

II. AMERICA'S MARITIME SECURITY INTERESTS, THREATS AND CHALLENGES

America's greatest liquid assets are the oceans on either side of the continent.[13] The "liquid assets" adjacent to the some 95,000 miles of U.S. coastlines are enormous, encompassing five maritime and ocean areas – the Arctic Ocean, Bering Sea, the Pacific Ocean, the Gulf of Mexico and the Caribbean, and the Atlantic Ocean – and ranging from Arctic to tropical and equatorial climates.[14] America's maritime borders encompass almost 3.4 million square miles of territorial seas and exclusive economic zones, the largest in the world. More than 95 percent of the nation's trade tonnage – excluding that transported over land bridges with Canada and Mexico – is carried by ship (less than three percent of which travels in U.S.-flag vessels), with important ports along Atlantic, Gulf, and Pacific coastlines serving as America's gateways to the world. One-quarter of all domestic goods is shipped by water, and half of all oil consumed in the United States arrives by sea. Fragile living resources, with some fisheries in crisis from overexploitation and pollution, support a \$24 billion commercial industry and tens of thousands of jobs. Coastal tourism and marine recreation – which in 1997 generated \$71 billion to state and local economies, 85 percent of all U.S. tourism-related revenues – are the fastest-growing sector of the U.S. service industry and demand clean shorelines and marine environments.[15]



Courtesy of Don Leavitt

"Yet many people still consider the oceans as not only inexhaustible, but immune to human interference," Anne Platt McGinn noted in the *Worldwatch State of the World*, 1999 assessment. "In part," she continued,

the vast seascape is far removed from everyday life and therefore remains separate and disconnected from the more familiar landscape. Much of the ocean environment is relatively inaccessible to scientists, let alone the general public. Because scientists have only begun to piece together how ocean systems work, society has yet to appreciate – much less protect – the wealth of oceans in its entirety. Indeed, our current course of action is rapidly undermining this wealth. Overcoming ignorance and apathy is never

[13] From *A Cartoon History of United States Foreign Policy, 1776-1976*, quoted in Gregory Hartmann and Scott C. Truver, *Weapons that Wait*, 2nd edition (Annapolis, MD: Naval Institute Press, 1991).

[14] The appendix provides basic data on maritime areas of interest to the Coast Guard, generally, and particularly the Deepwater Project. The Great Lakes and inland waterways are likewise important regions for Coast Guard operations, and Deepwater fixed-wing aircraft and helicopter assets provide essential services for search and rescue, environmental protection, ice imagery for icebreaking, and control of smuggling on the Great Lakes. However, the Coast Guard does not routinely operate Deepwater cutter assets in the Great Lakes and virtually never in inland waterways. That said, the command-control-and-communications infrastructure that supports Deepwater operations also supports operations in coastal, Great Lakes, and inland operating areas, and Deepwater aircraft – fixed-wing and helicopter – assets are employed to meet non-Deepwater needs.

[15] Richard Danzig and William M. Daley, *Turning to the Sea: America's Ocean Future* (Washington, DC: September 1999), p. 12.

"America is surrounded by one of the largest, richest, and most diverse marine territories of any nation. From the Arctic Ocean bordering Alaska to the Atlantic, Caribbean, and Pacific oceans framing the mainland, Americans enjoy and prosper from an abundance of marine resources and activities, including productive fisheries, global trade, coastal recreation, mineral and energy production, and diverse marine ecosystems."

Our Ocean Future, May 1998

easy, but educating people about our collective dependence on healthy oceans will help build support for marine conservation. And that is just what the oceans need." [16]

At the dawn of the 21st century, the Coast Guard stands as the nation's sole military, multimission, maritime service that combines humanitarian, law enforcement, diplomatic, and military capabilities in a single organization focused on safeguarding and enhancing America's maritime safety and security. In all five core Coast Guard maritime security roles, the enduring tasks of providing a meaningful, credible presence; conducting surveillance; detecting, classifying, and identifying targets of interest; and intercepting and engaging those targets remain at the fulcrum of its operations to defend important U.S. maritime security interests: [17]



Courtesy of NOAA

- **Maritime Safety:** Saving lives and property at risk on the seas – search and rescue, response to maritime tragedies, ensuring seaworthy vessels
- **Maritime Mobility:** Providing a safe and efficient marine transportation system – ports, harbors, waterways, aids to navigation, domestic and international ice-breaking and patrol
- **Maritime Law Enforcement:** Upholding laws and treaties and defending maritime borders and sovereignty
- **Marine Environmental Protection:** Protecting living and non-living marine resources – fisheries and endangered marine species, and offshore mineral resources – and the control, response, and remediation of pollution incidents
- **National Defense:** Conducting military and defense operations in peacetime, smaller-scale contingencies, and major theater war

Meanwhile, the nation's maritime borders are under increasing siege from a broad spectrum of threats and challenges, most of which have a pronounced law-enforcement component – illegal alien migration, for example – and then transition to a national security problem. Indeed, U.S. national security and maritime security can no longer be defined solely in terms of direct military threats to America and its allies. The United States can expect no "peer competitor" to emerge until 2015, if not beyond. In such a geopolitical environment in which no single power holds the United States at risk of imminent attack and destruction, "national security" has come to embrace broad economic, social, environmental, political, cultural, and military factors, trends, and dynamics that are not readily apparent or obvious as Americans go about their daily lives. Indeed, a much more expansive construct has been articulated by the President's *National Security*

[16] Anne Platt McGinn, "Charting a New Course for Oceans," *State of the World 1999: A Worldwatch Institute Report on Progress Toward a Sustainable Society* (New York: W.W. Norton & Company, 1999), p. 79.

[17] For discussions of Canadian maritime security concerns, see: Rear Admiral Fred Crickard (Ret.), "Canada's Ocean and Maritime Security," *Marine Policy*, Vol. 19, No. 4 (1995), pp. 335-342; Crickard and Peter T. Haydon, *Why Canada Needs Maritime Forces* (Ontario: Napier Publishing for The Naval Officers' Association of Canada, 1994); Crickard, *et alia*, ed. *Multinational Naval Cooperation and Foreign Policy into the 21st Century* (Aldershot, England: Ashgate Publishing, Ltd, 1998); Ann L. Griffiths and Peter T. Haydon, *Maritime Forces in Global Security: Comparative Views of Maritime Strategy as We Approach the 21st Century* (Halifax, Nova Scotia: Center for Foreign Policy Studies, Dalhousie University, 1995); and Colin S. Gray, *Canadians in a Dangerous World* (Toronto: The Atlantic Council of Canada, 1994).

Strategy, which recognizes that diverse and numerous threats – regional or state-centered threats, transnational threats, the spread of dangerous technologies, foreign intelligence collection, and failed states – must be countered through an integrated approach to defend the nation, shape the international environment, respond to crises, and prepare for an uncertain future:

The goal of the national security strategy is to ensure the protection of our nation's fundamental and enduring needs: protect the lives and safety of Americans, maintain the sovereignty of the United States with its values, institutions and territory intact, and promote the prosperity and well-being of the nation and its people.... Our strategy is based on three national objectives: enhancing our security, bolstering our economic prosperity and promoting democracy abroad.[18]

Similarly, the Department of Transportation's *Strategic Plan 1997-2002* recognizes that "we must be prepared to face global markets, environmental challenges, transnational security threats, and a communications and information revolution." [19] Secretary of Transportation Rodney E. Slater, warning of "terrorist threats, the increasing dependence on high-technology transportation systems and communications networks, and increasing illegal immigrant transportation and smuggling," clearly echoed the concerns of numerous observers who have called out for scrutiny of and the ability to counter a broad spectrum of threats to U.S. maritime security.[20] The specific national security "Outcome Goals" identified by Secretary Slater, which (especially Goals 4 and 5) will shape the operational needs for all Coast Guard assets, are as follows:



- **Goal 1.** Reduce the vulnerability and consequences of intentional harm to the transportation system and its users.
- **Goal 2.** Ensure readiness and capability of all modes of commercial transportation to meet national security needs.
- **Goal 3.** Ensure transportation physical and information infrastructure and technology are adequate to facilitate military logistics during mobility, training exercises, and mobilization.

[18] *A National Security for a New Century*, *op.cit.*, p. 5. The May 1997 edition of the *National Security Strategy*, at p. 7, is much more expressive: "...the dangers we face are unprecedented in their complexity. Ethnic conflict and outlaw states threaten regional stability; terrorism, drugs, organized crime, and proliferation of weapons of mass destruction are global concerns that transcend national borders; and environmental damage and rapid population growth undermine economic prosperity and political stability in many countries."

[19] Rodney E. Slater, Secretary of Transportation, *U.S. Department of Transportation Strategic Plan 1997-2002* (Washington, D.C.: Department of Transportation, 30 September 1997), p. 1. See also pp. 33-35 for an expansion of DoT's national security strategic goal.

[20] See generally: *Coast Guard 2020*, *op.cit.*, pp. 4-5; Office of Naval Intelligence, *Worldwide Challenges 1997* (Washington, D.C.: Department of the Navy, March 1997); U.S. Navy Office of Naval Intelligence and U.S. Coast Guard Intelligence Coordination Center, *Threats and Challenges to Maritime Security 2020* (Washington, D.C.: U.S. Coast Guard, 1 March 1999); William S. Cohen, Secretary of Defense, *1998 Annual Report to the President and the Congress* (Washington, D.C.: GPO, 1998), pp. 2, 24-26; Cohen, *1999 Annual Report to the President and the Congress* (Washington, D.C.: GPO, 1999), pp. 1-3; *Critical Foundations: Protecting America's Infrastructures* (Washington, D.C.: GPO, October 1997), especially Chapter Three, "New Vulnerabilities, Shared Threats, Shared Responsibility," pp. 11-20; National Defense Panel, *Transforming Defense: National Security in the 21st Century* (Washington, D.C.: GPO, December 1997), pp. i-iii, 1-7, 11-22; Robert Mandel, *The Changing Face of National Security: A Conceptual Analysis* (Westport, CT: Greenwood Press, 1994); William J. Perry and Ashton B. Carter, "Preventative Defense," *Hoover Digest*, Number 4, 1999, pp. 84-92; and the annual Strategic Assessments prepared by the Institute for National Strategic Studies, National Defense University.

[21] *1999 Annual Report to the President and the Congress*, *op.cit.*, pp. 1-3.

Department of Transportation
National Security Strategic Goal

Advance the Nation's vital security interests in support of national strategies such as the National Security Strategy and National Drug Control Strategy by ensuring that the transportation system is secure and available for defense mobility and that our borders are safe from illegal intrusion.

U.S. Department of Transportation
Strategic Plan 1997-2002

- **Goal 4.** Maintain readiness of resources including operating forces and contingency resources owned, managed, or coordinated by DOT necessary to support the President's National Security Strategy and other security-related plans.
- **Goal 5.** Reduce flow of illegal drugs and of illegal aliens entering the United States.

Likewise, Secretary of Defense William S. Cohen explained in early 1999 that "the world remains a complex, dynamic, and dangerous place." While admitting that "there is great uncertainty about how the security environment will evolve," the Defense Secretary outlined six projected security challenges – large-scale, cross-border aggression; flow of potentially dangerous technologies; transnational dangers; threats to the U.S. homeland; failed states; and adversary use of asymmetric means – that will certainly affect the need for a full spectrum of maritime security and military capabilities, including the Coast Guard's contributions to protecting U.S. national security – not just military security – interests.[21]

Finally, the Phase I Report of the Hart-Rudman Commission, released in September 1999, outlined a future of crisis, terror, and conflict that will directly attack America in ways against which military superiority cannot entirely deter or protect.[22] The first of 14 prominent themes warned that "America will become increasingly vulnerable to hostile attack on our homeland, and our military superiority will not entirely protect us.

The United States will be both absolutely and relatively stronger than any other state or combination of states. Although a global competitor to the United States is unlikely to arise over the next 25 years, emerging powers – either singly or in coalition – will increasingly constrain U.S. options regionally and limit its strategic influence. As a result, we will remain limited in our ability to impose our will, and we will be vulnerable to an increasing range of threats against American forces and citizens overseas as well as at home. American influence will increasingly be both embraced and resented abroad, as U.S. cultural, economic, and political power persists and perhaps spreads. States, terrorists, and other disaffected groups will acquire weapons of mass destruction and mass disruption, and some will use them. Americans will likely die on American soil, possibly in large numbers.[23]



Courtesy of Don Wilson/Port of Seattle

[22] *New World Coming: American Security in the 21st Century, Major Themes and Implications* (Washington, D.C., The Commission, established by the Department of Defense as a result of congressional activism and language included in the Fiscal Year 1998 DoD Appropriations Act, was renamed The United States Commission on National Security/21st Century. See also, "Homeland Terrorism, More 'Kosovos' Ahead, Security Panel Warns," *Inside the Navy*, 9 August 1999, pp. 1, 12-13. The report is available at: http://www.nssg.gov/Reports/New_World_Coming/new-world-coming.htm.

[23] *Ibid.*, p. 4.

Other key themes identified by the Hart-Rudman Commission were as follows:

- Rapid advances in information and biotechnologies will create new vulnerabilities for U.S. security.
- New technologies will divide the world as well as draw it together.
- The national security of all advanced states will be increasingly affected by the vulnerabilities of the evolving global economic infrastructure.
- Energy will continue to have major strategic significance.
- All borders will be more porous; some will bend and some will break.
- The sovereignty of states will come under pressure, but will endure.
- Fragmentation or failure of states will occur, with destabilizing effects on neighboring states.
- Foreign crises will be replete with atrocities and the deliberate terrorizing of civilian populations.
- Space will become a critical and competitive military environment.
- The essence of war will not change.
- U.S. intelligence will face more challenging adversaries, and even excellent intelligence will not prevent all surprises.
- The United States will be called upon frequently to intervene militarily in a time of uncertain alliances and with the prospect of fewer forward-deployed forces.
- The emerging security environment in the next quarter century will require different military and other national capabilities.

It must be admitted that a good deal of uncertainty is involved in predicting the world situation next year, much less 20 years into the future, and assessing the implications of that future for U.S. maritime security interests and the Coast Guard. In 1988 for example, few pundits and futurists had the foresight – or *chutzpah!* – to predict that by the end of 1989 the Berlin Wall would be torn down and the Soviet Union would be in disarray. Several issues or events may have a great effect on America's maritime security in 2020, but the specific occurrences and implications cannot be predicted with any degree of accuracy. Regional conflicts, natural disasters, asymmetric warfare carried out by hostile states or non-state actors, and technological surprises are all examples of "wild cards" that will affect maritime security in 2020. Even with these uncertainties, however, certain trends shaping America's maritime security interests can be illuminated. Indeed, if past is prologue, U.S. national and maritime security will increasingly be challenged in diverse and sometimes surprising ways. As Secretary Cohen warned in mid-1999:

This is not hyperbole. It is reality. Indeed, past may be prologue. In 1995 the Japanese cult Aum Shinrikyo used Sarin gas in its attack on the Tokyo subway and also planned to unleash anthrax against U.S. forces in Japan. Those behind the 1993 World Trade Center bombing were also gathering the ingredients for a chemical weapon that could have killed thousands. In the past year, dozens of threats to use chemical or biological weapons in the United States have turned out to be hoaxes. Someday, one will be real.[24]

[24] William S. Cohen, "Preparing for a Grave New World," *The Washington Post*, 26 July 1999, p. 19.

Marine Environment

America's marine waters and their ecosystems are vital to the health, well-being, and economy of the Nation. Along with increased use of the oceans for recreation, fishing, minerals development, and transportation, the potential is growing for greater stresses on the marine environment to pose grave risk to U.S. interests.

As discussed in the following section, the natural resources of the marine environment include biologically and economically important marine life, energy resources, and minerals. Presidential Decision Directive-36 outlines the national policy "for providing stewardship of the marine resources under U.S. jurisdiction and for U.S. leadership in promoting international cooperation to care for the high seas." [25] The marine ecological system itself is perhaps the most important "resource," having great aesthetic as well as economic value. The marine coastal environment, which for the United States can extend to the full expanse of the Nation's 200-nautical mile EEZ, is among the most valuable and productive natural resources on Earth.

It is also the most threatened by man's activities – on the land as well as above, on, and under the water. Harland Cleveland, former U.S. Assistant Secretary of State and ambassador to NATO, warned that the "poor and the rich, we are cooperating to destroy – in different but mutually reinforcing ways – the environment we share." [26] There is growing concern about the damage to coastal fishing stocks by both local and long-distance fishing fleets, as well as threats of pollution from ships carrying hazardous materials and from offshore energy exploration and development. Waste and pollution loads have increased, vital habitats have been degraded or destroyed, and water quality has decreased. Chemicals and debris from all sources are presenting severe problems – acute and chronic toxicity that threatens the food chain (including humans) through uptake, while marine debris often harms or kills marine organisms, damages fishing gear, and reduces the appeal of recreational beaches. Coastal pollution can have a significant effect on marine travel and tourism, and can pose severe risk of contamination to shellfish and other living marine resources. As oceanographer Scott W. Nixon explained, with "little cause for celebration" despite increased awareness and scientific research:



Part of the problem will come directly as a result of population growth. With the occupancy of the planet expected to reach more than nine billion by 2050, there will be that many more mouths to feed, more fields to fertilize, more livestock to raise and more tons of waste to dispose of. Many experts predict that the release of

"The task of rescuing the seas is far from hopeless, given their amazing resilience. State and local efforts to restore the health of large estuaries like Long Island Sound and Chesapeake Bay are moving forward. Washington has begun to focus on the problem of agricultural runoff of poisonous wastes, and has embarked on an ambitious project to clean up the Mississippi River and help prevent the "dead zones" in the Gulf of Mexico. But none of these efforts confront the larger menace of overfishing. That is a global problem, on which Washington can and must take the lead."

The Troubled Seas
New York Times
13 September 1998

[25] PDD-36, 15 April 1995. The five principal objectives are: Promoting Sustainable Fisheries; Promoting the Conservation of Whales and Other Protected Species; Becoming a Party to the Law of the Sea Convention; Supporting Integrated Coastal Resource Management and Reducing Marine Pollution, and Supporting Critical Scientific Research. It continues by listing the priorities in these efforts to include: vessel construction and safety standards; promoting navigational standards; curbing the spread of aquatic nuisance species through ballast water; raising maritime personnel training and certification standards; promoting insurance requirements; and reducing air pollution from ships – all important priorities on which the Coast Guard will continue to focus.

[26] Cleveland, "The Global Commons," *The Futurist*, May-June 1993, pp. 9-13, at p. 9. See also, Linda Starke, ed., *Vital Signs 1998: The Environmental Trends that are Shaping Our Future* (New York: W.W. Norton & Company, 1998, Worldwatch Institute), for several essays that outline the nation's environmental challenges.

[27] Scott W. Nixon, "Enriching the Sea to Death," *Scientific American Presents The Oceans*, Fall 1998, pp. 48-53 at p. 53. In his analysis of the effects of eutrophication on near-shore oceanic regions, Nixon noted that the developing countries of Western Europe and the United States produce 100 times

nutritive nitrogen from fertilizer and fossil-fuel combustion will double in the next 25 years, most of that increase occurring in the developing world...

With large stretches of the coastline exposed to unprecedented levels of nitrogen, it seems inevitable that ocean waters around the world will become greener, browner and redder and that there will be more frequent periods when the bottom of the sea in vulnerable locations becomes lifeless.[27]

Coastal population growth *will* play an important role in the health of the marine environment through 2020 and beyond. Human activity degrades the environment through non-point-source pollution – pollutants originating from non-distinct sources – and the physical alteration of habitats. Already, 66 percent of the world's people live within 60 miles of the ocean, and, because of migration from inland areas to the prosperous coasts,

populations in coastal zones are increasing at a much faster rate than overall population. As much as 85 percent of the U.S. population lives near the coast, where population densities are five times the national average, and coastal populations are growing more rapidly than other populations: in the late 1990s, 17 of the 20 fastest growing states were located along the coast, and America's coastal population had been increasing by 3,600 people per day.[28] This continuous coastal growth poses a threat to the natural resources in the surrounding waters.



Courtesy of Don Leavitt

While the United States is likely to expend the necessary resources to combat degradation of the marine environment resulting from coastal population growth, most developing countries will not have the means to do so.

The degradation of the marine environment will remain a substantial concern. However, there will be a great disparity in the actual health of the seas from region to region around the world. Because of the high value that developed countries will place on preserving as pristine a marine environment as possible, they will continue the trend toward more regulation and stricter standards in shipping and environmental protection, and will devote the resources necessary to obtain their goal. The result will be healthier marine environments near most developed states by 2020. Conversely, the developing states will not have the means, even if they have the will, to enact effective measures to protect the seas adjacent to their countries. Waters abutting most developing states will, therefore, be more polluted in 2020 than today. Several factors will contribute in varying degrees to the degradation of the marine environment.

The monitoring of U.S. waters and high seas regions that are held in common with the world is necessary to ensure the well-being of their vast natural resources, and has implications for both conventional and customary international law.[29] Actions including the unauthorized or accidental discharge of oil and other petroleum products, hazardous

“...man's fingerprint is found everywhere in the oceans. Chemical contamination and litter can be observed from the poles to the tropics and from beaches to abyssal depths.... But conditions in the marine environment vary widely. The open sea is relatively clean.... In contrast to the open ocean, the margins of the sea are affected by man almost everywhere, and encroachment on coastal areas continues worldwide.... If unchecked, this trend will lead to global deterioration in the quality and productivity of the marine environment.”

The State of the Marine Environment
Group of Experts on the Scientific Aspects of Marine Pollution, 1990

the amount of nitrogen per square kilometer of land than much of Africa. In the fall 1999, the United Nations reported that the rate of population growth was slowing such that by 2050 world population will be approximately 8.9 billion. This is 500 million fewer people than the U.N. had predicted at the 1994 world population conference in Cairo. Still, the 20th century has experienced the fastest population growth in history, with the number of people quadrupling since 1900. “Population Growth Slows Worldwide, U.N. Report Says,” *The Washington Post*, 23 September 1999, p. A22.

[28] *Our Ocean Future: Themes and Issues Concerning the Nation's Stake in the Oceans* (Washington, D.C.: The H. John Heinz II Center for Science, Economics and the Environment, May 1998), pp. 11-16; *Coast Guard 2020, op.cit.*, p. 13; Richard D. Kohout, *et alia, Looking Out to 2020: Trends Relevant to the Coast Guard* (Alexandria, VA: Center for Naval Analyses, CIM499/February 1997), pp. 123-154; and “Threats and Challenges, 2020,” *op.cit.*, pp. III-43 - III-48.

[29] On the various law of the sea issues, particularly the exploitation of seabed resources, see National Intelligence Council, *Law of the Sea: End Game* (Washington, D.C.: National Technical Information Service, March 1996).

substances, or human waste can result in far-reaching effects to not only the local environment, but to the economic viability and personal health of maritime communities and regions. Likewise, the inadvertent introduction of alien marine species, transported in



ships' ballast water, as well as other foreign species, already pose severe threats to local U.S. ecosystems. Every minute, 40,000 gallons of foreign ballast water that may contain exotic species and pathogens are pumped into U.S. harbors, threatening to displace or eliminate native species and damaging important fisheries. More than 240 non-indigenous species are now found in San Francisco Bay, for example, while foreign viruses reduced U.S. aquaculture shrimp production by half in 1996 and

may cost the Great Lakes commercial and sport fisheries more than \$500 million by the year 2005. Current estimates indicate that control measures alone can cost communities more than \$6 billion each year to reduce problems caused by non-indigenous species.[30]

Maritime commercial activity will expand greatly during the next 20 years, resulting in larger amounts of petroleum and chemical products being transported by ship and produced in maritime regions. However, the adoption and enforcement of stricter safety standards will ensure that both the number of devastating incidents and the volume of contaminants spilled will decrease substantially. This trend is already evident in the United States, where the amount of oil and chemicals shipped through U.S. waters has steadily increased during the past 15 years, from 259.9 million gallons in 1982, to 307.8 million gallons in 1990, and to 333.1 million gallons in 1995. During same period, however, the amount of oil and chemicals spilled per million gallons shipped dropped dramatically, from 13.5 gallons to 5.96 gallons. Actions of developed states to effect a safer shipping industry will contribute to safer shipping in developing countries and therefore help reduce the threat of pollution from maritime accidents. Efforts such as the U.S. Port State Control program will grow, reducing if not eliminating loopholes exploited by shipping companies to save money through the use of flag states with lax shipping regulations and little ability to enforce the standards they do have. For these reasons, environmental damage caused by marine accidents should decrease worldwide over the next 20 years.

The number of significant spills from oil production and transportation in U.S. and nearby waters has been relatively low for some time.[31] But when a large-scale oil spill does occur, as in the 1989 *Exxon Valdez* accident in Alaska, the short-term effects can be devastating. In addition to the long-term destruction of habitat and local economies, the spill killed some 350,000 marine birds, 2,800 sea otters, 300 harbor seals, 250 bald eagles, and 22 killer whales. Ten years later, Exxon had spent \$113 million in Cordova, alone, including \$80 million for clean-up and \$26 million compensating the town of 2,500 people for lost income; added to this was the \$900 million settlement Exxon paid to the state and federal governments.[32] Another \$5 billion in punitive damages ordered by a U.S. District Court have been appealed. (Figure 2 illustrates the immense expanse of the *Exxon Valdez* oil spill, transposed off the U.S. east coast.)

Both the number of incidents and volume of hazardous waste materials intentionally dumped into the marine environment will likely decline in the years ahead, a result of stricter regulation of the shipping industry. Whether vessels wish to transport toxins,

[30] *Turning to the Sea: America's Ocean Future*, *op.cit.*, pp. 50-51.

[31] For example, on 28 June 1999, a tanker unloading oil at the Tosco refinery near Ferndale, Washington, north of Puget Sound, became untethered and spilled slightly more than 1,000 gallons of crude oil. The flow of oil was stopped immediately, but the spill touched land in two locations, posing a threat to wildlife.

[32] "Spill's Residue Still Sticks in Alaska's Craw," *The Washington Post*, 23 March 1999, pp. A3, A4.

dump nuclear or other industrial waste, or deballast tanks, doing so will remain explicitly prohibited without the possession of a permit. The likelihood of obtaining such permission, however, will decrease as restrictions tighten and are expanded to more types of chemicals and waste products. Consequently, the present declining trend in ocean dumping, in both volume and number of incidents, internationally and within waters under U.S. jurisdiction, is likely to continue. Detecting and apprehending ocean dumping violators will remain an enforcement challenge, however, as great incentive will exist to try to avoid legal but expensive disposal requirements.

With maritime trade expected to as much as triple by 2020, the threat of invasive species entering the United States through seaborne trade will increase significantly. Invasive species are ones intentionally or unintentionally introduced into an area outside of their natural ranges. Invasive species affect marine, estuarine, freshwater, and terrestrial ecosystems throughout the world and have strong economic and environmental consequences. Nearly every part of the United States faces at least one highly damaging invasive species. For example, in June 1999 colonies of “killer bees” were found at the port of Jacksonville,



Florida; officials were concerned that the Africanized honey bees had been brought in by ship and, if they spread, could threaten Florida’s \$20 million annual honey industry. Another example of the range and cost of damage from invasive species can be derived by examining the effects of the introduction of the zebra mussel into U.S. waters. These effects range from clogged municipal and industrial water intake pipes to the decline and

perhaps extinction of native mussel populations. The minimum cost to industries and municipalities to repair zebra mussel damage from 1993 through 2003 is estimated to be more than \$3 billion.

Thus, for waters under U.S. jurisdiction, the challenge will be to ensure the safety and seaworthiness of increasingly larger ships, many of which will not be able to berth at U.S. ports because of draft limitations. This will drive the need for farther-offshore lightering, vulnerable offshore facilities, and transshipment of hazardous materials through long and exposed pipelines, and, in the event of a large spill, enhanced Deepwater response and mediation capabilities.

Figure 2. Equivalent Area Covered by the EXXON VALDEZ Oil Spill



“As we approach the new millennium, it is more evident than ever before that the oceans are a common asset of humanity as a whole. The oceans are a privileged space for the strengthening of relationships between states: relationships forged on a spirit of cooperation, understanding and solidarity. With an economic approach prevailing in these days of harsh competition, the important capital that are the oceans represent to humanity is often overlooked, particularly their non-material aspects. This capital has no price, no replacement and no exchange value. We must preserve it for the benefit of present and future generations.”

Mario Soares
The Ocean Our Future
 Independent World Commission
 on the Oceans, 1998

Marine Resources

The demand for food, minerals, and energy from the oceans will continue to increase, especially as world populations continue to grow. Globally, critical fish stocks are under great pressure as overfishing and habitat destruction continue. Meanwhile, new technologies are permitting more remote exploration and development of minerals and petroleum resources in ever-greater depths and farther out to sea.

Fisheries

In the mid-1990s the United States had an annual commercial fish catch of nearly five million metric tons, 90 percent of which was harvested within 200 nautical miles of the coast – an industry worth some \$24 billion each year. The U.S. EEZ is estimated to hold some 20 percent of the world's fishery resources. About 110,000 commercial fishing vessels operate from U.S. ports; in addition, the fishing fleets of numerous countries ply the waters adjacent to – and sometimes venturing into – America's EEZ in search of protein. Moreover, saltwater sport fishing is popular in many states and contributes greatly to local economies. Nevertheless, these fishery resources, the ecosystems that support them, and the communities that depend on them are under increasing pressure from consumers who spend some \$46 billion each year on fish products.[33]

Marine species dominate U.S. commercial landings, with freshwater fish representing only a small portion of the total catch. Shellfish account for only one-sixth of the weight of the total catch but nearly one-half of the value. Alaskan pollock makes up about one-third of all landings by weight but only one-tenth of the catch by value. Menhaden, a species used in the manufacture of oil and fertilizer, accounts for nearly one-fifth of the tonnage landed but only about three percent of the value. The most valuable species caught are crabs, salmon, and shrimp, each representing about one-sixth of the total value. Other important species include lobsters, clams, flounders, scallops, Pacific cod, and oysters.

Alaska leads all states in both the volume and value of the catch; important species landed at Alaskan ports include salmon, king crab, halibut, and pollock. Other leading fishing states are Louisiana, Massachusetts, Texas, Maine, California, Florida, Hawaii, Washington, and Virginia. Measured by value of the catch in the mid-1990s, Dutch Harbor, Alaska, is the nation's leading fishing port, followed by New Bedford, Massachusetts. Other important U.S. fisheries include high-seas tuna landings in American Samoa and Guam.

The U.S. National Marine Fisheries Service (NMFS) has estimated that of the approximately 300 fish stocks that are economically valuable to the United States, 62 stocks in the U.S. EEZ are currently overfished or are at risk.[34] Another 28 highly migratory fish stocks with commercial value to the United States are also overfished. The overexploitation of these stocks represents hundreds of millions of dollars lost to the U.S. economy each year. For example, NMFS data provided to the President's Interagency Task



Courtesy of Don Wilson/Port of Seattle

[33] *Turning to the Sea: America's Ocean Future*, *op.cit.*, p. 16.

[34] Assistant Administrator for Fisheries, National Oceanographic and Atmospheric Administration, National Marine Fisheries Service, Briefing to the Interagency Task Force on the Roles and Missions of the Coast Guard, June 1999.

Force on the Roles and Missions of the Coast Guard in late spring 1999 indicated that if the New England groundfish fishery were operated at maximum economic yield (MEY), the industry would be worth more than \$500 million annually, not the \$50 million in 1998 resulting from severe overexploitation. Species such as the Gulf of Maine codfish are greatly overfished and would require draconian management efforts to avoid economic extinction and complete closure, as has been the fate of the Grand Banks cod stocks just to the northeast. The U.S. fishing fleet generally is overcapitalized; there are far too many boats trying to catch increasingly fewer fish. In addition to creating personal crises, financial hardships, and enforcement challenges, this situation has driven up demand for more imports of overseas-caught species.

Ongoing analysis indicates a trend of increasing U.S. imports of fishery products, at increasingly high cost, as U.S. fisheries remain stagnant or decline. "This increasing dependence on imports can be explained," another assessment concluded,

...by greater demand in the United States for fish and non-edible fishery products, a declining domestic fishing industry that is unable to catch sufficiently greater amounts of fish, the decreasing availability of domestic fishery stocks, and the inability of inland fisheries or aquaculture to compensate for the difference between available supply and increasing domestic demand.[35]

Similar trends are expected worldwide, according to the United Nations Food and Agriculture Organization (FAO).[36] World commercial fish catch has more than quadrupled since 1950 and was 93 million tons in 1996, down from the peak level of more than 100 million tons in 1989. Between 1970 and 1990, the world's fishing fleet grew twice as fast as the rate of the global catch, doubling in total tonnage and number of vessels. Harvesting is so intense that in some fisheries as much as 90 percent of the stock is removed each year. The FAO estimates that 70 percent of the world's marine fish stocks are fully fished, overfished, depleted, or recovering, and by the turn of the century no additional increases will be possible. (Table 1 presents data on world fisheries depletion; Figure 3 shows the projected demand for fish for human consumption.)

Table 1.
Depletion of World Fisheries
(Harvests in Thousands of Metric Tons)

Fishing Area	Year Maximum Harvest Reached	Maximum Harvest	Most Recent Harvest*	Percent Change In Catch*
Atlantic, NW	1967	2,588	1,007	- 61%
Antarctic	1971	189	28	- 85%
Atlantic, SE	1972	962	312	- 68%
Atlantic, W/Central	1974	181	162	- 11%
Atlantic, E/Central	1974	481	320	- 33%
Atlantic, NE	1976	5,745	4,575	- 20%
Pacific, NW	1987	6,950	5,661	- 19%
Pacific, NE	1988	2,556	2,337	- 9%
Atlantic, SW	1989	1,000	967	- 3%
Pacific, SW	1990	498	498	-
Pacific, SE	1990	508	459	- 10%
Mediterranean	1991	284	284	-
Indian Ocean, W	1991	822	822	-
Indian Ocean, E	1991	379	379	-
Pacific, W/Central	1991	833	833	-

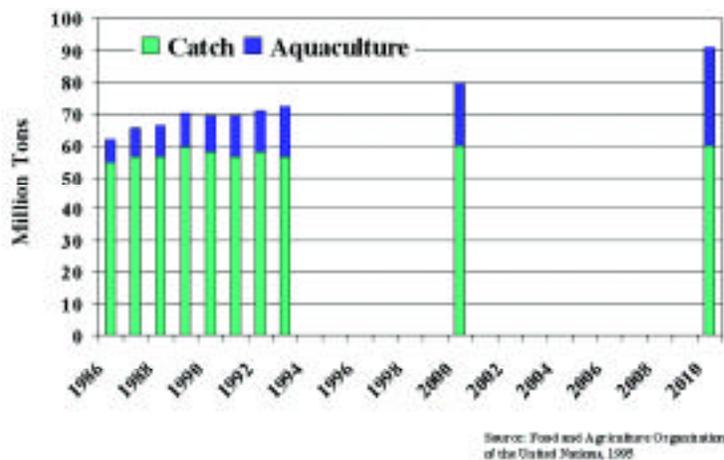
*Peak year to most recent harvest for which data are available, 1995-1997.

Sources: FAO Fisheries Department, *The State of World Fisheries and Aquaculture* (Rome: Food and Agriculture Organization, 1995), pp. 9-12; *Washington Post*, 25 July 1998, p. A17; and Carl Safina, "The World's Imperiled Fish," *Scientific American Presents The Oceans*, Fall 1998, p. 59.

[35] *Looking Out to 2020: Trends Relevant to the Coast Guard*, *op.cit.*, p. 75.

[36] "The Catch of Fishing," *Washington Post*, 25 July 1997, p. A17. See also, FAO Fisheries Department, *The State of World Fisheries and Aquaculture* (Rome: Food and Agriculture Organization of the United Nations, 1995); Michael Parfit, "Diminishing Returns: Exploiting the Ocean's Bounty," *National Geographic*, November 1995, pp. 2-37; Carl Safina, "The World's Imperiled Fish," *Scientific American Presents The Oceans*, Fall 1998, pp. 58-63; "Threats and Challenges 2020," *op.cit.*, pp. III-1 - III-6, and *Turning to the Sea: America's Ocean Future*, *op.cit.*, pp. 18-21.

Figure 3. Projected Demand to the Year 2010 of Fish for Human Consumption



Today, on the average, people receive about six percent of their total protein and 16 percent of their animal protein from fish. Nearly one billion people, primarily in Asia, rely on fish for at least 30 percent of their animal protein supply.[37] The FAO expects demand for edible fish products to increase from 80 million tons in 1998 to 91 million tons by 2010 (with 115 million tons anticipated in 2015) as world populations continue to increase, primarily in the developing countries, and commercial catches remain stable, at best, if not continue to decline. This demand can be satisfied only if aquaculture can be doubled from approximately 26 million tons in 1996 and overfishing is brought under control so that depleted stocks can recover. The FAO concludes that both are unlikely, and, if so, the result will be a further depletion of stocks, crisis, and even conflict among nations.

Indeed, “fish wars” over access to and protection of fisheries might ultimately engulf U.S. interests and demand a Coast Guard (if not a U.S. Navy) response, especially if world fishing fleets look to U.S.-managed fisheries as sources of protein and income. (See Figure 4, which shows areas of “prime conflict” over scarce fishery resources.) In the past four years, there were at least 13 incidents between fishing fleets and naval forces, at times with shots fired and people killed:[38]

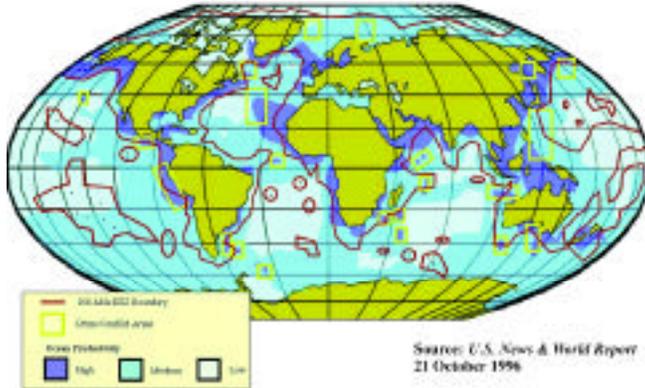
- March 1995: Canadian coastguard forces chase down and seize a Spanish trawler poaching in Canada’s Grand Banks fishery conservation/management zone
- November 1995: Malaysian naval vessel fires on a Thai trawler, killing the vessel’s captain and his son
- December 1995: Australian forces seize eight Indonesian fishing boats near Ashmore Reef
- Summer 1996: In the northeast Atlantic, Iceland authorizes the use of force to exclude Danish trawlers from disputed waters
- August 1996: Ireland arrests a Japanese tuna-boat captain
- August 1996: The Philippine navy arrests 91 Chinese fishermen

[37] Anne Platt McGinn, *op.cit.*, p. 80.

[38] Tim Zimmerman, “If World War III Comes, Blame Fish,” *U.S. News & World Report*, 21 October 1996, pp. 59-60. Also, “South Korea Claims to Sink North Korean Boat in Disputed Waters,” *The Washington Post*, 15 June 1999, pp. A21; and “U.S. Protests Seizure of Boat by Canada,” *The Washington Post*, 3 July 1999, p. A7. Bronwen Maddox, in his 30 August 1994 *Financial Times* article, “Fleets Fight in Over-Fished Waters: Fishing Disputes Have Risen up the Diplomatic Agenda,” catalogs 28 incidents of fishing disputes and clashes between August 1993 and August 1994.

- August 1996: Russian coastguard units fire on two small Japanese fishing craft near the disputed Kuril Island
- September 1996: Two Spanish fishermen are injured in Portuguese waters when a Portuguese naval patrol boat opens fire

Figure 4. Potential for "Fish Wars" Is Increasing



- October 1996: Vietnamese maritime authorities kill three Thai fisherman and detain two Thai trawlers accused of fishing in Vietnamese waters
- June 1998: Crew of a Russian border guard vessel kills two fishermen aboard Chinese high-seas driftnet vessel
- June 1999: South Korean naval vessels sink a North Korean torpedo boat and badly damage a second during a confrontation regarding jurisdiction over crab-rich waters of the Yellow Sea off the northwest coast of the Korean peninsula
- July 1999: Canadian coastguard forces seize an Alaska-based U.S. fishing boat for fishing in a disputed zone, prompting a State Department protest, demand for an explanation, and warning that "we plan to take appropriate action"
- August 1999: Russian factory trawler *Gixsar* is discovered fishing within U.S. EEZ off Aleutian Islands in the Bering Sea, near the U.S.-Russian maritime boundary line, and a Coast Guard law-enforcement boarding team is put aboard[39]

If these incidents and controversies grow as expected, there will be an increasing demand for Coast Guard services to help protect U.S. – and perhaps even regional or world fisheries – in support of United Nations or international management programs through effective enforcement of fishery regimes.[40] This is, to be sure, not a new problem, as Thomas Jefferson observed in his Message to the First Congress on 2 February 1791: "The rapid view of the [cod] fishery enables us to discern under what policy it has flourished or declined in the hands of other nations, and to mark the fact, that it is too poor a business to be left to itself, even with the nation the most advantageously situated." With the U.S. cod fishery severely depressed in the late 1990s, and other stocks under great pressure as

[39] This incident followed a series of uncooperative actions by Russian fishing vessels along U.S.-Russian maritime boundary line during the summer. A large, 15-person boarding team from USCG *Hamilton* (WHEC-715) was put aboard *Gixsar* because of intimidating actions from the Russian crew. Meanwhile, the Russian Federal Border Guard vessel *Antius* watched the incident from the Russian side of the maritime border, and its crew helped to translate *Hamilton's* warnings and requests to the fishing vessels, but otherwise took no other action. After 18 other Russian fishing vessels surrounded *Hamilton* and threatened to "shoulder" – i.e., run into the cutter at a glancing angle – and impede the seizure, Coast Guard District 17 decided to allow the Russian border patrol vessel to escort *Gixsar* to Russia. The Russians subsequently levied a fine on *Gixsar* for fishing violations. Simultaneously, the State Department urged the Russian government to take action against the other Russian fishing vessels that

well, the Coast Guard's responsibilities in the at-sea enforcement of living marine resources laws and regulations will continue to be great. As Vaughn C. Anthony, a scientist formerly with the U.S. National Marine Fisheries Service, exclaimed: "Any dumb fool knows there's no fish around." [41]



Courtesy of MarAd

Non-Living Marine Resources

Exploitation of non-living marine resources likely will increase decades to come.[42] The world increasingly will probe and exploit the oceans for energy and minerals to fuel economic growth. Furthermore, exploration, drilling, and mining operations will move farther offshore as new technology advances the ability to operate in deeper waters. More facilities and operations in deeper waters will create more maritime safety and security challenges.

Oil and Natural Gas Exploitation. Offshore oil and gas exploitation currently accounts for about 20 percent of all domestically produced oil and more than a quarter of the nation's domestic production of natural gas. (In all, as much as one-third of the world's petroleum reserves lie offshore, and will be increasingly exploited in the years ahead as resources on land are depleted or become too costly to exploit.) This activity is an important source of federal revenues, generating more than \$1.4 billion in bonuses, \$68 million in rents, and \$3.5 billion in royalties in 1997. It is an important employer, with some 38,000 workers offshore, and another 46,000 workers on-shore. Recent projections indicate that offshore production will increase as much as 100 percent in the Gulf of Mexico alone by the year 2010.[43] Still, about half of all petroleum consumed in the United States comes from overseas sources, a proportion that is likewise expected to increase in the decades ahead.

This increased offshore exploitation will be affected by two factors: continued government restriction and a push to deeper waters. A 1998 presidential directive under the Outer Continental Shelf Lands Act, which limits offshore oil and natural gas development to the Gulf Coast and parts of Alaska through 2012, will continue to stem industry growth in most of the U.S. EEZ. Oil and natural gas developments in water depths greater than 1,000 feet will become an increasingly important part of future production in the few areas where drilling is permitted. At the turn of the century, more than 4,000 platforms were operating in waters as deep as 3,900 feet, and some 30 drilling rigs were operating in waters more than 1,000 feet deep, one deeper than 7,700 feet.[44]

Thus no longer confined to near-shore areas, discoveries of oil and gas resources are increasingly far from shore, in waters as much as 10,000 feet deep, well beyond the U.S.

had acted so recklessly. Ironically, as the *Hamilton-Gissar* drama was unfolding, the Coast Guard was requested to respond to a search and rescue case involving six Russian boaters whose craft had become separated from their companions, a total of 37 people in 14 skiffs, during a crossing of the 65-nautical mile Bering Strait from St. Lawrence Island. "Coast Guard, Freighter Save 6 Mission Russian Boaters," *The Washington Post*, 9 August 1999, p. A4.

[40] In the aftermath of the June 1999 Korean fisheries crisis, two U.S. Navy Aegis guided missile cruisers – the USS *Vincennes* (CG-49) and *Mobile Bay* (CG-53) – were ordered to the Yellow Sea to help stabilize the situation. See, "2 Koreas' Navy Vessels Circle Cautiously; U.S. Sends Ships," *The New York Times*, 18 June 1999, p. A1.

[41] Safina, "The World's Imperiled Fish," *op.cit.*, p. 60.

[42] "Threats & Challenges 2020," *op.cit.*, pp. III-7 - III-18.

EEZ. In 1997, for example, the Ram-Powell and Mensa projects in the Gulf of Mexico came on-line in water depths of 3,200 and 5,300 feet, respectively. The MARS project in the Gulf illustrates the potential scale of future activity. Located 130 miles offshore, MARS is projected to produce 100,000 barrels of oil and 100 million cubic feet of natural gas daily, which will be pumped to the shore or an offshore gathering platform through a pipeline. The vulnerability of this system to sabotage should not be discounted, nor the environmental damage that an attack or accident might cause.

U.S. Department of Energy forecasts indicate U.S. offshore oil production will increase through 2006 and then decline to current levels through 2020. The projected initial increase is a result of deepwater activities and technological advances. By 2020, offshore production will be characterized by wells located in deeper waters and, as it is today, will be focused in the Gulf of Mexico. Increased production in the Gulf, however, will be offset by reduced production in Alaska, which is expected to decline at an average annual rate of 4.3 percent through 2020. The decrease in Alaska's oil production will be driven by the continued decline in production from Prudhoe Bay, the largest producing field, which historically has produced over 60 percent of Alaskan oil. Overall U.S. oil production is projected to decline at an average annual rate of 1.1 percent through 2020, while the demand for petroleum products in the United States is expected to grow by an average annual rate of 1.2 percent. The resulting gap between rising demand and declining production will be satisfied with an increase in foreign imports.



Courtesy of MarAd

Thus, another environmental concern is oil transport and transfer operations. Fears of large oil spills along fragile coastal areas, combined with increased imports by large tankers may raise pressure to force oil transfer operations offshore. However, the high cost of offshore oil transfer facilities will limit future progress. Projects such as the Louisiana Offshore Oil Port (LOOP) have been only marginally successful from a fiscal perspective, despite the environmental benefits the LOOP offers by being so far from shore. The port of Corpus Christi, Texas, attempted a similar venture on a slightly smaller scale, but after analysis revealed it would take 20 to 25 years to break even, the project was halted. Future prospects for offshore port development are considered unlikely.

America's use of natural gas will increase significantly within the next 20 years in order to meet an increased demand for electricity and to offset an expected continued reliance on nuclear power. Projections for natural gas production through 2020 indicate an average annual growth rate of 1.5 percent. Natural gas consumption, however, is expected to

[43] *Our Ocean Future, op.cit.*, pp. 20-21.

[44] *Turning to the Sea: America's Ocean Future, op.cit.*, pp. 24-25.

increase at a slightly higher rate, 1.6 percent per year. Like the oil industry, the difference between domestic demand and supply will be met with increased foreign imports. Net natural gas imports are expected to grow from 12.4 percent of total gas consumption in 1996 to 15.2 percent in 2020. Most of the imports will come from expanded pipeline growth between the United States and Canada. While most of the imports will come across land, some offshore imports are expected from locations such as Sable Island, Nova Scotia. Liquefied natural gas (LNG) will continue to be another source of energy, although less significant. Even so, LNG shipments will remain a maritime safety concern.

Ocean Minerals. The marine mineral industry will be substantially more robust in the next 20 years. Currently, the industry is active in exploration offshore, but production is limited to a few commodities such as sand and diamonds. In the short term, prohibitive costs and environmental concerns will hinder significant industry expansion beyond exploration. However, technological advances derived from deepwater oil exploration and production and, in some cases, increasing mineral prices may make marine mining ventures in several minerals profitable, including diamond mining – which in South Africa and Namibia has become more profitable than diamond mining on land. Technology developed in sophisticated marine diamond mining operations may be applied to mining for other minerals as well, decreasing development costs.

The most sought-after mineral commodities from the U.S. outer continental shelf during the next 20 years will continue to be sand and gravel, which are used primarily for beach restoration, coastal protection, and construction material. Through 2020, the demand for offshore sand and gravel likely will increase as land supplies begin to diminish and storms continue to erode beaches. Moreover, recovery operations will move farther offshore to avoid damaging coastal areas. There are immense sand and gravel reserves on the outer continental shelf, with estimates of more than one trillion cubic meters on the Atlantic shelf, alone. Already, six large sand-dredging projects are operating on the outer continental shelf along the Gulf and Atlantic coasts. In addition to sand and gravel, the oceans surrounding the United States contain a wide variety of mineral resources. These minerals are found on the continental shelf, in ocean basins, or dissolved in ocean waters. In the U.S. EEZ, potential mining prospects include:

- Phosphate beds from North Carolina to northern Florida
- Titanium-rich heavy mineral sands from New Jersey to Florida
- Gold-bearing sand and gravel deposits off the Alaskan shore
- Barite deposits off Southern California
- Manganese offshore along the Southern California and Georgia coasts
- Cobalt and platinum-rich seabeds in the Hawaiian EEZ

While mining of these marine minerals in U.S. waters is not currently active, they would almost certainly be exploited once price levels rise to the point where offshore operations become profitable.

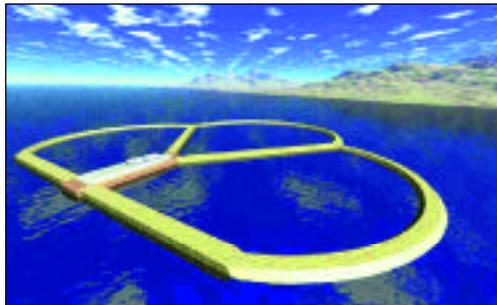
Ocean Energy. Harnessing ocean energy for commercial applications in the next 20 years likely will remain economically unfeasible for large-scale operations, but the potential for small-scale development does exist. Ocean energy does offer a significant source of energy supply, but unless other, currently cheaper sources of energy rapidly diminish, there is little incentive for any significant growth in the industry. Ocean Thermal Energy

Conversion (OTEC) is one energy conversion process with several applications.[45] These include:

- Generating electricity
- Desalinating water
- Supporting deep-water mariculture
- Providing air-conditioning and refrigeration
- Assisting mineral extraction

The Department of Energy's National Renewable Energy Laboratory in Golden, Colorado, sees the OTEC potential as enormous. The Lab has concluded that, on an average day, 23 million square miles of tropical seas absorb an amount of solar radiation equal in heat content to about 250 billion barrels of oil. Assuming no more than one-tenth of one percent of this stored energy could be converted into electric power, it would still supply more than 20 times the total amount of electricity consumed in the United States each day.

Two other types of energy conversion, tidal and wave power, involve the mechanical motion of the ocean to generate electricity. Specially designed turbines mounted in dams or on moorings can capture the energy manifested in elevated sea levels, high tidal amplitudes, and strong currents.[46]



Courtesy of Tidal Electric, Inc.

Marine Resource Concerns

The growth in marine natural resource exploitation, particularly in the far-offshore deep-water environment, will bring about new marine safety and security challenges in the years ahead. The year 2020 will likely see more oil and natural gas platforms in deeper waters, more pipelines offshore, increased ocean-based mining and dredging operations, and the possibility of ocean energy conversion facilities. Building, maintaining, and servicing these capital projects will greatly expand the amount of vessel traffic and human activity on the seas. While there will be strict regulation of these activities in U.S. waters, regulation alone will not guarantee the safety and security of life at sea nor the preservation of the environment. Substantial monitoring, enforcement, and response capabilities will be required.

There will be significant growth in U.S. offshore oil and natural gas platforms and pipelines. According to the U.S. Department of Energy, the number of oil and natural gas wells, both at sea and on land, is expected to increase by as much as 2.2 percent per year,

[45] OTEC is the process of converting solar radiation to electric power using the ocean's natural thermal gradient to drive a power-producing cycle. Warm seawater from the ocean's surface and the cold deep water below are pumped through a surface and the cold deep water below is pumped through a heat exchanger that employs a working fluid, such as ammonia, propane, or freon, in a closed cycle. The warm water vaporizes the working fluid, which turns a turbine, thus producing energy. In order for OTEC plants to work efficiently, the warm surface temperature must differ by about 20 degrees Celsius from the cold deep water. OTEC facilities can be built on land, submerged on the continental shelf, or designed to float on the surface. Although some projections show that OTEC plants could be competitive during the next 5-10 years in three particular markets, OTEC competitiveness is highly dependent on other energy source prices.

[46] One such concept, offered by Tidal Electric of West Simsbury, Connecticut, envisions an impoundment structure comprising a two-directional dam and conventional dam techniques. Projects are being planned for the United States (Alaska), the United Kingdom (Cornwall and Wales), and Mexico, at 10 megawatt to 500 megawatt power-generation capacity. For more information see: <http://tidalelectric.com>.

depending on oil price levels. The greatest growth of offshore platforms will occur on the outer continental shelf of the Gulf of Mexico where the innovative use of cost-saving technology and expected continuation of recent huge finds have encouraged greater interest.

The growth in these oil and gas infrastructure and operations will have major implications for maritime safety and security. Wells will be significantly more remote, increasing emergency response time. The operations may be technically more sophisticated and produce at much higher rates, increasing the scope of potential marine accidents, such as spills. Specific pipeline concerns include greater environmental risks associated with longer pipelines, as well as more complex oil-spill contingency plans required for larger pipelines.

The concomitant increase in people working offshore, particularly in the commercial energy sector, is another safety concern that figures in Coast Guard planning. More accidents at sea could occur as larger crews begin operating farther from shorelines and Coast Guard facilities. Several projections indicate that development in the Gulf of Mexico alone could create as many as 100,000 new jobs, with up to 70 percent of these sustained beyond 25 years. The response time in the event of an accident will increase as support structures and vessels begin operating farther from shore. The Minerals Management Service estimates that many of the new facilities will be beyond a two-hour helicopter flight.

In general, the safety and security concerns brought on by offshore oil and gas exploitation can be applied to other marine industries as well. While the future for marine mineral mining and ocean energy conversion is less certain, operations in any of these fields pose their own risks to the marine environment and place more lives at risk on the seas. New technologies and larger, more complex facilities associated with far-offshore activities could also create conflict with interests ashore. Projected resource development will place increased demands on coastal ports and communities for support facilities and services. And, with an increasing number of actors seeking to exploit ocean resources, conflicts among users could arise. In the late 1990s, moreover, numerous communities are opposed to offshore development because of environmental and land-use concerns. Finally, such development will almost certainly be opposed by environmental activist groups, who may protest ashore or at sea.

Marine Transportation and Waterborne Trade

Waterborne trade remains the lifeblood of the American economy, whose arteries carry raw materials and finished goods to and from every corner of the world. In 1997, more than 95 percent of U.S. foreign trade by tonnage – 1.1 billion metric tons valued at nearly \$626 billion – moved by ship, less than 3 percent of which was carried in vessels flying the American flag, a proportion expected to decline even as U.S. oceanborne trade increases in the years ahead.[47] U.S. oceanborne exports have increased 50 percent since 1990, a trend that is expected to continue into the next decade. Ironical for a country so tied to the sea and dependent upon sea power to protect national interests, the U.S. merchant marine is quite small, ranked only 15th in the world.



[47] *MARAD 98, 1998 Annual Report of the Maritime Administration* (Washington, D.C.: Department of Transportation, May 1999), pp. 44, 49.

Driven by global economic growth and flourishing international commerce, ocean-borne trade will at least double if not triple by 2020. Significant trade growth is expected between the United States and Asia during the next two decades. Nearly 75 percent of the world trade expansion during this period will come from emerging economies, especially those of the Pacific Rim and Asia. Several South American economies, particularly Brazil, and the Soviet successor states also will increase trade with the United States but not at the same level as Asia. Increased trade with these countries does not necessarily mean more ships, but rather larger ships carrying more cargo. Increased foreign trade also raises the potential for increases in smuggling of illegal goods hidden within legitimate cargo.

The most explosive growth will be in the container shipping industry, with the trend toward larger ships carrying more containers. The volume of cargo and size of ships will require U.S. ports to expand their infrastructure and deepen their channels to remain competitive. Smaller but faster container ships, travelling at speeds of up to 40 knots, will ply the coastal trade routes between U.S. ports. The movement of these relatively large vessels at such high speeds could create safety concerns in the coastal shipping lanes, particularly as recreational use will increase in addition to commercial traffic. Tanker traffic in U.S. waters will increase substantially by 2020 as U.S. oil imports rise. The increasing energy demand in the United States and decreasing domestic petroleum production will drive oil imports from half of U.S. domestic petroleum consumption in 1999 to some two-thirds in 2020. During this period, the number of cruise ships will likely double, and some of the newest cruise ships will be twice the size of cruise ships built in past few years. The Caribbean will remain the busiest region for these ships, but more routes to ever-remote areas such as Antarctica will open. High-speed ferries will be a burgeoning transportation business in 2020, with speeds expected to increase as ferry companies compete with other forms of transportation, such as commuter airlines. Ferry speeds may reach 80 or even 100 knots, posing significant safety challenges in busy coastal zones.

America's Marine Transportation System

Today, America's aging and fragmented marine transportation system (MTS) infrastructure is stressed and that stress continues to increase steadily, as Admiral James M. Loy, Coast Guard Commandant, and Clyde J. Hart, Jr., Administrator of the U.S. Maritime Administration (MarAd), outlined during a 13 May 1999 hearing on near- and far-term future MTS needs. In prepared testimony for the House Committee on Transportation and Infrastructure, Subcommittee on the Coast Guard and Maritime Transportation, Admiral Loy and Mr. Hart noted that "the challenge is clear.[48] Ports must be prepared to respond to the mounting pressures of growing trade, more noncommercial waterways users, the development of new means to harvest and preserve marine resources, and increasingly aggressive efforts by criminals and adversaries intent on doing societal harm. At the Federal level," Loy and Hart concluded, "we must include eliminating the gaps, overlaps, and stovepipes among government agencies. Government and the private sector must continue to work together if we want the very best MTS possible for the future."

The U.S. MTS is much more than the waterways and ports through which nearly all of America's foreign and one-quarter of its domestic trade moves every day. It is also the intermodal links to rail, truck, and pipeline services that support U.S. economic and military security. In particular, the marine infrastructure facilitates America's global outreach into overseas markets and the Nation's engagement in world affairs, including protection of

[48] U.S. Department of Transportation, Statement of Admiral James M. Loy, Commandant, United States Coast Guard, and Clyde J. Hart, Jr., Maritime Administrator, on The Future Needs of the U.S. Marine Transportation System, before the Subcommittee on Coast Guard and Maritime Transportation, Committee on Transportation and Infrastructure, U.S. House of Representatives, 13 May 1999. See also the Department of Transportation report to Congress, *An Assessment of the U.S. Marine Transportation System* (Washington, D.C., September 1999). The September 1999 MTS Assessment was relied upon for much of the data presented in this section.

U.S. national security interests. The MTS includes, as well, the national and international regulatory framework that governs trade and commerce. In short, it is the intricate and in some instances delicate web of relationships and systems that link the farmer in Iowa to customers in Russia, China, and other U.S. trading partners throughout the world.

In the late 1990s, there were 336 seaports and 3,726 marine terminals in the United States, 150 of which handled about 95 percent of all marine cargo tonnage. Linked by



Courtesy of American Waterways Operators

some 25,000 miles of federally and privately maintained navigation channels, they serve thousands of miles of rail, highways, and pipelines that criss-cross the nation. More than 90 percent of the U.S. population is served by domestic shipping, which moves nearly one-quarter of the nation's freight (by ton-mile) for less than two percent of the total freight bill.

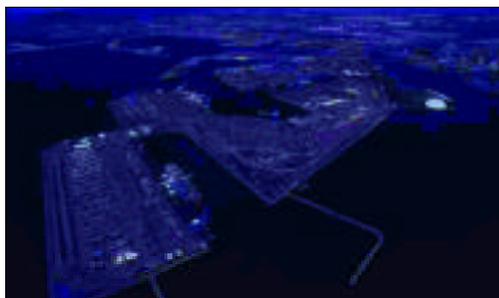
In peacetime, more than 95 percent of U.S. trade (measured by tonnage) is carried in ships, including the 3.3 billion barrels of oil that fuel the American economy – more than half of our annual consumption. And in war – as witnessed during the 1991-92 Persian Gulf war – some 95 percent of everything carried to and from conflict theaters will be moved by ships. At the height of the shipping movement in Operation Desert Shield, a “Steel Bridge” of ships linked U.S. ports with in-theater facilities in a continuous movement of “beans and bullets” needed to defeat Saddam Hussein's forces.

Overall, the national economic impact of the U.S. marine transportation system is enormous. According to the U.S. Maritime Administration, U.S. coastal and inland ports in 1996 generated 13.1 million jobs and personal income of \$494.2 billion, resulted in sales of \$1.5 trillion, contributed \$742.9 billion to the nation's Gross Domestic Product (GDP), and generated nearly \$200 billion in federal, state, and local taxes. Focusing just on the port industry, that sector of the U.S. economy was responsible for generating more than 1.4 million jobs and directly and indirectly responsible for some \$53 billion in personal income and more than \$140 billion in sales revenues each year during the late 1990s. More than \$20 billion in federal, state, and local tax revenues were generated. In 1996, the public port industry's capital expenditures amounted to \$1.3 billion, and generated some 45,600 jobs, \$1.7 billion in personal income, and \$3.9 billion in sales revenues. Looking at the users of America's ports, those business that make significant use of waterborne commerce and infrastructure for shipping or receiving goods, they accounted for 11.7 million jobs, \$439.8 billion in personal income, and sales approaching \$1.4 trillion.

U.S. waterborne trade in 1996 totalled 2,072 million metric tons (mmt), of which 998.5 mmt (48.2 percent) was in domestic commerce (Coastwise, 242.6 mmt; Lakewise, 104.2 mmt; Internal/Riverine, 564.3 mmt; Intraport, 80.7 mmt; and Intraterritorial, 6.7 mmt). U.S. oceanborne foreign trade comprised 1,073.5 mmt (51.8 percent), of which 664.6 mmt were imports and 408.9 mmt were exports. Compare that to 1960, in which total U.S. waterborne commerce was just 997.5 mmt, of which 30.8 percent comprised foreign trade and 69.2 percent U.S. domestic trade (226.5 mmt of which was on coastwise and river systems). In 1996, the Mississippi and Ohio rivers and the Gulf Intercoastal Waterway moved the bulk – nearly 611 mmt (76 percent) – of all inland and coastal waterway tonnage.[49]

The leading 50 U.S. coastal and inland ports handled 89.4 percent of the total waterborne trade in 1996. The top five – Port of South Louisiana (172.2 mmt), Houston (134.4 mmt), New York/New Jersey (119.4 mmt), New Orleans (76 mmt), and Baton Rouge (73.5 mmt) – accounted for about 28 percent. (Charleston, number 50, moved slightly more than 10 mmt that year.) Even with this high degree of concentration, there were 145 ports, or 40 percent of all U.S. ports handling waterborne commerce, that accounted for more than one million metric tons of cargo each in 1996.

In terms of movement of containerized cargoes, for 1996 the top 25 ports handled 98.3 percent of U.S. foreign container cargoes; the leading 10 ports accounted for about 80 percent, with the Los Angeles/Long Beach port complex accounting for nearly one-third of all containers. The top five container ports in 1997 were: Long Beach (2.7 million Twenty-foot Equivalent Units or TEUs), Los Angeles (2.1 million TEUs), New York/New Jersey (1.7 million TEUs), Charleston (955 thousand TEUs), and Seattle (843 thousand TEUs). Number 25 in 1997, Honolulu, accounted for about 37 thousand TEUs.



Courtesy of Port of Long Beach

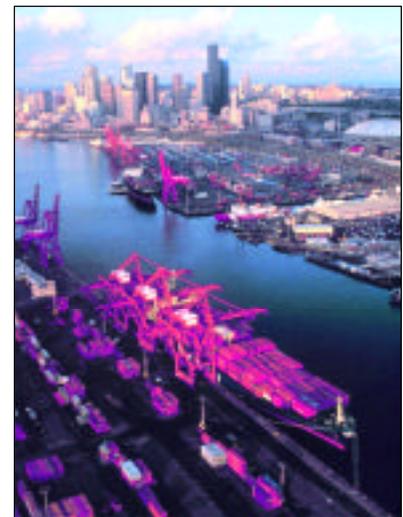
Commercial vessels make approximately 70,000 port calls in the United States each year. At the same time, Americans operate about 20 million recreational craft. With both commercial and recreational traffic and competition for access to U.S. waterways expected to increase dramatically in the years ahead, the potential for disaster and increased demand on Coast Guard maritime safety and search and rescue capabilities, from inland waters to the high seas, will grow as well.

Estimates for 1999 indicate that as much as three billion metric tons of cargo valued at more than one trillion dollars would transit U.S. waters and arrive in/leave from U.S. ports. In addition, some 78 million recreational users, 140 million passengers, and 110 thousand fishing vessels would compete for access to a fixed area of water space. Looking out a quarter century, the Coast Guard's 1998 strategic vision publication, *Coast Guard 2020*, identified key challenges facing America's MTS. Specifically focusing on "economic globalization," *CG 2020* forecast:

America will become more dependent upon international trade, the vast majority of which will be transported on the water. U.S. maritime trade will double, if not triple, by 2020. Trade with Asian-Pacific and Latin American countries will increase more than with other regions. Efficient maritime transportation will become more critical to America's economy and competitiveness. Global seaborne trade will bring larger numbers of ultra-large, deep-draft, and minimally crewed ships. America's inland and coastal commerce will experience increased barge and tow traffic. Higher volumes of oil, hazardous materials, and bulk commodities are likely. Just-in-time delivery of raw materials and finished goods will become the norm, magnifying the consequences of disruptions and emphasizing the importance of the marine transportation system's reliability. Furthermore, growing numbers of people will have the resources and leisure time to spend on cruises and recreational boating. Collectively, this congestion on America's waterways will create a greater need for a well-integrated intermodal transportation system with close links among the sea, land, and air components.

[49] Summary data for 1997 indicate that growth continues: U.S. waterborne foreign trade totalled 1.07 billion tons valued at \$625.7 billion. *MARAD 98, op.cit.*, p. 49.

In the coming decades, the United States will become even more dependent upon international seaborne trade, as well as the domestic ocean, intercoastal, and inland waterways commerce, to ensure economic well-being. U.S. oceanborne trade is expected to at least double – some projections show a tripling of America’s maritime commerce – by 2020. “Mega-ships” carrying 6,000-plus containers or more than 5,000 passengers and crew are already on computer “drawing boards,” as are high-speed ferries capable of 80 knots, if not more. Inland waterways systems anticipate similar growth trends; forecasts for the Upper Mississippi barge traffic, for example, show a more than 60 percent increase during the next 50 years.[50] Inland and coastal commerce will need to accommodate increased traffic and demands on aging infrastructure; more than half of all the locks and dams on the inland waterways will be more than 50 years old by the turn of the century. Similarly, U.S. recreational boating activities will continue to increase, by perhaps as much as five percent per year through 2020. In short, America is at a critical juncture with respect to its MTS future. There will continue to be an increasing demand on our ports and waterways. Unfortunately, there is no coordinated public and private sector plan in place to address the challenge. Collectively, the increased likelihood of congestion on and competition for America’s waterways will create growing demand for a well-integrated, intermodal transportation system with close links and cooperation among the sea, land, and air components. This is troubling, as the port infrastructure of the United States is being pushed to the limits of its capacity in the late 1990s, with major modernization decisions and investments looming on the horizon. National leadership is needed now to ensure our waterways keep pace with the shoreside infrastructure. In short, an efficient marine transportation system, linking ships, ports, transshipment points, and inland waterways will be crucial to the U.S. economy and international competitiveness in the decades to come.



Courtesy of MarAd

Container Shipping. The container shipping industry will undergo enormous growth through 2020, highlighted by larger ships carrying more cargo. Container ships are already growing in size, with the newest versions too large to enter most U.S. ports. These large container ships, sometimes referred to as “mega-ships,” are increasingly capable of carrying 4,500 TEUs or more and require channel depths of nearly 50 feet. Industry experts believe about one-third of the world’s container ship fleet will be 4,500 TEU capacity and larger within 15 years. The *Regina Maersk*, 1,043 feet long with a 6,000-TEU cargo capacity and 47.5-foot draft, is just one example of the mega-ships that will transit U.S. waters in the future. The push toward larger container ships is being driven by profit considerations; simply, more containers carried by a vessel decreases the cost per container. Mega-ships will primarily call at a few major load centers, which can handle the ship size and cargo volume. As a result, feeder ships transiting from the load centers to smaller ports will increase coastwise

[50] The total direct economic activity generated by the domestic trade is approximately \$10 billion per year, of which some \$4 billion results from wages paid to vessel crews and shoreside managers. The principal products moving in the domestic ocean trade are crude and refined petroleum, residual fuel, and coal, while containerized cargoes – including textiles, manufactured and household goods, and groceries move between the contiguous 48 states and Alaska, Hawaii, and Puerto Rico. In the inland waterways, the barge and towing industry is a vital element in America’s intermodal transportation system that moves more than 600 million tons of cargoes annually.

movements, which could also produce a concomitant increase in the number of ships engaged in *cabotage*, or coastwise trade, reserved for U.S.-flag ships under the 1920 Jones Act.

With the move toward extremely large container ships calling on a few major load centers, another possible development in the container industry will be the “Fast Ship” working between the load centers and feeder ports. In the “Fast Ship” scenario, smaller, 1,200-TEU container ships traveling at speeds of up to 40 knots rapidly move containers to the feeder ports. The movement of these relatively large vessels at such high speeds could create safety concerns in coastal shipping lanes.



Bulk and Break-Bulk Shipping. While the growth in containerized cargo will have the greatest impact on future U.S. shipping trends, bulk and break-bulk cargo will remain extremely important through 2020. Bulk cargo vessels carry large quantities of cargo, such as grain or iron ore, in large, unpartitioned cargo holds. Break-bulk cargo vessels carry their shipments in barrels, bags, pallets, or other units. Bulk and break-bulk cargoes make up half of all cargo (by volume) entering or leaving the United States, and will continue to account for a large portion in 2020. The outlook for bulk and break-bulk cargo vessels should be stable for the foreseeable future, and these services will remain critically important in U.S. maritime trade. Thus, because no major changes in this field are expected, the demands on port infrastructure, vessel safety, and law enforcement efforts, from this sector of the market, will remain relatively stable.

Tankers. Tanker traffic in U.S. waters will increase substantially by 2020 as U.S. oil imports rise. Increasing energy demand in the United States and decreasing domestic petroleum production will drive oil imports from about half of U.S. petroleum consumption in 1996 to two-thirds in 2020. The demand for increased oil imports will be met with more transits rather than growth in tanker size. Domestically, Alaskan oil production will decrease, while oil drilling in the Gulf of Mexico will move farther offshore. These trends will bring accompanying changes in tanker movement patterns. By 2020, more foreign tankers will be entering U.S. waters, especially the Gulf of Mexico. The Gulf will be the area of primary activity for two reasons. First, most of the U.S. oil refining capacity is in or near Gulf ports. Second, increased deepwater oil production in the Gulf likely will require tankers as well as pipelines to move oil ashore. On the West Coast, fewer U.S. tankers will be transiting from Alaska to refineries in Southern California, because of the drop in Alaskan oil production.

Liquefied natural gas imports into the United States will continue to grow through 2020, but will represent only a small portion of U.S. energy imports. Still, the volatile characteristics associated with LNG will present a significant safety concern during vessel transits. Two U.S. ports (Everett, Massachusetts and Lake Charles, Louisiana) likely will continue to import LNG through 2020. LNG imports into Everett and Lake Charles are projected to increase nine-fold, reaching a level of 360 billion cubic feet in 2020, compared to just 40 billion cubic feet in 1996.

Cruise Ships and Ferries. Tremendous growth in the cruise line industry and the emergence of high-speed ferries will be the key developments in the maritime passenger transport business through 2020. Both developments will pose challenges to maritime transportation in the United States.

The cruise line industry will exhibit strong growth throughout the next two decades. Since 1980, the average annual growth of the industry has been almost eight percent, and with the world fleet of 230 cruise ships operating at 90 percent capacity, there are no signs of this growth slowing. North America is the largest market, and surveys indicate that nearly 60 percent of Americans want to take cruises, although only 11 percent have done so through 1998. The number of cruise line passengers worldwide is projected to triple to 15 million by 2020.



Courtesy of Victoria Clipper

The cruise line industry will respond to this increasing demand with new ships and new markets. The number of cruise ships will likely double before 2020, and the industry already is building or has plans to build 44 ships. Many of these new ships will be larger as well, with Leviathans such as the 142,000-ton *Voyager of the Seas* coming on line by 2001. Industry specialists indicate that the overriding trend in the worldwide cruise industry will be the significant increase in global capacity as older ships are retired from the North American arena.

New cruise markets will emerge as these older vessels reposition to other areas. The Caribbean will remain the top destination of cruise ships, with approximately 60 percent of such traffic (a 1992 study found that half a million cruise passengers would likely visit Cuba in the first two years after the lifting of the U.S. economic embargo, followed by 1.2



Courtesy of Royal Caribbean International

million in the subsequent few years), but more routes will open to remote areas such as South Pacific islands, the Amazon, and Antarctica. The Coast Guard has already had to respond to a virtual explosion of small cruise ships plying ever-remote areas of Alaska's Inside Passage, venturing where the larger ships cannot go. About 50 small (between 50 feet and 200 feet in length) vessels carried some 200,000 passengers in 1999, at times getting into so much trouble that Coast Guard assistance and that of other nearby vessels were needed.[51] Some of the areas have not been surveyed since 1890, prompting a close liaison among the Coast Guard, the National Oceanic and Atmospheric Administration, and the Alaska Small Vessel Task Force. This trend toward ever-more remote destinations has significant implications for Coast Guard search and rescue opera-

[51] During the 1999 cruise season, four vessels got into extremis and needed assistance. "Safer Ships Urged, Panel Targets Small Vessels," Associated Press/*Anchorage Daily News*, 28 August 1999.

tions, including the increasingly likely need for emergency medical evacuations of stricken passengers and crew members from cruise ships far offshore.[52]

Another maritime transportation industry expected to grow significantly by 2020 is the high-speed ferry business. In certain world markets, high-speed ferries are already competitive with other forms of transportation, particularly commuter airlines. High-speed passenger ferries already have begun to ply U.S. waters and will increase in number and speed during the next two decades. With speeds perhaps exceeding 80 knots, such ferries will pose significant safety challenges as they encounter other maritime traffic. The challenge will be to maintain adequate separation between these high-speed ferries and other vessels, thereby reducing the risk of human error.

Nuclear Waste. The need to move and secure shipments of spent nuclear fuel and waste from reprocessing will increase. This trade is now predominately between the Far East and reprocessing facilities in Europe. Concerns about an environmental catastrophe and security of the nuclear waste may lead to increased demands for storage in or transit through U.S. hands, particularly from the Russian Far East. At the same time, increased numbers of plants will generate a growing surplus of spent fuels to be transported. Because of some states' environmental concerns, moreover, shipments may also be detoured away from optimum shipping routes into more dangerous areas, thus increasing the risk to the vessel, its cargo, and the environment.

Port Infrastructure. U.S. ports will continue to face intensifying pressure to expand to meet the growing volume of shipping and to combat the threat of foreign competition. The container industry, in particular, because of the increasing volume of cargo and the growing size of the ships themselves, will divide ports into two categories: load centers with deep harbors and world-class inland intermodal infrastructure, and feeder ports that cannot accommodate the new generation of ultra-large vessels.



Courtesy of MarAd

The more numerous feeder ports still will play an important role in maritime trade, even though they will not handle volumes of cargo nearly as large as those moved through the load centers. Unlike the load centers, feeder ports will be less affected by global developments in the shipping industry. These ports will strive to diversify into the bulk and break-bulk trades to avoid dependence on the container industry. However, lower profit margins in bulk and break-bulk, and competition from other transportation modes (railroads, pipelines and canals/waterways), may prevent ship owners and operators from driving expensive capital development the way they can in the containerized sector.

While U.S. ports will compete among themselves for positions as load centers, their greatest competition may very well come from foreign ports. Vancouver and Halifax, Canada, and Freeport, Bahamas, already compete with American ports for U.S.-bound container cargo, and by 2020 Mexican ports could challenge as well, if planned improvements to the Mexican transportation infrastructure are completed. Halifax, where the main channel is 60 feet deep, has captured ten percent of New York's midwest-bound traffic

[52] See, for example, "Getting Sick on the High Seas: A Question of Accountability," *The New York Times*, 31 October 1999, pp. 1, 34-35. Although focused on legal issues of accountability for poor health care, the article underscores what might become a new element of USCG SAR requirements – emergency MedEvacs.

annually since 1994. The deep harbor and intermodal infrastructure in Halifax make the port a strong competitor for eastern U.S. ports. The North American Free Trade Agreement (NAFTA) further enhanced the competitiveness of Halifax and other non-U.S. North American ports, expanding their access to U.S. markets. While more than 95 percent by weight of all cargo leaving or entering the United States currently passes through U.S. ports, the challenge from foreign ports, particularly for containerized cargo, could reduce that figure.

Challenges and Developments

With global maritime trade perhaps tripling by 2020, larger numbers of ultra-large, deep-draft, and minimally crewed ships – many carrying hazardous cargoes – plying U.S. waters and economic zones, and cruise ships capable of carrying 5,000 or more people heading for ever-more remote areas, there will be a critical need for effective vessel identification and tracking in all weather conditions, throughout the year. The potential for disastrous environmental harm and loss of life from even a single incident will continue to grow. Likewise, the need will increase for more effective prevention of and rapid response to accidents, including those in the Deepwater environment, as increasing globalization and ever-larger vessels affect U.S. commercial, environmental, recreational, and security interests farther out to sea.

The future also has potentially grave implications for U.S. military readiness, in addition to global economic competitiveness, as current Defense Department and Navy projections show that almost all of the equipment, ordnance, and supplies needed to support any sizeable projection of military power must move by sea.[53] During the 1990-1991 Gulf War, nearly 95 percent of all material, supplies, and equipment sent to the combat theater – and returned to the United States once peace was restored – was carried on ships. Efficient ports are critically important for U.S. military combat operations, as well as to respond to regional crises and humanitarian needs, in America's strategy of engagement to enhance security, bolster economic prosperity, and promote democracy.

The vulnerability of the maritime transport system to interruption, whether from natural and man-made disasters or direct attack, must not be underestimated. In the wake of recent bombings within the United States, the susceptibility of ships and key infrastructure elements to terrorist attack is a problem that begs for a multifaceted solution, as identified by the President's Commission on Critical Infrastructure Protection.[54] "The physical distribution infrastructure is critical to the national security, economic well being, global competitiveness, and quality of life in the U.S.," the Commission noted in its October 1997 *Critical Foundations* report. "It includes 1,900 seaports and 1,700 inland river terminals on 11,000 miles of inland waterways carrying grain, chemicals, petroleum products, and import and export goods.... Tomorrow – perhaps next year, perhaps in ten years – critical transportation systems could be vulnerable to such attacks and crippled unless action is taken now." Likewise, piracy remains an international scourge that costs the world economy millions of dollars in losses each year; while pirates are absent from U.S. waters, the Coast Guard can play a strong leadership role in working with other

[53] Admiral Jay Johnson, USN, Chief of Naval Operations, *Vision...Presence...Power: A Program Guide to the U.S. Navy* (Washington, D.C. Office of the Chief of Naval Operations, May 1998), p. 25, hereafter cited as VPP98; Secretary of Defense, *Report of the Quadrennial Defense Review* (Washington, D.C.: Department of Defense, May 1997), <http://www.dtic.mil/defense/defenselink/pubs/qdr/sect5.html>, pp. 7-8, where the results of the 1995 Mobility Requirements Study Bottom-Up Review Update were confirmed. Also, an unpublished history of the Military Sealift Command's operations during the Gulf War, "Desert Sealift: The Military Sealift Command in Desert Shield, Desert Storm, and Desert Sortie" (prepared for the Commander, MSC, by Dr. Scott C. Truver and Norman Polmar, TECHMATICS, March 1993), described the sometimes severe challenges and difficulties of moving defense cargoes, particularly ordnance and ammunition, and especially through commercial ports. In Desert Shield Phase I, for example, only one layberth was available in Savannah, Georgia, for loadout of MSC's Fast Sealift Ships.

[54] *Critical Foundations: Protecting America's Infrastructures*, *op.cit.* The vulnerabilities of the

countries' naval and maritime defense forces to defeat *piracy jure gentium* – a crime against all nations. Thus, the security of the sources of supply and the maritime routes and gateways through which America's imports and exports must pass will continue to be a key U.S. maritime interest. Failure to plan now for these challenges will reduce U.S. competitiveness and increase risks to safety, security, and the marine environment, a perspective driven home by Admiral Loy and MarAd Administrator Hart. "These challenges will continue to require both public and private sector efforts," the nation's marine transportation leaders told the Congress in May 1999.[55]

"These challenges" are exacerbated by competing interests and demands, which often have pitted one element of the MTS against another, as well as the fragmented responsibility for management, oversight, and promotion of the overall system – if, indeed, "system" is not an oxymoron. More than 20 federal agencies have responsibilities for elements of the U.S. MTS. Varied jurisdictions, overlapping responsibilities, and a lack of overall leadership for the development of a national maritime transportation system vision, plan, or policy characterize the situation today. But there is hope, if a series of regional "listening sessions" that culminated in the fall 1998 National MTS Conference bear fruit. For the first time, every element of the MTS community was brought together, which allowed all participants to air concerns and identify possible solutions.

The seven "listening sessions" that MarAd and the Coast Guard conducted at coastal and inland ports during the spring and summer of 1998 resulted in several key issues and imperatives. These included: the need to develop consensus on a vision for the MTS of 2020; inter-agency coordination at the national, regional, and local levels; and recommendations to improve safety, security, global competitiveness, infrastructure, and environmental protection of the marine transportation system. These issues and imperatives were the focus of the National MTS Conference held from 17-19 November 1998, at which 144 representatives from all areas of the MTS community participated. "Two overriding concerns cited were time and again," Admiral Loy and Administrator Hart acknowledged during their 1999 testimony: "the lack of a shared national vision for the MTS and the lack of leadership and coordination among government agencies."

At the outset of the conference, Secretary of Transportation Rodney Slater put great emphasis on the need for a clear and focused statement, noting that it "will enable us to move forward to create a marine transportation system for the 21st century – one that continues to be safe, secure, and environmentally sound." In the end, a consensus was crafted that balanced virtually everyone's interests in a compelling vision of the future MTS:

The U.S. Marine Transportation System will be the world's most technologically advanced, safe, secure, efficient, effective, accessible, globally competitive, dynamic, and environmentally responsible system for moving goods and people.

Operationalizing that goal has already begun, but will not be an easy proposition, as hundreds of millions of dollars, perhaps billions, will be needed to achieve a world-class MTS. Simply by raising the visibility of the MTS, especially in the Administration and the Congress, there is hope that this will encourage cooperation and sharing of information among all MTS players, and result in the needed resources to achieve the vision.

"Physical Distribution" network and the Coast Guard's role in transportation security are discussed at pp. A-11 – A-23. See also, *Turning to the Sea: America's Ocean Future*, *op.cit.*, pp. 32-33.

[55] Statement before the Subcommittee on Coast Guard and Maritime Transportation, *op.cit.*, 13 May 1999.

The Coast Guard and the Maritime Administration will remain key players in the current and future health of the U.S. MTS. They have bound together to help craft a vision for America's Marine Transportation System, much as President Eisenhower's vision of the 1950s' for an interstate highway system galvanized the nation into action. Working closely with all elements of America's MTS, the Coast Guard-MarAd team continues to seek a strategy, plan, and integrated programs that embrace the waterways, ports, and intermodal connections as a truly integrated, national system.

Maritime Sovereignty and Homeland Security

The basic requirement for the Coast Guard is to protect U.S. citizens and interests in inland waterways, territorial seas, and exclusive economic zones under U.S. jurisdiction, as well as to detect, deter, and defeat threats to U.S. sovereignty that might arise on the high seas. The marine areas under U.S. jurisdiction are enormous, covering 3.5 million square miles of ocean space. The spectrum of possible threats is likewise very broad, spanning economic, environmental, humanitarian, political, and military interests.

The salient factor in all of these, however, is that the Coast Guard – working with numerous local, regional, national and international agencies – must safeguard domestic security: Americans must feel secure within their own country. Indeed, as the National Defense Panel underscored in its 1997 report, “protecting the territory of the United States and its citizens from ‘all enemies both foreign and domestic’ is the principal task of government.” More to the concern of the Coast Guard, the National Defense Panel concluded that “coastal and border defense of the homeland is a challenge that again deserves serious thought.” [56]

An expansive concept of “homeland security” is now being explored and is directly related to the concept of maritime security. Former Under Secretary of Defense Fred C. Ikle warned that “Until recently, we have not greatly worried about direct attacks within the U.S. homeland – apart from the risk of nuclear war. The bombings of New York's World Trade Center and the Federal building in Oklahoma City in the United States to make evident that a few determined terrorists can cause enormous destruction almost anywhere in the United States.” [57] The Sarin gas attack in the Tokyo subway and the bombings of the U.S. embassies in Africa underscored the vulnerability to terrorists.



Courtesy of FEMA

[56] National Defense Panel, *Transforming Defense: National Security in the 21st Century*, op.cit., pp. 25ff. More than advocating only “serious thought,” the National Defense Panel, at pp. 26-27, stated that “The U.S. Coast Guard and the Department of Defense should work closely to ensure that new classes of cutters are outfitted with a combat systems suite that gives these ships a robust capability in support of homeland defense, including such missions as drug interdiction, immigration control, and anti-transnational crime operations.”

[57] Fred C. Ikle, “An Argument for Homeland Defense,” *The Washington Quarterly*, Spring 1998, p. 8.

[58] William Safire, “Team B vs. C.I.A.,” *The New York Times*, 20 July 1998, p. 17.

[59] Falkenrath, “Confronting Nuclear, Biological and Chemical Terrorism,” *Survival*, Autumn 1998, pp. 43-65, at p. 43. He concludes that intelligence is the first and most important line of defense and, at p. 65, that the “best action policy-makers can take...is to focus on the threat before it reaches emergency proportions, and to begin implementing a balanced program of preventive and preparedness measures.”

[60] Remarks of Deputy Secretary of Defense John J. Hamre, American Bar Association, National Security Panel Breakfast, 29 April 1999; <http://www.defenselink.mil/speeches/1999/s19990429-depsecdef.html>. More to the point of the Armed Services' roles in homeland defense, Hamre noted that

Moreover, the ease by which smugglers can clandestinely infiltrate U.S. maritime borders, bringing in drugs, illegal immigrants, and contraband goods, gives pause for grave concern. In some future crisis, or even in non-crisis situations when the United States would least expect it, terrorist cells could infiltrate America's ports and cities, armed with weapons of mass destruction – chemical, biological, or nuclear devices. Essayist William Safire posed a hypothetical problem for a future U.S. President in this way: "Saddam Hussein invades Saudi Arabia. You warn of Desert Storm II; he says he has a weapon of mass destruction on a ship near the U.S. and is ready to sacrifice Baghdad if you are ready to lose New York. Decide." [58] As Richard A. Falkenrath assessed the threat from nuclear, biological, and chemical terrorism:

All modern societies, however, are vulnerable to massive loss of life from an attack involving a weapon of mass destruction (WMD) – nuclear, biological or chemical (NBC). This vulnerability has existed for many years: it is a function of accessible weapons, porous borders, free and open societies, and high population densities in cities. Yet while national-security leaders have generally recognized the military threat posed by NBC weapons, they have tended to downplay or disregard the possibility that these weapons might be used by a non-state or transnational actor in a campaign of mass-destruction terrorism....

Something of a shift now appears under way, evident particularly in the United States since the early 1990s. Senior U.S. officials, congressional leaders and non-governmental experts now routinely call attention to the threat of WMD terrorism – particularly biological weapons – and rank it among the most serious challenges to U.S. security. [59]

That future may already be here. In late April 1999, then-Deputy Secretary of Defense John Hamre noted that

...during the last year, there have been over 100 alleged or implied terrorist incidents involving chemical or biological weapons in the United States. Most of them have been fraudulent... I think they're happening virtually once a week now in California. It is a sad reality that we had the first threat of anthrax attack a year and a half ago and that we have had over 100 in the last 12 months. At some point, one of them will be real. [60]

But these concerns are not limited to terrorist threats, although the Coast Guard is likely to be a critical "first-responder" to an attack in a crowded roadstead or harbor, and Coast Guard men and women must be trained and equipped to handle such a crucial task. [61] Other important U.S. interests – a clean marine environment, healthy fish stocks, protected species, safe offshore production and lightering facilities, and secure maritime transport – are also "targets" needing protection. In short, America's maritime security and

"But the government's fear of bioterrorism isn't completely unfounded. Even if we don't know much about the terrorists, there is a large and authoritative body of knowledge about the use and effects of biological agents – and it is scary. This technical data, much of it obtained prior to the cancellation of the U.S. offensive biological program in 1969, demonstrates that it's possible to place large populations at risk by releasing appropriately prepared pathogens into the air. Even relatively small quantities of biological agents can have catastrophic results: a panel of World Health Organization experts calculated that 50 kilograms of anthrax released over a city of half a million people would kill 95,000 and incapacitate another 125,000. Some experts believe that, pound for pound, biological weapons are potentially more lethal than thermonuclear warheads."

W. Seth Carus
Assessing the Bioterrorism Threat
New Republic, August 1999

there was no desire to change *Posse Comitatus*, which he saw as "an enormously important protection for the Department of Defense as well as for Americans." In his July 1999 "Grave New World" commentary, Secretary of Defense Cohen likewise noted that "our military response efforts will be grounded primarily in the National Guard and Reserve. In contrast to their more familiar role of reinforcing active-duty forces overseas, our Guard and Reserve are the forward-deployed forces here at home. Special National Guard teams are being positioned around the nation to advise and assist communities upon request.... The *Posse Comitatus* Act and the Defense Department's implementing policies are clear – the military is not to conduct domestic law enforcement without explicit statutory authority, and we strongly believe no changes should be made to *Posse Comitatus*." Both Secretary Cohen and Deputy Secretary Hamre seemed to ignore the Coast Guard's role in homeland security. Unlike the other four Armed Services, the Coast Guard is not constrained by *Posse Comitatus* and has strong and comprehensive law-enforcement mandates, responsibilities, and capabilities.

[61] In addition to carrying out emergency response, containment, and remediation efforts, the Coast Guard will almost certainly be a critical command-and-control element, linking together local, regional, and national assets. See "Readying Emergency Teams for Terrorist Attacks," *The New York Times*, 3 July 1999, p. A9.

interests can be challenged in numerous ways, as Secretary of Defense Cohen summarized in his 1999 *Annual Report to the President and the Congress*:

Transnational Dangers. The variety of actors that can affect U.S. security and the stability of the broader international community will continue to grow in number and capability. Increasingly capable and violent terrorists will continue to threaten the lives of American citizens and their institutions and will try to undermine U.S. policies and alliances. Over the next 15 years, terrorists will become even more sophisticated in their targeting, propaganda, and political action operations. State-sponsored terrorism will continue to provide support to a disparate mix of terrorist groups and movements. The illegal drug trade and international organized crime, including piracy and the illegal trade in weapons and strategic materials, will persist, undermining the legitimacy of friendly governments, disrupting key regions and sea lanes, and threatening the safety of U.S. citizens at home and abroad. Finally, environmental disasters, uncontrolled flows of migrants, and other human emergencies will sporadically destabilize regions of the world.

Threats to U.S. Homeland. The proliferation of advanced information and military technology increases the likelihood that a growing array of actors could attack the United States, using ballistic missiles, NBC weapons, or information warfare (which could include attacks on U.S. infrastructure through computer-based information networks). Together with the continued threat of illegal drugs, organized crime, and migrant flows, and the threat inherent in the remaining strategic nuclear arsenals of other countries, direct threats to the United States are significant, albeit dramatically smaller in scale than during the Cold War.[62]

It is, therefore, in America's strategic interest to engage these threats to the U.S. homeland as far away from the United States as possible. This has generated within the Coast Guard a novel strategic operational concept called simply "Pressing Out Our Borders." This envisages close planning liaison and operational teaming with the Navy, not unlike the "National Fleet" initiative championed by Admiral Johnson, the Chief of Naval Operations, and Admiral Loy, Coast Guard Commandant (see Appendix C and the "National Fleet" discussion in Chapter V). It calls for a "layered defense" comprising surveillance, detection, identification, sorting, and interception and engagement of threats in four areas of approach to the United States: overseas source departure zones, trans-oceanic route zones, U.S. coastal route zones, and U.S. port zones. In this way, threats that do materialize can be thwarted well before they can be in position to deliver an attack against America. As strategist Lawrence Freedman recognized,



If a conflict is close to home, there is a risk that its effects will be felt within Western societies. There are good reason to be way of situations that allow gangsters and drug-traffickers to flourish, prompt extremist to export violence or encourage local bullies and predators. Substantial population movements, collapsing local currencies, disrupted markets and sources of important commodities such as oil can all have substantial knock-on effects. Images of human distress on a massive scale and violations

[62] William S. Cohen, Secretary of Defense, *Annual Report to the President and the Congress*, 1999 (Washington, D.C.: Department of Defense, 1999), p. 2.

of human rights can prick Western consciences and discredit passivity. If non-military remedies such as diplomatic missions and economic sanctions are inadequate, the calculable losses of intervention can be outweighed by the less calculable damage resulting from non-intervention.[63]

Illegal Commerce

Just as the world's oceans are avenues for the nation's overseas commerce, they are also the highways for the import or export of illegal or untaxed commodities. Clearly, the smuggling of illegal drugs, aliens, the import of untaxed cargoes, and the export of unauthorized technologies will remain a major threat to the nation's security in the *next* 100 years of Coast Guard service, just as was the case during the first 200 years of its history. The permeability of international borders and the inability of governments to address effectively these transnational threats continue to lure both individuals and organizations looking for enormous profits. The sale of illicit drugs in the United States during 1993 alone was estimated at \$49 billion, while the trafficking of illegal immigrants throughout the world is likewise a multibillion dollar enterprise.

With more than a quarter-million visits by commercial ships to U.S. ports, movement of more than four million maritime shipping containers, and six million sea passengers embarking and debarking annually, the complexity of ownership, registration, and operation of commercial merchant vessels provides a deep thicket from which those intent on breaking laws can operate. These complexities impede the ability to establish quickly who controls the movements of a vessel and its cargo. A ship's true owner may be camouflaged through multiple layers that involve multinational corporations. The ship itself will more than likely be registered under a "flag of convenience" that does not represent a ship's true nationality. The use of separate corporations for chartering ships, a separate vessel mortgagee, and multinational crews all provide opportunities for exploitation and "cover" for movement of contraband. Forward-operating Coast Guard forces executing interdiction operations must increasingly be supported by timely and focused intelligence, as well as effective command, control, and communications systems if they are to unravel successfully these complex relationships as a critical part of executing their missions.

Nowhere is this more true than with regard to the Nation's "war on drugs." Drug trafficking will continue to plague the United States through 2020, driven by Americans' demand for illicit drugs. Traffickers in the future will rely increasingly on commercial transportation systems to move their products. They also will use successful noncommercial means, remaining flexible in altering methods in response to law enforcement tactics. It is a "cat-and-mouse" game with lethal consequences.

Control of the processing and sale of illicit drugs worldwide is a continuous challenge that has no short-term solutions. The U.S. General Accounting Office has estimated that law enforcement, corrections, and public health costs of the illegal drug problem total \$67 billion annually. Given that there will be a future illicit drug market, there also will be sources of supply and transportation methods to deliver drugs to market; the maritime trafficking of illegal drugs is expected to remain a global threat. While numerous studies

[63] Lawrence Freedman, *The Revolution in Strategic Affairs*, Adelphi Paper 318 (New York: Oxford University Press, 1998), p. 35.

have not attempted any specific conclusions concerning the scope of the U.S. drug market in 2020, they do suggest that:

- The number of chronic cocaine users will not significantly change. The number of chronic cocaine users has not significantly changed in seven years. Given that any program attempting to alter perceptions of drug use will require time to take effect, (reversing perceptions of tobacco use took 20 years, for example) the number of chronic users will not be significantly altered by 2020.
- Cocaine market demand will not significantly change. Given that chronic users account for three-quarters of the total cocaine market, the number of chronic users is unlikely to change significantly.
- The global use of illicit drugs may increase if social mores change significantly. Such changes could develop as a result of improved methods of drug ingestion, revived attempts to legalize controlled drugs, greater concern over personal freedoms, the lax enforcement of current drug laws, or a general global acceptance of drug abuse as an uncontrollable issue.

Worldwide illegal drug production is expected to continue to expand well into 2020. Illegal drug producers will be increasingly flexible in circumventing international enforcement efforts. They will be able to weather law enforcement attacks on specific drug production nodes and survive. This flexibility will be largely due to an increased use of technology to support highly mobile operations and to improve both operational security and production methods. Organized crime syndicates will provide effective business planning and will make use of their significant financial power to corrupt the authorities in a growing number of countries. Moreover, links between drug traffickers and rebel groups within source countries can pose significant threats to regional stability and peace.[64]



Courtesy of Corbb

During the past decade, illicit drug production has spread to places where law enforcement poses the least threat. That trend will continue. By 2020 major drug producing nations such as Afghanistan (heroin), Colombia (cocaine, heroin), and Mexico (marijuana, heroin, and synthetic drugs) will likely be competing with other countries to supply major U.S. and European markets. Countries most vulnerable to being overwhelmed by drug producers are those that have weak central governments, access to regional or global drug markets, and remote areas where illegal drugs can be cultivated without detection. These conditions exist in many Eurasian countries of the former Soviet bloc, as well as some developing African nations. With the drug trade's significant profit potential, several of these countries will likely fall into the ranks of those where drug production is already endemic.

Future producers will use technology at least as efficiently as today's narco-businessman. Tools such as portable computers, handheld satellite phones, and increasingly "miniaturized" equipment make highly mobile production facilities an easily attainable goal. Where mobility is not required, producers can use technology to reduce operating expenses. Large-scale *cannabis* growers use computer-controlled, warehouse-sized

[64] For example, the line between Colombia's thriving narcotics trade and the Marxist Revolutionary Armed Forces of Colombia (FARC), which earns tens of millions of dollars each year protecting illicit crops, has faded in recent years, prompting concerns about the stability of the Colombian government and sparking rumors about imminent U.S. military intervention. "Colombia Abuzz with Talk of Intervention," *The Washington Post*, 23 August 1999, p. 13.

hydroponics hot houses to grow thousands of plants in optimum growth conditions, decreasing labor costs and improving productivity and operational security. Other improvements in the technical process have increased plant yields in both coca leaves and marijuana. In Colombia, chemical process improvements have yielded higher purity heroin than that of rival producers in Mexico. In the future, technology may allow producers to increase plant yields, cheaply produce synthetic versions of organic drug components, or even mask indicators of drug use.

While technology may significantly improve raw production capabilities, organized crime will provide many producers the business acumen, political leverage, and funds with which to expand their enterprise effectively.

High-profit potential will continue to attract crime syndicates to the drug production business in 2020. For producers, the diversification these partners bring could provide ready-made distribution networks, money laundering services, and even venture capital, which could be used to purchase and incorporate new technology.

This union of complementary criminal enterprises inextricably links the drug trade to a host of other crimes such as smuggling (drugs, weapons, people) gambling, prostitution, and corruption.



Drug trafficking will continue to plague the global community well into the next century. Future traffickers will increasingly rely on commercial transportation systems to move their products. The relatively low cost of maritime bulk transshipment and good product security, as well as limited personal risk, will entice a number of future drug transporters away from traditional noncommercial maritime methods. Smugglers moving smaller loads by speedboat will have more capable platforms than vessels currently in use, and future amateur smugglers will be able to use traditional smuggling techniques with some degree of success. Speedboats or “go-fasts” will likely continue to improve beyond today’s impressive standards – capabilities to carry a metric ton of drugs at speeds of 35 knots or more. Future boats may triple the speed and cargo capacity of current platforms, while virtually “disappearing” from surveillance and tracking sensors through the use of a variety of low-observable technologies. Innovations such as super efficient engines or jet drives may significantly increase their operating range, and new computers may allow for the remote operation of high-speed delivery vehicles from an airplane or remote site.

Population Growth and Illegal Migration

World population apparently reached 6 billion on or about 12 October 1999, is expected to reach 8.9 billion by 2050, and more than 10 billion sometime after 2100, according to United Nations projections.[65] Although such growth will continue to fuel naturally occurring migration, the occurrence of sudden, uncontrolled migrations will grow as large numbers of people are affected by ethnic and sectarian strife. In addition, population growth stresses already limited resources for water, energy, basic health care, and education in the emerging nations of the world and influences the basic desire to improve one’s economic position. These levels of migration also place enormous economic and social burdens on targeted destination countries. Today, the speed and size of migrations have been directly impacted not only by improved means of transportation, but by the increased

[65] “6 Billion and Counting – but Slower,” *The Washington Post*, 12 October 1999, pp, A1, A16.

“Violence within states...could reach unprecedented levels. Generated by ethnic, tribal, and religious cleavages, and exacerbated by economic fragmentation and demographic shifts, such violence will form by far the most common type of conflict in the next century...”

While such conflicts need not disrupt the core strategic interests of major powers, they will do so if they trigger larger interstate conflicts, grossly violate internationally accepted norms, or create massive flows of refugees, disease, and environmental degradation. The latter is particularly likely since such conflicts often generate humanitarian disasters that are hard to ignore in an age of mass communications. Yet major powers cannot intervene for humanitarian purposes without also intervening in the underlying politics that create such troubles in the first place. The Somalias, Bosnias, Rwandas, Kosovos, and Haitis of the world will not disappear, and neither will the dilemmas they pose.”

*New World Coming:
American Security in the
21st Century*
15 September 1999

level of information now available nearly worldwide as a result of the information revolution. People will continue to seek better lives for themselves and their families and given an external impetus will move rapidly, as the Worldwatch Institute recognized in 1995:

A volatile cocktail of pressures has boiled over into wars, famine, and wrenching poverty to drive four million new refugees from their countries last year. These pressures also compel about 125 million people to live outside their countries of birth, and cause tens of millions to move from countryside to city inside their own countries every year – vast human migrations that have become a barometer of our changing, and sometimes declining, prospects for global security.[66]

Most – approaching 95 percent – of the world’s population growth during the next 20 years will be in developing countries. The relationship between population growth and its potential to disrupt the international security environment, however, is not simply a function of population increases. Instead, population growth becomes a security concern when the effects of such growth clash with standing economic resources and political institutions. The huge population increases in many developing countries will overburden their labor markets, public systems, and social services, creating unrest and incentives for migration.[67]



Fueled by tremendous population increases in developing countries and uneven global economic growth, international migration will be one of the most important factors affecting maritime security through 2020. This is particularly true for the United States, long a preferred destination for migrants the world over. While it is impossible to predict how many people from individual countries will attempt to migrate to the United States in the 2000-2020 time frame, the migration issue will be of great concern to U.S. national security. Furthermore, illegal migration via maritime means will be the most visible and problematic, and may generate the highest political levels of attention.[68]

Of concern is the potential for recurrences of mass migrations by sea similar to those from impoverished Caribbean nations that were experienced in the mid-1990s. During seven months of 1994 alone, nearly 60,000 Haitian and Cuban immigrants were interdicted while attempting to make their way to the United States by sea in overcrowded and poorly outfitted vessels. Ernest Preeg has estimated that there were about one million people of Haitian origin in the United States in the mid-1990s, and “hundreds of thousands if not millions more would quickly migrate to the United States if U.S. immigration laws and the U.S. Coast Guard permitted it.”[69] Only the dedicated efforts of Coast Guard

[66] Hal Kane, *The Hour of Departure: Forces that Create Refugees and Migrants*, Worldwatch Paper 125, Jane A. Peterson, ed. (Washington, D.C.: Worldwatch Institute June 1995), p. 1.

[67] For example, U.S. State Department officials in July 1999 worried that worsening economic conditions and political violence in Colombia would combine to create an immigration crisis and mass movements of people into the United States. In the first six months of the year, some 65,000 Colombians left the country, and officials projected that another 300,000 could leave in the next six months. But fewer than 15,000 Colombians each year are permitted to enter the United States as legal immigrants, according to the Immigration and Naturalization Service. “Colombians Fleeing Homeland: U.S. Officials Worry about Tide of Immigration Flowing North,” *The Washington Post*, 28 July 1999, p. A14.

A looming illegal immigration threat is also felt by Canada, among others. In a one-month period in the summer 1999, more than 250 illegal immigrants from China’s Fujian province landed on Canada’s Pacific shores, having made the crossing in two filthy, unmarked vessels run by smugglers. At the end of August, the Canadian Coast Guard was put on alert after military aircraft detected a third ship believed to be carrying illegal Chinese migrants to Canada. “Third Mystery Ship Headed Toward Canada,” United Press International, 30 August 1999.

[68] The unfortunate example of the “Miami Six” on 29 June 1999 illustrates the public-political potential of illegal migration incidents. It was, clearly, a situation that no one wanted – the drama of U.S. Coast Guard personnel using fire hoses (not “water cannons” as the media reported) and pepper spray to subdue six Cubans who were intent on making it to the United States and were intercepted just

men and women operating in the Caribbean approaches to the United States have prevented what could have been a loss of life on an unprecedented scale. Future Coast Guard forces, operating in the offshore approaches to our nation, must therefore be capable and suitably equipped to respond to this kind of transnational challenge.



The movement of people between countries is driven by the interaction of two forces: the negative reality of life at home (often because of political violence, social instability, economic problems, or a combination of these), and the perception that a better life exists elsewhere. International migration spurred by a decline of social welfare or internal political unrest has become more common over the past decades and will continue to drive the movement of many people. As a result, migration, the most natural economic response to population explosions and worsening living conditions in developing states, will remain a major challenge to global stability well into the 21st century.

The world of 2020 will see increasing disparities between the haves and the have-nots, not only between the rich and poor in a given country, but also between the developed and developing nations. Latin America, for example, has the highest income disparities in the world; in Brazil, the top fifth of the population has 32 times the income of the bottom fifth. This is only expected to worsen in the future. Income disparities between developed and developing nations are expected to widen as well. In 1995, the average annual income gap per person between developed and developing nations was approximately \$18,000. By 2020, that difference will increase to about \$30,000 (in 1995 dollars). These inequities in the global economy will be primary incentives for international migration toward developed nations such as the United States.

With emigration pressure from less developed countries expected to rise during the next 20 years, thousands of potential immigrants will be unable to gain legal admission to the United States because of quota-controls, travel costs, or other obstacles. For a variety of reasons, many of these migrants will attempt to enter the United States illegally, and, with more than 12,000 miles of continental U.S. maritime coastline, many of these attempts will be by maritime means. While some migrants will make these attempts on their own or en masse, others will receive assistance from family, friends, or paid smugglers to avoid detection and capture by border control forces.

short of their goal. The six Cubans were clearly illegal immigrants attempting to circumvent the nation's immigration laws. They may, as well, have been pawns in an organized smuggling ring. Their physical and mental conditions showed that they could not have been in the water for the several days it would have taken to row a 15-foot rowboat the 90 miles between Cuba and Key West, much less all the way to Miami. Following an intensive investigation of the event, the Coast Guard determined that the use of pepper spray was authorized by existing policy guidance but that in retrospect its use against people in the water could have had the unintended consequence of disabling a person. Likewise, although permitted, the use of a fire hose to keep the migrants' boat away from the Coast Guard patrol boat and to keep the migrants' boat from making shore was assessed as ineffective and unnecessary. The Service announced a thorough review of use of force policy guidance and direction. "Miami Cubans Are Outraged At Treatment Of 6 Refugees," *New York Times*, 1 July 1999, p. A12; "Refugee Incident Spawns a Tempest," *Washington Post*, 3 July 1999, p. A3; and "Inquiry Clears Crew in Clash with Rafters," *Miami Herald*, 11 August 1999, pp. 1ff. See also "Release of Migrant Interdiction Incident of 29 June 1999 Investigation, Admiral Loy's Statement," U.S. Coast Guard Headquarters, 11 August 1999.

The incidence of violence has been increasing, as the situations in migrants' home countries becomes more desperate. In late September 1999, a group of Cuban migrants used machetes and knives to attack Coast Guard authorities who intercepted their boat off Key Largo, prompting a renewed interest in use-of-force doctrine and tactics.

[69] Ernest H. Preeg, *The Haitian Dilemma: A Case Study in Demographics, Development, and U.S. Foreign Policy* (Washington, D.C.: The Center for Strategic & International Studies, 1996), p. 1.

The United States has weathered five maritime mass migrations in the last two decades, all from Cuba and Haiti. In the Cuban “boatlifts,” thousands of Cubans used any boat or raft they could obtain – even inflated inner tubes lashed together – to sail toward the United States. In the Haitian cases, thousands of people crowded onto dilapidated wooden sailboats to leave Haiti for the United States. The overwhelming demands of such large groups of people strained U.S. societal infrastructure and government resources so severely that the U.S. government now routinely monitors events that may spark other mass movements. The policies and actions of the United States, such as routine Coast Guard patrols north of Haiti and within the Mona Passage, direct repatriation of migrants, and the May 1995 Immigration Accords with Cuba have helped deter mass migrations. With these measures in place, the likelihood of future mass migrations has been reduced, though certainly not eliminated.



Interdicting illegal migrants at sea will continue to remain a serious challenge for the United States. From 1980 through 1998, about 290,000 illegal migrants were interdicted



at sea, and with rapidly expanding regional populations in the developing world, this number is likely to increase. The high cost of interdicting migrants at sea and repatriating them will continue to challenge U.S. Coast Guard and Navy forces. While interdiction costs remain high, intercepting U.S.-bound illegal migrants before they reach the border saves the government significant sums. Because migrants interdicted at sea are afforded less legal recourse than those caught

within the U.S. border, the government avoids the cost of providing basic human services and security as well as the expense of extended and costly appeals. Increased populations and migration trends will also place greater pressure on the ability of the planet’s inhabitants to feed themselves. Although the Malthusian principle – “The power of population is indefinitely greater than the power in the earth to produce subsistence for man” (“Essay on the Principle of Population,” 1798) – has proven to be “very simple, attractive and arresting, and completely inconsistent with modern society and economics,” according to Nicholas Eberstadt, a demographer at the American Enterprise Institute,[70] there is growing concern. The Worldwatch Institute, for example, points to “demographic fatigue” that has brought critical areas – water, food, fisheries, climate, cropland, forests, energy – to the brink of collapse.

Thus, the protection and conservation of the maritime food supply from illegal exploitation or contamination will play an even more critical role in the future. The

[70] “Will the World Be Too Crowded to Manage?” *The Washington Times*, 7 February 1999, pp. A1, A7, at A7.

[71] The U.N. Law of the Sea Convention, 1982, defines “piracy” in article 101 as any of the following acts:
 (a) any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or passengers of a private ship or a private aircraft, and directed:
 (i) on the high seas, against another ship or aircraft, or against persons or property on board such ship or aircraft;
 (ii) against a ship, aircraft, persons or property in a place outside the jurisdiction of any state;
 (b) any act of voluntary participation in the operations of a ship or of an aircraft with knowledge of facts making it a pirate ship or aircraft;

United States has also enacted laws that delineate responsibilities for monitoring fishing on the high seas. Enforcement of both U.S. EEZ and high seas fishery regimes requires the ability to monitor large ocean areas, to determine vessels engaged in prohibited fishing activities, and to intercept and engage those vessels.

Piracy and Organized Crime

Incidents of violent maritime crime – particularly piracy and maritime terrorism – may change in both nature and frequency as advanced technologies are used in attacks against ships and their cargoes. Consistent with contemporary experience, the vast majority of incidents will occur within port areas, at anchor or in coastal waters.

Piracy, in any of its many modern forms, along with terrorism and other types of maritime crimes, has flourished with the growth in global trade and exchange of commercial goods, financial instruments, and people. Today's pirate is a far cry from those of yesteryear, and most "piratical" acts are carried out within territorial seas, not high seas, which presents a problem of legal definition.[71] They are often well-equipped with heavy weapons, high-speed craft, and advanced communications. One pirate ship captured in Indonesian waters was outfitted with fraudulent immigration stamps, tools to forge ship documents, and sophisticated radar, communications, and satellite-tracking equipment. "We thought pirates belonged to history, but they are back and meaner than ever," remarked Yoshihiko Yamada, of the Nippon Foundation, a group that tracks piracy incidents.[72]

Not only have the numbers of these types of incidents increased worldwide – partly as a result of an improved worldwide reporting system – but they have become more lethal, with crews abandoned at sea in lifeboats or murdered outright. In March 1999, for example, the 5,600-ton freighter *Marine Master* was attacked off Thailand by 20 pirates in three fast boats. Shooting and wounding one crew member, the pirates set all 16 seaman adrift in small plastic life rafts; after six days drifting, they were rescued by fishermen. Pirates killed at least 67 seamen last year, all but one of them in Asia, and at least 40 are missing. Incidents of piracy tend to occur in four regional areas: Southeast Asia, Africa, South America, and Central America. Furthermore, most incidents of maritime crime occur in coastal waters, with nearly 80 percent of all reported "piracy" incidents occurring in territorial waters, and thus should more properly be called "sea robbery" rather than piracy *per se*. The majority of recent incidents have been focused primarily in Southeast Asia, astride major maritime chokepoints, where these sea-going criminals can easily observe potential prey. In 1998, one-third – 59 cases – of the 192 piracy incidents occurred in the Indonesian archipelago. But there have also been



Courtesy of Worldwide Maritime Security Information

(c) any act of inciting or of intentionally facilitating [piratical acts].

Acts of piracy can also be committed by a warship, government ship or government aircraft whose crew has mutinied and taken control of the ship or aircraft.

This definition is somewhat narrow, as *de jure* piracy can occur only on the high seas, i.e., areas beyond a state's territorial sea, including Exclusive Economic Zones. As such, the suppression of piracy *de jure gentium* is a responsibility of all states. However, as most "piratical" acts take place within EEZs or territorial seas, some coastal states may be highly sensitive of foreign states' naval or coastguard forces pursuing pirates into their EEZs (legally permissible) or territorial seas (impermissible without the permission of the coastal state). See Richard Hill, "Piracy and Related Matters," in Stephen Jermy, John Lippie, and Richard Hill, *Maritime Operations in Peace: Drug Interdiction, Disaster Relief, Suppression of Piracy*, International Studies Centre, University of Plymouth, Plymouth International Papers No. 10 (undated), pp. 33-37.

[72] "High-Tech Pirates Ravage Asian Seas," *The Washington Post*, 5 July 1999, p. A18.

"In the anti-piracy role, there is a need for some larger ships each with good endurance, sensors, communications and action information, having on board an elite corps ready to man at least two boarding boats, an armed helicopter and discriminating shipboard weapons; a larger number perhaps of smaller vessels with as many as possible of the above qualities but without, for example, a helicopter; fixed wing patrol aircraft with sufficient endurance, sensors and communications; and an operational command organisation with access to all available information and intelligence, the ability to talk to other government departments and access to allies if these are part of the particular anti-piracy scene."

Richard Hill
Piracy and Related Matters
Plymouth International Papers
Number 10
International Studies Centre
University of Plymouth, U.K., 1998

increases in incidents along both coasts of Africa and the coast of Brazil. Estimates of the total financial losses due to piracy worldwide have reached \$16 billion per year. The Nippon Foundation has estimated that pirates attack at least one ship every day and kill a seaman each week. Thus, the confidence that the high seas and important coastal trade routes are secure for commerce may increasingly be in doubt in this future, and should be a national security concern for the United States and its allies. The case of Japan is compelling. With nearly 100 percent of its domestic energy needs supplied by foreign oil, much of it transiting the Indonesian archipelago infested by pirates, its petroleum lifeline is at risk.

There is, moreover, a growing potential for catastrophic environmental disaster resulting from piratical depredation. The trend is for pirates to board ships while underway at slow speeds in constricted straits and waterways; to detain, set adrift, or murder the crews; and then leaving the ships underway with no one at the helm. The prospect of a fully laden crude oil tanker ramming other ships or running aground, with a significant discharge of its cargo, cannot be ignored.

Similarly, the potential for pirate groups to become politicized or hired out by politically motivated groups and engaging in terrorism must also be assessed. For example, in the Philippines, the Abu Sayaff Islamic terrorist group and the Moro National Liberation Front's "Lost Commandos" have engaged in maritime attacks to raise funds to carry out attacks against the government.

While the number of piracy incidents will most likely remain constant during the next 20 years, there will likely be an increase in incident reporting. It is widely accepted among the government and nongovernment organizations that track piracy worldwide – including the U.S. Office of Naval Intelligence (ONI), U.K. Defence Intelligence Service (DIS), Australian Defence Intelligence Organization (DIO) and the International Maritime Bureau (IMB) – that the annual number of piracy cases is seriously under-counted. DIS estimates the actual number of piracy cases could be 2,000 percent higher on an annual basis, while DIO assesses the under-reporting to be 20 to 70 percent. Since the establishment of the IMB's Regional Piracy Center in Malaysia in 1992 and its subsequent efforts to publicize the piracy problem, there has been increased reporting on major incidents, but incidents involving fishermen and recreational boaters are still heavily under-counted. Also, the average loss from a piracy incident does not cross the monetary threshold for insurance action, further contributing to under-reporting. Most incidents will continue to go unreported except in cases where there is serious loss of property and life or damage to a foreign interest. One reason for this is that a ship owner/operator stands to lose tens of thousands of dollars in revenue for each day that the vessel is idled for an investigation of a piracy case.

The concentration of piracy and "sea robbery" incidents will continue to be located in areas with little or no maritime law enforcement, political and economic instability, and a high volume of commercial activity. Of greater concern is the awareness that these incidents are now occurring within the once secure confines of harbors and anchorages. Crowded harbors and deeper-draft vessels now require ships to often anchor in areas distant from local marine security services. The criminal element is now exploiting various surveillance and enforcement weaknesses and conducting the maritime equivalent of the "smash and grab," striking and disappearing before security forces can respond.

Organized crime will increase in influence and scope during the next 20 years as organized criminal groups become increasingly entrenched in the international economy and as demand for and profits from the illicit transportation of people, drugs, and contraband multiply. If left unchecked, international criminal organizations will continue to expand their illegal activities in the 21st century. International criminal organizations will increase in number and influence as they become more adept at manipulating and chal-

lenging local and national governments and international organizations and consolidating their power bases. The expected growth of transnational criminal organizations will be exacerbated by advances in communications and transportation technologies; a decrease in governmental controls over the international flow of goods, services, and money; the establishment of international affiliations among immigrant communities; and the projected rates of unemployment in developing countries and in the Soviet successor countries and Eastern Europe. Relying on a myriad of international connections to provide them with both human and financial resources, by 2020 transnational criminal syndicates will be as problematic for global security as organized insurgent groups and terrorists. The problem of organized crime will become more compelling as these groups and even "rogue governments," some running entire regions as virtual "medieval feudal fiefdoms," gain access to more sophisticated technologies. As Dr. Kimberley Thachuk, Visiting Fellow at the Institute for National Strategic Studies, warned the Transnational Issues Conference in mid-October 1998:



...it has been the explosion in new technology that has significantly abetted the growth and proliferation of international organized crime groups and their capabilities. With access to modern communications and weapons technologies, these enterprises now have considerable coercive political and economic leverage. The use of electronic transfers, unfettered internet access and high tech communications equipment has permitted international criminal organizations to increasingly commit faceless crimes that while they erode the state, are difficult to attribute to particular perpetrators. This enables organized crime groups to run massive transnational economic empires moving their operations between states fluidly with less state-imposed constraints than ever before. Some organizations, such as certain Russian or Colombian groups, now constitute a "state within a state" or are equivalent to some of the smaller states.[73]

Future terrorist organizations will continue to use attacks on maritime targets as a means of furthering their political goals. From the 1961 hijacking of the Portuguese flagged passenger vessel *Santa Maria* to the numerous maritime attacks of the Sri Lankan Tamil Sea Tigers during the 1990s, widely publicized incidents of terrorism in the maritime environment have drawn immediate concern and action. Trends seen in terrorism during the late 1980s and 1990s will likely continue in the future. The number of terrorist incidents worldwide has decreased while the number of casualties inflicted has risen. The typical terrorist tactic of holding hostages has declined, due in part to the growing sophistication of counter-terrorist forces worldwide. Also, the number of terrorist groups espousing a leftist ideology such as Marxism and Socialism has decreased, with a subsequent rise in the number of groups based on nationalism, ethnicity and religion.

While terrorists would prefer to attack a target that is immobile and easy to survey, there will continue to be a small number of attacks in the maritime environment. For example, several Middle Eastern terrorist groups maintain a maritime attack capability through diver and underwater warfare training provided by Iran and Libya. Other groups with a cultural maritime heritage find it easier to develop a competent maritime attack capability. The Sri Lankan Tamil Sea Tigers and the Filipino Abu Sayyang Group are

[73] Dr. Kimberley Thachuk, "International Organized Crime and Drug Trafficking," paper presented at the Transnational Issues Conference, Institute for National Strategic Studies, National Defense University, Washington, D.C., 14-15 October 1998, p. 3.

examples of seafaring groups that have conducted multiple maritime terrorist attacks, as well as piracy acts for fundraising purposes. The concern for the future is that terrorists will shift emphasis and make the rapidly growing cruise line industry a new target of opportunity.

Similar actions, employed against U.S. defense sealift forces, introduce an asymmetric threat to America's security that could effectively neutralize the flow of troops and materials. The Nation must clearly address how it intends to protect not only this "steel bridge" during times of crisis, but also the routine protection of forward-deployed strategic assets such as the Maritime Prepositioning Ships (MPS) and Afloat Prepositioning Force (APF).

Asymmetric Threats

America's adversaries will be more likely to engage in asymmetric warfare such as terrorism, sabotage, information operations, and chemical or biological attacks – focused against weaknesses of strategy, doctrine, tactics, and technology – than direct military confrontation and attack. The proliferation of nuclear, chemical, and biological weapons will also remain a concern. Given that only a handful of countries will have the capability to project substantial naval power beyond their own geographic regions, and that the vast majority will remain unable to project power much beyond their own territorial waters, it is highly unlikely that any "peer" foreign naval power will emerge by 2020 that will be capable of challenging U.S. maritime superiority on a global basis. Rather, the vast majority of future maritime challenges will originate from individual states and stateless organizations. In order to defeat their adversaries, such countries and organizations will only be able to achieve success against modern Western maritime forces through the use of asymmetric warfare.

Asymmetric warfare concepts vary widely, and many types of warfare could be used asymmetrically. According to the National Defense University's Institute for National Strategic Studies, there are four broad asymmetric warfare options available to potential adversaries to combat foreseeable U.S. military superiority:[74]

- Acquiring weapons of mass destruction (WMD) and long-range ballistic or cruise missiles
- Acquiring high-technology sensors, communications, and weapon systems
- Exploiting cyberweapons to disrupt military logistics systems or the U.S. national strategic infrastructure
- Engaging the U.S. in environments that degrade U.S. ability to attack militarily significant targets. For example, choosing to fight in urban areas, or purposely blurring the distinctions between actions considered crimes and those viewed as warfare

In addition, small boat tactics, guerrilla warfare, terrorist activities, and the exploitation of media coverage of events are other possible asymmetric options. Regardless of the options employed, the asymmetric challenger, "unable or unwilling to confront U.S. military power directly, and in kind, will pursue asymmetrical advantages designed to negate the U.S. military's comparative advantages." [75] In this perspective, an adversary will subscribe to an overall strategy that links political and military objectives in a manner that thwarts any U.S. and allied hopes of a quick, "surgical" victory. He may even try to inflict a level of damage on U.S. forces and facilities that will weaken U.S. domestic

[74] Hans A. Binnendijk and David C. Gompert, eds., *Strategic Assessment 1998: Engaging Power for Peace* (Washington, D.C.: National Defense University Press, 1998), pp. 170-171. See also Hans Binnendijk and Richard Kugler, eds., *Strategic Assessment 1999: Priorities for a Turbulent World* (Washington, D.C.: National Defense University Press, 1999), particularly Chapter One.

[75] William Rosenau, Kemper Gay, and David Mussington, "Transnational Threats and U.S. National Security," *Low Intensity Conflict and Law Enforcement*, Vol. 6, 1997, p. 152.

political resolve for a protracted war, avoiding a direct confrontation with superior U.S. military power and instead concentrating on inflicting unacceptably high levels of damage and casualties by exploiting U.S. vulnerabilities.

The world's littorals will continue to present the most challenging environment for operations by maritime forces. In coastal areas, both long- and short-range, land-based systems, as well as maritime forces, ranging from those tied closely to the shore to those with open-ocean capabilities, can be brought to bear against U.S. maritime forces. Moreover, with the continually increasing range and accuracy of standoff weapons, those few states with any capability to do so will seek to deny the United States the sea area necessary to conduct long-range strike operations, while the rest will seek at least to oppose those U.S. forces that must operate closer to shore.



Future conventional maritime weaponry that could present severe challenges in the littoral include naval mines, aircraft, antiship and land-attack cruise missiles, patrol combatants and larger naval surface combatants, advanced diesel/air-independent/nuclear submarines, special operations forces, small craft, coastal artillery, and ballistic missiles (including terminally guided weapons). Other nonconventional weapons, including biological and chemical weapons, could also be encountered. Many military operations in times of tension short of war – during sanctions enforcement, noncombatant evacuations or shipping escort operations, for example – could take place very near the bases and routine operating areas of potentially hostile foreign forces, allowing our adversaries to attack with little warning at a time and place of their choosing, and in waters well known to them.[76]

Control of the littoral battlespace of the future will be won by those forces that best combine surveillance, strike, and support capabilities. In many countries, improvement in littoral surveillance capabilities will be driven by a need to patrol exclusive economic zones and enforce sovereignty in them. In a few cases, an additional imperative will exist to monitor and target hostile forces approaching or operating within standoff weapon range of the country's coast. Surveillance and targeting technology is becoming more complex and capable, with space surveillance systems expected gradually to assume a more important role in reconnaissance and target cueing.

With the growing availability of vital information in electronic form, accessible through the Internet or private computer networks, the future security threat to information and technology infrastructures will increase dramatically. Despite efforts to construct "firewalls" and secure networks, critical military and economic data will be more vulnerable to attacks by individual "hackers" and organized, focused sabotage operations. Key functions of maritime operations, such as navigation, communications, and maritime surveillance, have always had a significant information component. The obvious dependence of maritime security and law enforcement on information makes the information itself a

[76] One critically important area of the not-so-distant future that demands innovation, far-sightedness, investment, and the willingness to reject the overwhelming tendency toward "business as usual" is the need to counter the rapidly escalating threat of land-attack cruise missiles to U.S. forces overseas and to the U.S. homeland. Whether armed with conventional high-explosive warheads, special devices intended to defeat electrical/electronic grids, or Weapons of Mass Destruction (WMD – nuclear, biological, or chemical weapons), cruise missiles offer U.S. adversaries the ability to attack directly our will to fight, to employ imaginative tactics and techniques, to deny our power-projection forces access to forward operating areas, and to attack fixed installations and massed formations, including population centers in the U.S. homeland. In some future crisis or conflict, a containerized cruise missile armed with a "chem-bio" warhead could be launched against U.S. and allied forces ashore – not to mention against capitals and cities in America and overseas – from any one of hundreds of commercial containerships plying offshore shipping lanes, a "shell-game" with potentially disastrous consequences.

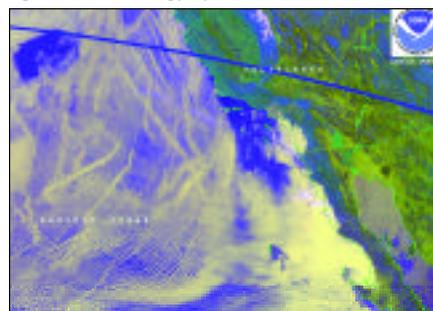
high-payoff target for adversaries, whether state-sponsored or not. Information warfare will increase by 2020; the dependence of the United States on information networks makes it especially vulnerable to information attack. Although the United States is strategically placed to benefit from, and perhaps even to continue to dominate, information technologies, America's ability to operate without fear of "cyber-attacks" against its information infrastructure will erode as other states choose information over industry as an instrument of national power.

Advanced Technologies

Technology development will be another overarching influence on the maritime environment during the next two decades. Advanced military and, increasingly important, commercial technologies will continue to spread worldwide, enabling state and non-state actors to acquire information, command-and-control, communications, sensors, and weapon systems that will decrease the United States' technological advantage. The assessment of the National Defense University is sobering: "From a national security perspective, the most salient trend in the new information environment is that the capabilities DoD spent billions to build in the 1980s are increasingly available for other nations to rent or buy at a fraction of that cost." [77] Therefore, while the United States will doubtlessly move forward with advancements in power sources, space systems, electronics and materials, the overall edge that it has enjoyed during much of the 20th century will begin to diminish.

Although America's technological advantage will decrease by 2020, the United States will remain one of the most technologically advanced states in both commercial/civilian and military spheres. The American application of existing technological innovations will continue to yield major advancements in defense systems and infrastructure, ensure American technological progress, and reduce the cost of high-end technological products. At the same time, these technological advancements will also produce benefits that can be shared by the civilian sectors, although the more compelling "technology flow" will be from the commercial/civilian sectors to the military. The trend evident in the late-1980s will continue: the most advanced militaries around the world increasingly will rely on commercially developed technologies for their highest-technology systems.

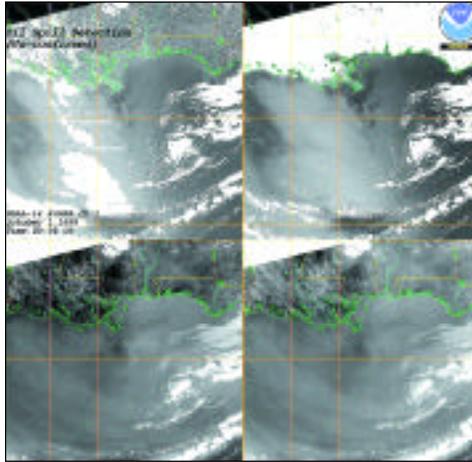
For example, the capabilities of space-based ocean monitoring systems will greatly increase through 2020, and these will increasingly be available to anyone with the cash to rent them or buy their output – friend and foe, alike. The resolution and availability of imagery from commercial electro-optical and synthetic aperture radar satellites will improve dramatically. There will be numerous applications for this technology, such as navigation, surveillance, search and rescue, and monitoring of oil spills. Surveillance and targeting technology will become more complex and capable, with space surveillance systems expected to assume a more important role in reconnaissance and target cueing.



Courtesy of NOAA

[77] *Strategic Assessment 1998, op.cit.*, p. 151.

Although the United States will continue to be one of the biggest beneficiaries of future technological advancements and their subsequent applications in the maritime arena, other nations and non-state actors will be able to acquire the same or similar capabilities, and sometimes apply them in ways that will surprise America. Through 2020 and beyond, the operational capabilities of foreign naval and maritime forces will increase as more sophisticated weapons and maritime platforms enter service. Allies and adversaries will be able to acquire advanced systems through a variety of avenues, including indigenous and cooperative production, technology transfers, legal arms sales, illegal arms transfers, espionage, and the outright purchase and military application of “commercial off-the-shelf” – COTS – civilian technologies. The appearance of high-technology systems worldwide, as well as their application to a spectrum of contingencies and conflict – from conventional operations to asymmetric warfare – will ensure that the maritime environment continues to present a challenge to U.S. maritime forces, and particularly the Coast Guard in its maritime security roles.



Courtesy of NOAA

A Dangerous – If Uncertain – Future

Looking to this ambiguous yet potentially perilous future, the National Defense Panel explained in late 1997 that “The United States enters the new millennium facing challenges very different from those that shaped our national security policy during the almost 50 years of the Cold War.” [78] Many of these are clearly “coastguard-type” challenges, and the United States, as well as our allies and friends, can benefit greatly from the Coast Guard’s unique expertise in safeguarding maritime security. Although many of the missions, operations, and tasks necessary to defeat these challenges are clearly “non-traditional” missions for the Defense Department, they are long-standing *traditional* Coast Guard missions that are routinely carried out by the Coast Guard’s men and women across the spectrum of operating areas – from America’s ports and coastal waterways to Deepwater environments. In the future, there is likely to be a greater need for Coast Guard involvement in meeting these challenges. Indeed, as the Institute for National Strategic Studies recognized:

Some threats of this kind seem to call for military forces to back up police forces that are outgunned and out-maneuvered by international crime syndicates. Quasi-police operations have been normal for armed forces in many nations and for U.S. armed forces in times past. They have not, however played a major role since World War II in the activities of most of the armed forces, other than the Coast Guard and National Guard. There may well be resistance within the military [other than in the Coast Guard and National Guard] to the use of increasingly scarce resources for quasi-police functions. [79]

[78] *Transforming Defense: National Security in the 21st Century*, *op.cit.*, p. 5.

[79] Institute for National Strategic Studies, National Defense University, *Strategic Assessment 1995* (Washington, D.C.: GPO, 1995), p. 11. William Rosenau, Kemper Gay, and David Mussington conclude that “The post-World War II armed forces have long declared that ‘fighting and winning the nation’s wars’ was their *raison d’etre*. Such a vision is likely to conflict with the requirements posed by transnational challenges. Developing human intelligence networks, enforcing embargoes and sanctions, securing borders and other essentially police-like activities will be important features of the military component of the U.S. response.” “Transnational Threats and U.S. National Security,” *op.cit.*, p. 158.