

# Space and Oceans: *Can They Be Controlled?*

**S**pace and oceans have become an important component of international affairs. Prospects for controlling them in a manner that serves U.S. interests, the Western community, and peace and stability are addressed here. Control of both mediums likely will face growing challenges.

## Space

Transformation from the industrial to the information age is far from complete, but the rate of change is accelerating. Because the United States is at the forefront of the information age, advanced technology and information have been the engine of economic strength and military prowess. Space-based capabilities have become so intertwined with U.S. society that continued unimpeded access to space has become a vital U.S. interest.

In the 21<sup>st</sup> century, space systems will be the nexus among economic, diplomatic, and military elements of national power. The United States has \$100 billion invested in space today; in the next century this investment could approach 10 percent of the U.S. gross domestic product (GDP). This includes satellite manufacturing,

launch vehicle production, launch services, production of earth-based tracking and control terminals, handheld global positioning system (GPS) or telephone receiver/transmitters equipment, sophisticated satellite control earth stations, satellite insurance, and the sale of space-based services.

The value of information collected or transmitted via space systems is immeasurable, as is the value of direct applications of space technology to society. Additionally, U.S. corporations gain efficiencies and a competitive advantage in the world market as a result of their access to space-based information.

The benefits of space-based systems reach every level of U.S. society. Satellite dishes provide direct TV to over 10 million households. Satellite navigation systems in American cars are routine. Space systems provide crucial data for environmental monitoring, real-time weather forecasts, and long-term trend assessments. Accurate weather projections have profoundly affected agriculture, severe weather warnings, aviation operations, maritime operations, and many other aspects of daily life.

## Key Trends

### Increasing Commercial Activity in Space

In 1997, the world spent \$79 billion on space systems. By 2001, it is expected to reach \$117 billion. In 1996, the United States spent more in the commercial space sector than on military space. This trend will increase. Currently, some 600 satellites are in orbit, with roughly a third belonging to the United States. Within the next decade, the world will launch over 1,500 satellites, with the commercial sector responsible for the vast majority. They will provide customers with communications, remote sensing, and navigation capabilities approaching the capabilities and technical sophistication of military capabilities.

The projected growth in space systems is most evident in commercial satellite communications. Emerging technologies and huge potential profits have led to fierce competition among satellite manufacturers, communication system operators, and the developing international

launch industry. No fewer than eight major communication projects are underway. Within the next decade, these projects will launch over 500 satellites.

The Iridium communications system began operating in 1998 and has completed its 66-satellite constellation. Teledesic's system is scheduled to go online in 2001, with full service in 2003. Teledesic hopes to eventually have 288 low-earth-orbit satellite systems and provide subscribers with what has been described as worldwide, fiber optics, quality data transmission. These mobile telephone systems and others will offer a superior "communication systems in being" to anyone with a credit card.

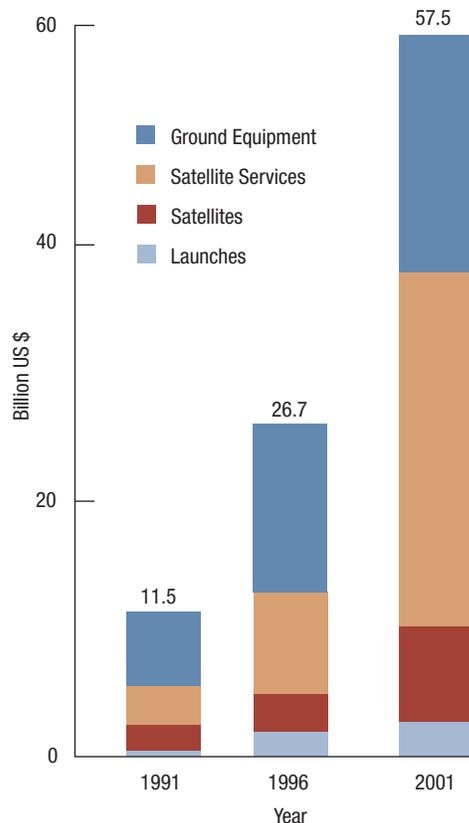
Once the purview of governments, commercial remote-sensing systems are entering the marketplace. The demand for high-resolution imagery is expanding into such areas as farming, land management, urban planning, environmental monitoring, cartography, and hydrology. According to Commerce Department estimates, growth in commercial remote sensing systems sales and services will increase from \$150 million in 1990 to \$2 billion in 2000. Within the next 4 years, 20 new commercial remote sensing satellites are expected to be in operation.

Not only are commercial assets plentiful, their products are becoming inexpensive and technologically sophisticated. Today's commercial systems offer a variety of technologies for imagery, including electro-optical systems, synthetic aperture radar, and infrared systems. Previously, the industry standard was 10- to 30-meter resolution imagery. Soon, commercially available satellites will offer 1-meter resolution imagery. Already a foreign commercial/civil system offers broad area, high-resolution multispectral imagery for \$4,000, and recently, a U.S. agency proposed selling Landsat-7 data for as little as \$400 a scene.

Commercial growth in the use of the GPS is staggering. What was essentially a system designed for military applications has become a vibrant industry. The Commerce Department reports that global sales for GPS receivers were \$867 million in 1994 and nearly \$1.3 billion in 1995 and are projected to grow to \$8 to \$10 billion by 2000. In 1995, more than 500,000 GPS users were in the United States. By 2000, this number is projected to be 2.5 million. Initially developed by the Defense Department, the military share of the GPS receiver market is steadily shrinking. By 2000, it will represent only 1.5 percent of the total.

GPS technology enables precision tracking—a critical capability with many military and

#### Growth of Commercial Space Worldwide



Sources: *Air Force Magazine*, March 1998; Air Force Scientific Advisory Board, "Space Roadmap for the 21<sup>st</sup> Century Aerospace Force," November 1998.

**Existing or Planned Satellite Systems of 10-Meter or Better Resolution**

System	Status	Resolution	Swath Width	Data Sources	Operator	Spectral Bands	Sensor(s)	WWW	Revisit Time
EarlyBird	Lost 12/97	Pan=3m MS=15m	Pan=36km MS=925km	EarthWatch	EarthWatch	Pan, G, R, NIR	Pan, MS	www.digitalglobe.com	2 to 5 days depending on latitude
QuickBird	Expected 1999	Pan=1m MS=4m	Pan=22km MS=22km	EarthWatch	EarthWatch	Pan, MS, NIR	Pan, MS	www.digitalglobe.com	1 to 4 days depending on latitude
IKONOS-1 & IKONOS-2	Expected mid-to late 1998	Pan=1m MS=4m	11km	Space Imaging	Space Imaging	Pan, VNIR	Pan, MS	www.spaceimaging.com	Every 3-5 days from a different angle; 140 days for the same path in the same orbit
IRIS IC/ID	Operational	Pan=5.8m MS3=23.5m, 70.5m, 188m	LISS=141km Pan=70km WIFS=774km	Space Imaging (in U.S.)	Indian Remote Sensing Agency	LISS 3, WIFS, Pan	LISS 3 (Linear Imaging Self Scanner), Pan & WIFS (Wide Field Sensor)	www.spaceimaging.com	24 days
OrbView-3	Expected 1999	Pan=1 & 2m MS=4m HS=8m	Pan=8km MS=8km HS=5km	OrbImage	OrbImage, Inc.	Pan, MS	Pan, MS, HS	www.orbimage.com	Less than 3 days
RADARSAT	Operational	Microwave; 8-100m	50-500km	Space Imaging (in U.S.)	Canadian Space Agency (CSA)	C Band	Synthetic Aperture Radar	www.spaceimaging.com	24 days
Resource 21	Expected 1999	10-20m cirrus 100+m	205km x400km	Boeing Resource 21	Resource 21	MS	MS	www.boeing.com	Twice in 25 min per day at equator; twice weekly with nadir view
Resurs	Operational	MS=2m, 10m	180km, 200km	U.S. Spin-2	Sovinform-sputnik	Pan, Digitized photographs	KVR-1000 Camera	www.spin-2.com	16-17 days
SPOT 4	Operational	Pan=10m MS=20m	60km, 2250km	SPOT Image	CNES & SPOT Image	MS, VNIR, Pan, side-looking	2 HRVs (Haute Resolution Visible)	www.spot.com	26 days

Source: *Commercial Space & Military Information Dominance, Assessing Security on the New Frontier*, Institute for Foreign Policy Analysis, June 1998.

commercial applications. Delivery companies like UPS and FEDEX closely monitor their fleets, enabling them to accomplish efficient delivery schedules. Construction contractors use GPS to streamline complex surveying projects. Automobile manufacturers are offering consumers such GPS services as location and direction finding, trip-tracking, and emergency-response assistance. Hikers use GPS to navigate unfamiliar terrain. Its potential uses are nearly unlimited.

Since the Gulf War, GPS has significantly improved the accuracy of both its position data and timing data. According to the U.S. Space Command, precision timing provided by GPS probably offers the greater commercial value. Cellular phone calls are measured by GPS-provided standards. Computer use and many other time-sensitive applications depend on GPS to provide timing for billing purposes. The recent 30-second time error in one satellite caused a 1-day failure of a cellular net, costing millions of dollars.

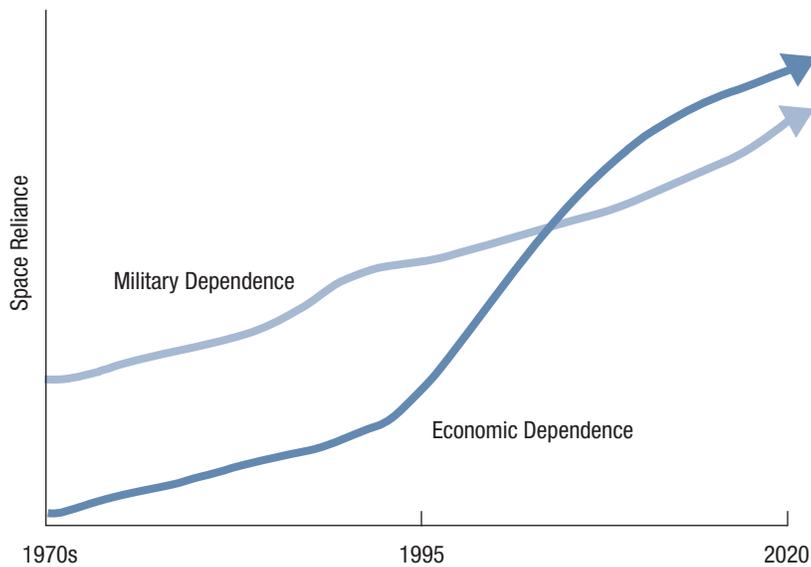
The U.S. Government's 1996 GPS policy statement recognizes the civil and commercial

significance of GPS. Previously, GPS signals were degraded for commercial users. The new policy directed the Department of Defense (DOD) to discontinue this practice and to provide worldwide users with the same accurate navigation signals as provided military users.

### Increasing Military Use of Commercial Systems

A nation wages war the way it produces wealth. Just as oil was essential for industrial-age warfare, space-based information will be central to war in the information age. Space systems have become integral to military operations from the strategic level all the way down to the tactical level of warfare. Remote sensing, weather, and communication satellites provide the means of gathering, harnessing, processing and distributing information. The GPS directly supports new generations of weapons, including the most advanced Tomahawk and standoff attack munitions.

## Evolution of Space Dependency



Source: Long Range Plan: Implementing USSPACECOM Vision for 2020, March 1998

Since the Gulf War, success in U.S. military operations is becoming increasingly dependent on information dominance and the ability to collect, process, and distribute relevant information through a network to widely dispersed users. The lynchpin in information dominance is space-based capabilities. The concepts of *Joint Vision 2010*—battlefield dominance, precision strike, full-dimension protection, and focused logistics—are dependent on space-based information.

With the exception of electronic surveillance and strategic warning systems, the U.S. military is losing its preeminence in space just when space operations have become a critical requirement for successful military operations. The marketplace is driving innovation in space technology. As a result, commercial capability is approaching military capability. Spurred by declining budgets and increasing requirements, the U.S. military has taken advantage of inexpensive, readily available commercial capability. The U.S. Space Command reports that 70 percent of DOD satellite communication requirements are leased from commercial systems.

To ensure critical communications, the U.S. military will maintain “high end” military command and control communication satellites that possess anti-jam, low probability of intercept/detection, and electromagnetic pulse-protected

systems. But the sheer volume of bandwidth mandates extensive use of commercial assets.

The satellite communications (Satcom) bandwidth required by one deployed aircraft carrier is illustrative. The Naval Space Command states that in 1991, one carrier required 9.6 kilobits per second (Kbps) of bandwidth for full connectivity. In 1997, this requirement grew to 2,000 Kbps and by 2005 is expected to grow to 10,000 + Kbps. Projections for 2010 call for 32,000 Kbps of Satcom bandwidth. Other services’ requirements show similar growth. Planned military satellites cannot keep pace with these expanding bandwidth requirements, necessitating more use of vulnerable commercial systems.

## Vulnerable Space-Based Systems

The growing military and commercial use of space generates significant national security policy challenges. Any disruption to the vulnerable space industry would immediately and adversely affect the U.S. economy, military, and society. The May 1998 failure of just one on-orbit commercial satellite, with the resultant loss of service to 90 percent of the pagers in the United States, was a significant event for hundreds of thousands of Americans and illustrates how U.S. society is becoming dependent on space-based systems.

Forces hostile to U.S. interests likely are studying how to attack space networks. The U.S. military’s dependence on space assets was obvious in the Gulf War. Subsequent doctrine and systems developments have increased that dependence. Some foreign strategists have described U.S. space assets as a Clausewitzian center of gravity.

Technologies exist today that could challenge U.S. dominance in space. Satellites are vulnerable to attack or disruption, particularly commercial satellites that lack the hardening of military systems. A 1997 *Defense Week* article described an Army experiment in which a commercially available 30-watt laser was used to blind an earth-observing satellite operating in a low-earth orbit.<sup>1</sup>

Satellites can be attacked directly by jamming or nuclear electromagnetic pulse and radiation. Today, equipment purchased in any reasonably sized shopping mall can easily jam local GPS signals from a satellite orbiting at 11,000 nautical miles. In 1997, a 5-watt transmitter reportedly disrupted GPS signals to aircraft flying overhead.

Many scientists believe that the radiation produced by a 50-kiloton nuclear burst at 200

miles altitude would eliminate most low-earth-orbit commercial satellites within months. The proliferation of nuclear weapons and missile systems makes such an attack feasible.

Although requiring more technological sophistication, kinetic kill antisatellite (ASAT) weapons were tested in space by the Soviets as early as 1968. Few countries today have active ASAT programs, but off-the-shelf and other enabling technologies exist in numerous countries. With 46 countries having active space programs, the use of rudimentary ASAT systems against low-earth-orbit satellites is becoming feasible.

Ground support facilities and key technical personnel are targets for less technologically advanced adversaries. The GPS depends on critical nodes in Colorado Springs, Hawaii, Ascencion Island, Diego Garcia, and Kwajalein Island. Successful attacks on any of these sites would, over time, disrupt significant portions of the system.

Advanced information warfare attacks against satellite software, uplink commands, or downlink information flow could prove devastating. Computer hackers targeting satellites is one example of the effects this type of information-warfare attack could have.

## U.S. Interests

The use and control of space have been vital U.S. interests for 40 years. The strategic importance of space seems destined to grow for U.S. commercial and military interests. Foreign countries will be entering space in growing ways as well. This medium will no longer be the primary province of U.S. forces. American strategists must plan to exploit space to the fullest, while at the same time planning to face foreign competitors in space.

### Enhancing Strategic Interests

Today, U.S. forces use space-based intelligence, communications, and navigation systems to enhance the capabilities of air, land, and sea forces. By 2010, even with an increased dependence on space systems, U.S. forces will remain earthbound in the form of traditional ground, naval, and air forces. The distant future is hard to discern because it depends on technological breakthroughs that are only now being contemplated. Yet, the use of space for broader military purposes seems inevitable. Deployment of space-based ballistic missile defense systems to counter proliferation of weapons of mass destruction seems likely. Faster strategic mobility

from transatmospheric strategic transports is another possibility. Deployment of transatmospheric combat aircraft and other weapon platforms also seems likely. The F-22 and Joint Strike Fighter may be the last low-flying tactical combat aircraft procured by the United States.

## The Challenge to U.S. Interests in Space

In the coming decade, other countries will likely use space for military purposes in broader ways than now. Most will be friendly Western democracies. As they become more capable in space, their ability to assist the United States in projecting military power will increase. Russia and China will become greater participants in space. The strategic implications will depend heavily on their relations with the United States. Partnership activities already are being pursued and may expand if relations with Russia and China remain cooperative.

The "wild card" is how rogues will use space in the future. U.S. physical security will be directly endangered if rogues develop intercontinental and cruise missiles, along with the command, control, communications, computers, intelligence, surveillance, and reconnaissance (C<sup>4</sup>ISR) assets to use them effectively. Short of this step, rogues likely will develop better C<sup>4</sup>ISR assets for conventional forces in regional conflicts. This will better enable them to conduct sophisticated combat operations and degrade U.S. military missions. Regardless, increased military use of space by rogues spells greater trouble.

## Future Regional Conflicts in Space and Cyberspace

Today, the United States and its allies are the primary users of space and cyberspace. As rogues develop greater offensive and defensive capabilities, space and cyberspace likely will become the focus for waging regional wars. Control of space and cyberspace will affect the outcomes of ground, sea, and air operations. The U.S. military will likely face greater opposition in space and cyberspace.

## Consequences for U.S. Policy

U.S. policy for using space has matured in recent years and is now a critical part of national



Russian space station Mir

security strategy. The principal challenge is to ensure this policy responds to emerging requirements.

### Balancing Commercial and Military Space Interests

Policy must balance the commercial advantages of selling advanced technology overseas with the national security goal of remaining dominant in space. This issue is becoming increasingly complicated. Privately developed technology is approaching or surpassing sensitive military technology.

A state-of-the-art satellite communications network could provide a needed telephone system to a country lacking the landline infrastructure. Satellite mobile systems, with available modern encryption, could also provide a potential adversary's forces with a sophisticated communications system. This dual-use technology has led to demands to restrict the export of sophisticated systems. However, trying to limit all but the most revolutionary commercial technology may be like trying to restrict the use of logarithmic tables; many experts believe that the technology cat is already out of the bag.

Numerous countries have robust space programs. There is a worldwide surplus of skilled scientists as a result of the growth of the private space industry, disintegration of Russia's space program, and Asia's economic crisis. Market forces are alive and well in the worldwide space

industries. Restricting U.S. companies from offering the most competitive services will not prevent the growth of sophisticated space technologies. It will probably lead to purchases from foreign companies. Yet, strict controls on the sale of military technology will remain a necessary component of U.S. policy.

### 21<sup>st</sup> Century Requirements for Space Control

Just as air and sea control was necessary for industrial age warfare, space control has become critical for information age warfare. Space-control goals mirror traditional sea-and-air-control objectives. Control of the oceans and skies ensures a friendly advantage and denies adversaries the capability to use them. However, the increasingly international use of commercial space platforms makes direct attacks on foreign-owned space systems problematic.

The first requirement of space control is to ensure protection of critical terrestrial and space systems. National Space Policy states: "Purposeful interference with space systems shall be viewed as an infringement on sovereign rights." However, today it is difficult, if not impossible, to determine if a satellite failure is the result of a malfunction or hostile actions. General Howell Estes, former Commander of the U.S. Space Command wrote that the United States must:

improve our ability to see what's happening in space. We need to detect and monitor objects less than half the size of what we can see now. Our satellites need to be designed to survive collisions with debris we cannot see and maneuver out of the path of debris we can see. Today, the first indication we would get that a satellite has been damaged would be when it quits working. We need to build sensors that can tell us if satellites have been damaged by solar flares, debris or someone on earth.

Adding attack-detection sensors on commercially built systems will require partnership between the government and private-satellite manufacturers. The world's dependence on space makes the possibility of foreign satellite manufacturers participating in some form of attack detector a viable option. The disruption of satellites would be devastating for commercial networks. Manufacturers have a strong incentive to participate in system protection, but who will provide funding for these sensors remains the

Photo from the South Korean Yonhap News Agency, purportedly of a North Korean satellite launched August 1998



AP/Wide World Photos

key issue. The most reasonable solution would be for government to fund the research and development of such systems and then make them commercially available.

The United States is not alone in recognizing the sophistication of commercial systems. Low-tech adversaries can quickly become sophisticated and at low cost. In future conflicts, U.S. and hostile forces could possibly use the same commercial communication satellites. An enemy could use enhanced command and control (C<sup>2</sup>) capabilities, facilitated by a commercial satellite telephone network to coordinate a GPS-guided missile attack

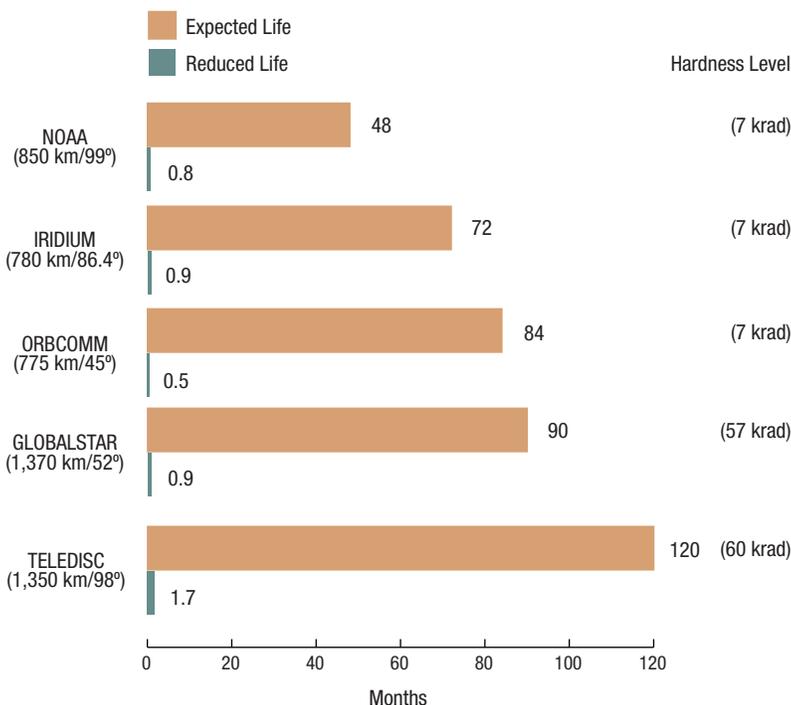
on a target detected by high-resolution imagery, provided from an internationally owned remote sensing satellite. The U.S. way of war assumes technical superiority. The United States should expect and plan for significant improvements in rogue states' militaries, as well as transnational paramilitary capabilities, through exploitation of commercial space systems.

Hostile forces using advanced commercial space assets against the U.S. military would present unique military and policy challenges. The crucial challenge is how to safeguard civil and military access to space services, while simultaneously denying the use of space to a rogue state or transnational terrorist group.

Policy and doctrine issues will need to be addressed, while the United States explores defensive and offensive possibilities of antisatellite systems, emerging laser technology, and cyber-attack. As a first step, U.S. intelligence could analyze the global-information net and determine what commercial systems opponents are using. Knowing what they know will be vital.

Even when confronting a hostile force with access to space systems, U.S. forces can prevail. The U.S. military retains a significant advantage in the integration of space-based data. It is this fusion that enables rapid decisionmaking. When coupled with well-trained and equipped forces, this capability translates into flexible and rapid maneuver that will allow U.S. forces to dominate.

**Commercial Satellite Lifetime**



**Promoting Partnership Between Government and Private Industry**

The days of the symbiotic relationship between government and the space industry are long over. The single-minded focus stimulated by the Cold War, along with the heady days of the Apollo Program and moon landings, has given way to a new reality. For industry, the real profit potential lies in commercial, not government, space programs. Specialized, low-production government contracts cannot justify capital expenditures on risky, emerging technology. In the highly competitive commercial-satellite market, the efficient use of current technology is what generates market share.

Shrinking federal budgets mean fewer dollars for research and development. Industry is also satisfied to rely on current technology. Pressure to reduce "corporate welfare" has led to questions regarding the relationship between government and commercial industries.

Source: *Future Challenges to U.S. Space Systems* (Washington: The Institute for Foreign Policy Analysis, Inc., June 1998).

Such a partnership must be focused on areas of common need. The U.S. Government has reasons to focus research and development on enabling technologies, such as the development of national launch systems, launch-facility infrastructure upgrades, satellite-attack warning systems, and integrated satellite control networks. The National Aeronautics and Space Administration (NASA) is moving in this direction. It seeks commercial operation of the shuttle program and, later, the international space station. This will allow NASA to concentrate on developing leading-edge space technologies.

## Sponsoring Research

In 1993, the United States established the National Science and Technology Council, which replaced the National Space Council. It was tasked with developing and coordinating space policy. In September 1996, it published the National Space Policy fact sheet, which listed the following five goals for the U.S. Space Program:

- Enhance knowledge of the Earth, solar system, and universe through human and robotic exploration
- Strengthen and maintain U.S. national security
- Enhance U.S. economic competitiveness and scientific and technical capabilities
- Encourage state and private-sector investment in space technologies
- Promote international cooperation to further U.S. domestic and foreign policies.

Growing dependence on commercial space systems, some of which may be foreign controlled, makes developing and implementing policy exceedingly difficult. Space systems must be given careful attention in the ongoing policy debates that are attempting to define "homeland defense" and "critical infrastructure" protection.

The recently created National Security Space Architect (NSSA) is a good example of how policy seeks to make space management more effective. As a result of the Defense Reform Initiative's recommendations, the NSSA defines the combined roles of the DOD space management and intelligence community as:

- Integrating DOD and the intelligence communities' space-system architectures
- Improving space support to customers
- Achieving efficiencies in acquisition and future operations
- Eliminating unnecessary stovepiping.

If successful, the NSSA, along with other Defense Reform Initiatives, will make DOD space management more efficient and effective. The requirement for more focused leadership was recently seen regarding who should license commercial communications satellites. This issue

is faced by competing demands from the State, Commerce, and Defense Departments, as well as Congress and the White House.

As is always the case with rapid technological advancement, policies and bureaucracies struggle to adapt. Policymakers view a leading U.S. position in growing commercial space industry as important to national security. Much has been done in developing overarching policy, but greater effort is needed in implementation.

Establishing a stable policy environment is a prerequisite for policy implementation. Implementation of the administration's vision is hindered by conflicting interpretations of goals and priorities, as well as a lack of consensus on space and technology priorities. Strengthening interagency policymaking on space is an important first step. Strengthening the National Science and Technology Council's role would better enable it to clarify organizational boundaries, set national priorities, and anticipate policy requirements for emerging technologies.

Regardless of how the United States decides to act, policy implementation must be addressed in a logical and integrated manner. How the United States balances economic and security concerns regarding space technologies will be one of its greatest policy challenges and will determine if it can maintain and expand its dominance in space.

## Oceans

Oceans have had a profound impact on the United States. Since the republic's inception, the oceans have been a source of food and have served as a defensive barrier to foreign intriguers. As the United States played a more active role in global affairs, the seas became a vital highway for the nation's merchantmen and armed forces.

The United States is a maritime nation, and international ocean policy is important to Americans. Today, 95 percent of U.S. trade is transported by sea, which represents 20 percent of the GDP. Vice President Gore stated that the oceans sustain one in every six American jobs.

National dependence on the seas is not unique. Seventy percent of the Earth's surface is covered by water. Between 50 and 60 percent of the world's population lives within 50 miles of a coastline. As the world's population grows, more

emphasis is being placed on the oceans. Countries depend on the sea for food and trade.

Historically, oceanic transit of goods required protection from states and piracy. Nations were free to determine passage rights and the extent of their national waters. In today's interdependent world, the international community is realizing that the oceans require international agreements to protect access, maintain environmental quality, and guard against the imprudent exploitation of marine resources. Increasingly, the oceans are being viewed as the unifying medium of the planet. Their global importance was reflected in the UN designation of 1998 as the "International Year of the Ocean."

For U.S. defense strategy, oceans will remain critical. The United States will need to maintain access to such traditional regions as Europe, Northeast Asia, and the Persian Gulf.

## Key Trends

### UN Conventions on the Law of the Sea

In 1994, President Clinton asked Congress for advice, consent, and ratification of the UN Convention on the Law of the Sea. The administration believes that the United States has a long-term national security interest in supporting the Convention. To date, the Senate has not ratified the treaty.

The international community's effort to establish global standards for the oceans was an immense task. It began in 1958 with the first Law of the Sea conference. Between 1973 and 1982, some 150 nations negotiated the Law of the Sea Convention. Three administrations supported the Convention's 1982 agreement, save for the provisions regarding deep seabed mining. The Convention codified limits on territorial seas to 12 nautical miles at a time when many nations actively claimed up to 200 nautical miles. The Clinton administration felt that the agreement struck a positive balance between coastal states and maritime states. It clarified such issues as marine pollution, fisheries and mineral-resource exploitation, and freedom of navigation through exclusive economic zones (EEZs), territorial seas, straits, and archipelagos. In 1994, the UN General Assembly adopted a revised part XI of the Convention, which answered U.S. concerns regarding seabed mining.

Protecting U.S. national security interests, while establishing a globally accepted legal framework for use of the oceans, has been the central

component in the 25-year effort to achieve a comprehensive Convention. The agreement codifies rights vital to a maritime nation such as ours. These rights, as outlined in a DOD-published report on the Law of the Sea, are as follows:

#### Innocent Passage

The right of ships to continuous and expeditious passage not prejudicial to the peace, good order, or security of coastal states is the primary right of nations in foreign territorial seas. Naval vessels rely on this right to conduct their passage expeditiously and effectively. The Convention plays a special role in codifying the customary right of innocent passage for ships on the surface and contains an exhaustive list of the types of forbidden shipboard activities. It also describes the extent of, and limitations on, the right of coastal states to regulate and suspend innocent passage.

#### Transit Passage

The convention protects and preserves free transit on, under, and over international straits. Free transit of straits is essential to the global mobility of U.S. forces. With the dramatic reduction of overseas bases and the greater reliance on our ability to project military power from the continental United States, the internationally recognized right of free transit is vital. More than 135 straits, which otherwise would have been severely restricted as a result of the extension of territorial seas to 12 nautical miles, are open to free passage. Less restrictive than innocent passage, ships and aircraft engaged in transit passage may pass through straits continuously and expeditiously in their normal mode. Submarines may pass through straits submerged, carriers may engage in flight operations, and military aircraft may transit unannounced and unchallenged.

#### Archipelagic Sea Lanes Passage

The right of transit by ships and aircraft through Archipelagos, such as the Philippines and Indonesia, has a significant impact on the ability of our military forces to deploy rapidly.

#### Freedoms of Navigation, Overflight, and Other Use in the EEZs

A third of the world's oceans, including entire seas, such as the Mediterranean, the Red Sea, and the Persian Gulf, is within 200 nautical miles of the coast, and thus within 200 nautical miles of the permissible limits of the EEZs. The Convention expressly preserves in the EEZs the

## The Submarine's Role in U.S. Power Projection

America's nuclear-powered submarines provide our civilian and military leaders the means to help counter asymmetric threats during this transitional period and beyond. Immune to both ballistic and coastal missiles as well as their potential chemical or biological fallout, and well equipped to counter the undersea threats of diesel submarines and mines, U.S. submarines can penetrate denied littoral areas and employ their multimission capabilities at every stage of conflict. Nuclear propulsion enables rapid redeployment and long, unsupported "dwell time," which, together with sophisticated sensors, make U.S. submarines the nation's premier, survivable intelligence collecting assets. Protected by their stealth, and with their magazines devoted to offensive weaponry, submarines possess unique attributes in taking the fight to an adversary's ships, submarines, and other targets ashore.

Two Defense Science Board studies, "Investments for 21<sup>st</sup> Century Military Superiority" and the "Submarine of the Future," recognize the important role of U.S. nuclear-powered submarines. Specifically, the latter study states:

"The unique combination of stealth, mobility, endurance and versatile offensive power have no valid competitor in the set of missions to which attack submarines apply today or in the foreseeable future. . . . Technology advances and proliferation will make the submarine's stealth, endurance and mobility even more important attributes in the future as surface and air forces become more vulnerable."

The *Future of War* warns against the historical precedent of employing "senile" weapons and strategies and the need to provide strategically significant weapon(s) that bring "force to bear in such a way that it decisively erodes the war-making capability of the enemy." The U.S. nuclear-powered submarine is such a weapon, to the degree that even the mere possibility of its presence can be used as leverage against potential adversaries. Just as America's submarines proved so effective in past conflicts, the future portends an expanding role for these stealthy ships in enabling U.S. power projection.

Source: George Friedman and Meredith Friedman, *The Future of War: Power, Technology, and American World Dominance in the Twenty-First Century* (New York: St Martin's Press, 1996).



**Navy SEALs conducting a fast-rope exercise from a SH-60H Seahawk helicopter onto the hull of a fast-attack submarine**

high-seas freedoms of navigation, overflight, laying and maintenance of submarine cables and pipelines, and related uses.

### High-Seas Freedoms

The Convention makes an important contribution by defining the types of activities permissible beyond the territorial seas. U.S. forces remain free to engage in task-force maneuvering, flight operations, military exercises, surveillance and intelligence activities, and ordnance firing.

### Sovereign Immunity of Warships and other Public Vessels and Aircraft

The concept of sovereign immunity of warships has come under increasing assault by coastal states wanting to circumscribe this historic right on the basis of security or environmental concerns. The Convention contains a vitally important codification of the customary law principle that warships enjoy sovereign immunity.

### A Closer U.S. Navy and Coast Guard Partnership

In the Cold War's aftermath, complex security issues have emerged. Naval forces have found themselves involved in hybrid missions. They increasingly rely on law enforcement, as demonstrated by operations such as *Sharp Guard*, the NATO-led sanction operations in the Adriatic, maritime drug interdiction operations in the Caribbean, Middle East interdiction operations in the Red Sea, and ongoing enforcement of UN sanctions in the Persian Gulf.

The increasing problems of counterpiracy, drug interdiction, migrant control, and refugee operations present unique challenges to the Navy. The downsized Navy is not as well equipped or trained to deal with these types of missions as it was previously. Today's 300-ship



**The U.S.S. Enterprise in the Persian Gulf**

Navy has only 120 surface-combatants. Many of these are technologically sophisticated Aegis cruisers and destroyers. Both are capable ships but mismatched for law-enforcement missions.

The Coast Guard will play an increasingly important role in the future. The strategic value provided by the Coast Guard is reflected in the following:

- The Coast Guard is the only Federal law-enforcement agency with jurisdiction both inside U.S. territorial waters and on the open oceans.
- Possessing open-ocean, high-endurance cutters, the Coast Guard, with its uniquely trained crews, plays increasingly important roles in enforcing UN sanctions and international embargoes at sea. Operating alongside the Navy, the Coast Guard provides trained and experienced boarding teams.
- The Coast Guard, along with Navy assets, provides harbor defense and maritime traffic management for strategic ports. Both are vital services for power projection.
- In the important military-to-military contact program between U.S. and former Warsaw Pact navies, the Coast Guard often is more compatible with coastal navies than the Navy.

## Regional Navies and Littoral Operations

In the 1980s, the U.S. fleet was building toward 600 ships, and its Maritime Strategy was focused principally on global war at sea. The Soviet Navy was building a mirror image of the U.S. fleet and represented the quintessential

symmetrical threat. Both fleets prepared for decisive battle in mid-ocean. U.S. naval forces focused on blue-water power projection, and Soviet forces focused on denying them this capability.

**Times change.** The Soviet fleet no longer exists. The successor Russian fleet is but a shadow of its former self. Its surface fleet remains pier-side, slowly rusting. Only the Russian submarine fleet remains a viable force.

During the last decade, the U.S. fleet has faced declining budgets and officials who questioned the Navy's relevance in the post-Cold War world. In response, the Navy successfully shifted its strategic focus from war at sea to littoral warfare. It has been a difficult transition for the Navy. Sensor and weapon technologies optimized for open-ocean warfare did not always translate well into the littoral. Designed to operate in an open-ocean environment, the Aegis System required extensive modification and introduction of the new SPY 1D(V) radar to be effective in littoral operations. Littoral seas presented particular difficulties for U.S. submarines, as sonar and torpedoes were greatly affected by shallow water. Although difficult, programs were developed to deal with these technological challenges.

Operating closer to shore, the Navy had to deal with a more asymmetric threat. For the most part, coastal navies could not militarily defeat the U.S. Navy. Potential adversaries, therefore, have pursued an area-denial strategy. Their likely intent is to delay, disrupt, and inflict damage on the deployment of U.S. forces.

As the U.S. Navy continues to reduce the number of ships, those remaining tend to be high-value ships. The loss of one could engender grave U.S. public reaction. Adversary navies targeting U.S. naval forces are likely to be taking into account the U.S. aversion to casualties.

This area-denial strategy is credible, because small navies are benefiting from technological advances. Advanced coastal defense missiles are available on the open market. World War II vintage mines are still effective. Modern mines are integrated systems, incorporating state-of-the-art sensors and processors that make countermine operations much more difficult. Countries hostile to U.S. interests routinely operate diesel submarines with sensors and weapons that are continually upgraded. Fast, modern, missile-equipped boats patrol important coastlines.

The U.S. Navy and Marines have devoted considerable effort to addressing the challenges

of coastal warfare. However, power projection operations are likely to have a cost in an increasingly dangerous littoral environment. Allied navies will be affected as well.

## Diminishing Fisheries

The Law of the Sea Convention established the right of coastal nations to manage ocean resources in the 200-nautical mile EEZs. This is an important aspect of the Convention, because 90 percent of the world's fish catch is within EEZs.

The United States oversees some of the world's most productive fishing grounds. Its 2.5 million square-mile EEZ is the world's largest and contains 20 percent of the world's fish resources. In 1995, the U.S. commercial fishing fleet, some 94,800 vessels, contributed nearly \$50 billion to the economy.

U.S. policy is to protect the ocean's natural resources while facilitating maritime commerce. However, more active protection of fish populations is required to ensure a sustainable fishing harvest. Regional fishery councils in the U.S. northeast have made tough decisions limiting catches, despite the severe economic and social impact on many fishermen. The scope of the proposed fishing restrictions demonstrates the severity of the problem. According to one U.S. Coast Guard officer, "40 percent of U.S. stocks are overfished, and 70 percent of the world's fish stocks are either fully or heavily exploited, over-exploited, depleted, or only slowly recovering."

As unconstrained harvesting continues, the pressure on coastal nations to retain access to productive fishing grounds will increase. This will inevitably lead to increasing conflict as nations attempt to prevent encroachment. In March 1995, such a dispute occurred between Canada and Spain. It involved the actual firing of warning shots by Canadian patrol boats.

Fishing is an important part of many coastal country economies; it often reaches deep into a nation's society. If fishing stocks continue to be depleted, security concerns over fishing rights may approach the same level of concern as water rights in the Middle East.

## U.S. Interests

On the whole, U.S. maritime interests are far more secure than during the Cold War. Yet, new regional problems are emerging.

## Absence of Blue Water Threats

During World War II, the United States and its allies were compelled to defeat major naval threats in both the Atlantic and the Pacific. During the Cold War, they remained constantly prepared for global war that promised major naval actions in multiple theaters. No similar threat looms in the future, provided U.S. and allied naval forces are able to defend the sea lanes. If so, U.S. power projection will be easier than during the Cold War and previous conflicts.

## Controlling Critical Chokepoints

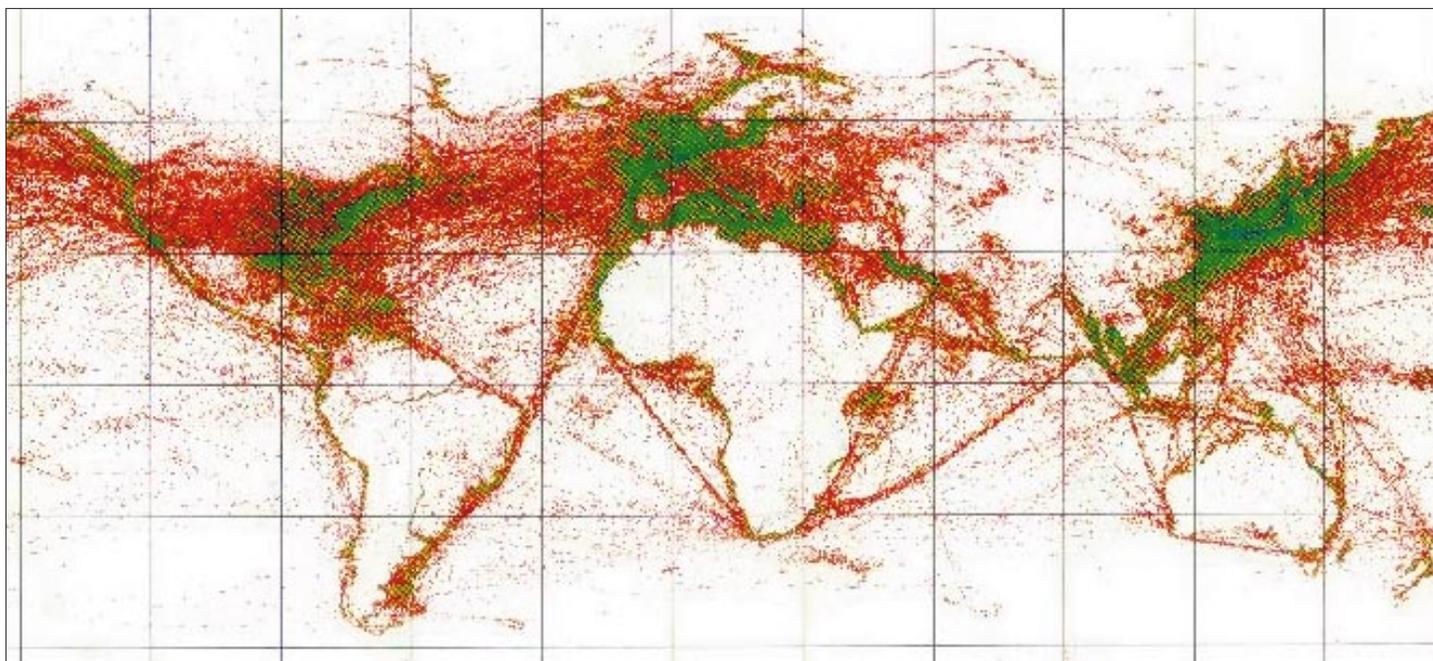
Commercial trade will require transit of such chokepoints as the Mediterranean Sea, the Suez Canal and the Red Sea, the Strait of Hormuz, and the Strait of Malacca. The same applies to U.S. military forces, which will use these and other chokepoints in conflict. As potential adversaries develop mines, cruise missiles, and air-strike assets, they will acquire a better capacity to interdict some of these chokepoints. Maintaining control over them will be a future challenge.

## Blue Water Threats to Asian Crescent Sea Lanes

The vast sea lanes of the Asian crescent stretch from Southeast Asia northward to Japan and Korea. Much of Asia's trade transits these sea lanes. Their control is also vital to wartime operations, including the movement of U.S. forces between the Pacific and the Persian Gulf. China lies astride virtually all of these sea lanes; if it develops a navy with power projection assets, it could potentially menace these sea lanes in ways that endanger U.S. and allied interests.

## Littoral Navies

U.S. defense strategy for regional conflicts will continue to rely heavily on rapid power projection and reinforcement of allies. Decisive naval contributions to joint operations depend on U.S. Navy and Marine forces getting close enough to a hostile shore to launch strike operations. Rapid follow-on power projection depends on access to sea ports. As adversary forces develop better capabilities in the littorals, they will be able to interfere with U.S. strike and reinforcement operations and pose greater threats to U.S. military strategy.



An electromagnetic spectrum image of the earth from space, depicting global lines of communication

## Multilateral Naval Partnerships and International Law

U.S. national security strategy calls not only for maintaining existing defense alliances, but also for developing relations with new friends and former adversaries. This includes maintaining existing naval partnerships and developing new ones. To the extent engagement and enlargement succeed, it can ease the challenges confronting U.S. defense strategy. Likewise, the extension of international law for use of the seas can reduce the potential for conflicts and contribute to stability in several turbulent regions.

## Consequences for U.S. Policy

As a maritime nation, the United States has an interest in continuing to play an active leadership role in establishing an international legal framework for the use of the oceans. It has the longest coastlines in the world, and 95 percent of U.S. import and export trade tonnage is transported by sea. The United States depends on unobstructed seas to project military power in support of global interests. This dependence on the oceans necessitates the following:

- The United States will continue to require strong space and naval forces to control both mediums.

- Congress should ratify the UN Convention on the Law of the Seas. The advantages greatly outweigh any possible objections to the convention.

- The Coast Guard will need to be recapitalized. The average age of cutters is approaching 25 years. Failure to recapitalize would cripple this service at a time when it has never been more relevant. In 1997, the Coast Guard seized 103,000 pounds of cocaine and an almost equal amount of marijuana. Their street value was estimated to be more than \$1 billion—greater than the Coast Guard's annual budget.

- As military forces are reduced, the Navy and Coast Guard should build a closer working relationship. A recent Memorandum of Agreement between the Secretaries of Transportation and Defense has advanced the operational interaction between the two services. However, interoperability requirements, particularly in areas of command and control between Navy ships and Coast Guard cutters, need to be critically examined. *Joint Vision 2010* should be as relevant to the Coast Guard as to the Navy.

- The ocean's resources are finite. The seas cannot absorb pollutants indefinitely. Continued international action is required to protect and manage the ocean environment.

- The ability to control coastal waters is crucial in uncertain times. The vast majority of U.S. military equipment arrives in theater in ships that have transited several narrow straits. Technology is increasing the potential reach and lethality of adversaries and threatening naval forces near the shore. This is occurring when the United States has fewer ships. The loss or delay of one fast sealift ship could significantly degrade overall military capabilities. Excess sealift does not exist, and sealift capabilities will be especially strained if multiple deployments are required.

The international community no longer views the oceans as barriers or as vast unregulated voids. The United States has an interest in protecting the seas and defusing conflict arising from competing demands for ocean resources. This can only be achieved through a comprehensive policy agenda for the oceans in the 21<sup>st</sup> century.

In addition to sea control and power projection, law enforcement is playing a central role in issues relating to the oceans. This is being reflected in naval missions as naval forces contend with world uncertainties, increasing local vice global conflict, and greater reliance on the United Nations and international law to resolve disputes. Enforcement of sanctions in numerous regions such as the Red Sea, Adriatic Sea, and Persian Gulf has led to maritime interdiction operations.

Commercial mobility and military power have an important relationship. The flow of commercial goods across the seas depends on naval forces to ensure open lines of communication. At the same time, naval forces depend on commercial trade for logistics support.

## Net Assessment

The oceans have always been important to U.S. interests and strategy. Space is acquiring equivalent importance. Today, U.S. military forces enjoy peacetime access to both mediums and are capable of controlling them in wartime. As international affairs change and new threats appear, strong efforts will be required to preserve this control.