in terms of visit and search, and of providing for the safety of crews and passengers of attacked ships.

The effect of late-nineteenth-century weapons on blockade operations has been outlined in a seminal work on technology and naval warfare: “Torpedo boats could threaten fleet operations in confined waters along a coast. But the fleet adopted quick-firing guns as a defense, and with new high-freeboard battleships, it moved farther out to sea where it could operate effectively but torpedo boats could not. This is the period when the strategy of distant blockade began to replace the traditional close blockade.”<sup>16</sup>

The combination of naval mines, torpedo boats, and submarines doomed the close blockade and rendered blockades much more difficult to impose effectively. It increased the premium on over-the-horizon reconnaissance and surveillance, a problem that was intractable prior to the introduction of the aircraft.

Weapons for enforcement of blockade operations have to be employed only if a ship or aircraft attempts to breach the blockade. Weapons to *prevent* the imposition of a maritime blockade tend to be similar to those used for enforcement. Technologically, weapons for use in maritime environments have become longer in range, more stealthy (which makes them more difficult to counter), and more accurate. Air-to-surface weapons have achieved high precision owing to satellite guidance against fixed targets and to terminal homing against moving ones. Mines by and large are cost-effective weapons for use against ships and submarines. Submarines have proven very deadly in the enforcement of blockades—most recently in the Falklands War of 1982.

Using submarines for blockade running could be a future possibility, especially carrying teams of infiltrators with weapons of mass destruction. The limiting factor will be that states with submarines that might be used for such a purpose tend not to operate them competently. While about forty states in the world have submarines in their naval orders of battle, those of only a few routinely submerge or leave their territorial waters. Of course, that could change in the future, but it could not happen quickly or undetectably, without intelligence warning. Further, it is unlikely that a nonstate entity, such as a terrorist group, could acquire and competently operate a submarine.

### *Inspecting for and Detecting “Contraband”*

The fourth of the technologies arises from the need to do more, having detected and stopped a ship, than check its manifests and match them against the cargo. Fortunately, “Technology has enhanced the capabilities of naval forces to conduct reconnaissance and identification over wide areas of the ocean and to detect the presence of some contrabands that were previously undetectable.”<sup>17</sup>

Containerization can easily foil off-board detection, however, and WMD can be very small and difficult to detect. Detection equipment exists for all known weapons of mass destruction; the problems are those of intrusiveness and sheer volume. This is where the Proliferation Security Initiative and the Container Security Initiative supplement inspections at the destination port. They seek to ensure that no WMD or other materials that would assist terrorists are loaded into containers at their origin or added while the container is in transit. Technology is very much in an “assist mode” in this application; the first line of defense is to ensure that “contraband” is never placed in a container. The need to ensure that containers are not opened nor contents disturbed in any way makes seals and detection devices important. Significant technological efforts are under way in all these areas.<sup>18</sup>

*If this book seems completely reasonable and all my extrapolations convincing, I will not have succeeded in looking very far ahead; for the one fact about the future of which we can be certain is that it will be utterly fantastic.*

ARTHUR C. CLARKE

The U.S. Maritime Transportation Security Act requires, in a provision that became effective 1 July 2004, that all foreign ships entering American ports have international shipping security certifications as well as secured bridges and engine rooms.<sup>19</sup> The intent of the act, and of the CSI and PSI, is to ensure that no materials, such as weapons of mass destruction, can be shipped to underwrite acts of terrorism.

How blockade operations—to prevent the movement of ships, aircraft, and their specific cargoes—have been conducted and the means by which they have been conducted have changed significantly over time. Technology has been the handmaiden of change, and, especially recently, it has had to bear the burden of making blockades operationally effective. Blockade law has not evolved to meet the new demands placed upon it. International law, of course, is impotent to control international terrorist acts; in any case, the international movement of WMD would render moot any idea of “neutrals” whose rights need to be protected in the event of blockade operations.

As was clear even in the early 1990s, however, “over the history of naval and administrative blockade there has been a steady improvement in the technology of enforcement, but there has never been a blockade of a major state which was impermeable.”<sup>20</sup> Unfortunately, since one terrorist act with weapons of mass destruction could have cataclysmic effects, the success rate of blockades against them must be 100 percent. No blockade in history has been 100 percent effective in preventing “contraband” from entering a blockaded state or in completely suppressing blockade running. The odds favor the perpetrator in these cases. That is all the more reason why states must take all possible precautions and pursue as many approaches as possible to prevent such a calamity.

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#### NOTES

1. The epigraph is from *Profiles of the Future: An Inquiry into the Limits of the Possible*, rev. ed. (New York: Harper and Row, 1973), p. 17 [emphasis original].
2. British blockades of the French often sought to encourage the French battle line to come out and fight: “Nelson’s blockade of Toulon in the period 1803–5 provides examples of every imaginable ruse to induce the French to put to sea.” Colin S. Gray, *The Leverage of Sea Power: The Strategic Advantage of Navies in War* (New York: Free Press, 1992), p. 21.
3. Michael G. Fraunces, “The International Law of Blockade: New Guiding Principles in Contemporary State Practice,” *Yale Law Journal* 101 (1991–92), p. 902.
4. “Weapons of Mass Destruction—Weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people. Weapons of mass destruction can be high explosives or nuclear, biological, chemical, and radiological weapons but exclude the means of transporting the weapon where such means is a separable and divisible part of the weapon.” U.S. Defense Dept., *Dictionary of Military and Associated Terms*, Joint Publication 1-02 (Washington, D.C.: Joint Staff, 12 April 2001, as amended through 30 November 2004), pp. 573–74, available at [www.dtic.mil/doctrine/jel/new\\_pubs/jp1\\_02.pdf](http://www.dtic.mil/doctrine/jel/new_pubs/jp1_02.pdf).
5. *The National Security Strategy of the United States of America* (Washington, D.C.: White House, September 2002), available at [www.globalsecurity.org/military/library/policy/national/nss-020920.pdf](http://www.globalsecurity.org/military/library/policy/national/nss-020920.pdf).
6. U.S. Naval Institute *Proceedings* 12, no. 4 (1895), p. 856.
7. In October 2001 a suspected al-Qa’ida terrorist was apprehended at a port in southern Italy inside a container bound for Canada. He had provisions for a long journey, false documents, a bed, and a bucket for a toilet. Richard Owen and Daniel McGrory, “Business-Class

- Suspect Caught in Container," *London Times*, 25 October 2001.
8. U.S. Navy Dept., *Commander's Handbook on the Law of Naval Operations*, Naval Warfare Publication 1-14M (Washington, D.C.: Navy Staff, 1995), sec. 7-7.
  9. U.S. Bureau of Public Affairs, *Proliferation Security Initiative* (Washington, D.C.: U.S. Government Printing Office, September 15, 2003).
  10. Dimitri K. Simes, "What War Means," *National Interest* (Thanksgiving 2001), pp. 37-38.
  11. For al-Qa'ida, John Mintz, "15 Freighters Believed to Be Linked to Al Qaeda: U.S. Fears Terrorists at Sea; Tracking Ships Is Difficult," *Washington Post*, 31 December 2002, p. 1. For the embassy bombings, "On the Waterfront," CBSNews.com, 3 August 2003.
  12. Craig Covault, "Sea Recons Readied: NRO to Bolster Space-Based Ocean Surveillance to Track Suspicious Ships," *Aviation Week and Space Technology*, 1 December 2003.
  13. Thomas C. Hone and Norman Friedman, "Harnessing New Technologies," in *Transforming America's Military*, ed. Hans Binnendijk (Washington, D.C.: National Defense Univ. Press, 2002), p. 41.
  14. For a sampling see U.S. Joint Forces Command, "Joint Transformational Potential for High Altitude Long Loiter (HALL) Capabilities," Rapid Assessment Process (RAP) Report 04-02 (Norfolk, Va.: May 2004), p. 10.
  15. Martin C. Libicki, "Technology and Warfare," in *2015: Power and Progress*, ed. Patrick Cronin (Washington, D.C.: National War College, Institute for National Strategic Studies, July 1996), available at [www.ndu.edu/ndu/inss/books/2015/chap4.html](http://www.ndu.edu/ndu/inss/books/2015/chap4.html).
  16. Karl Lautenschlager, "Technology and the Evolution of Naval Warfare," *International Security* 8, no. 2 (Fall 1983), pp. 17-18.
  17. Paul D. Hugill, *The Continuing Utility of Naval Blockades in the Twenty-first Century* (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 1998), pp. 5-6.
  18. See, for example, Maarten van de Voort and Kevin A. O'Brien, "*Seacurity*": *Improving the Security of the Global Sea-Container Shipping System*, MR-1695-JRC (Santa Monica, Calif.: RAND, 2003).
  19. Epigraph from *Profiles of the Future*, p. xvii [emphasis original].
  20. Nicholas Tracy, *Attack on Maritime Trade* (Toronto: Univ. of Toronto Press, 1991), p. 238.