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# OCEANS 92



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# Spilhaus Revisited: An Ocean Community's Conscience

## The Hawaii 'Debate' Between Craven and Spilhaus Was Recreated in Washington Recently, Losing Little in the Translation

By David M. Graham  
Editor

One of the highlights at Oceans '91 last year in Hawaii turned out to be a spirited "debate" between two elder statesmen/scientists in the oceanic community—Drs. Athelstan Spilhaus and John Craven. As we reported in November 1991 ("Editor's Corner," p. 99), Craven then took the role of interlocutor as the two squared off on some "old" topics, such as floating cities, and some recurring ones, such as oceanic resource development deficiencies.

The battle was rejoined after a fashion recently at a Washington, D.C., Marine Technology Society Section luncheon.

Equally venerable Joseph R. Vadus, senior technical advisor to the National Oceanic & Atmospheric Administration's National Ocean Service administrator, acted as interlocutor in John Craven's absence.

Spilly played himself, and he was in top form.

What follows is an abridged version of that debate reaffirming the wisdom and common sense of things oceanic from Athelstan Spilhaus.

The question about Spilly's bathythermograph invention was inevitable. Vadus noted that the invention's use has since resulted in considerable data. The question was: Have scientists used—or misused—the data well?

"It's being used, but I don't think that most of the ocean scientists understand the progression of science," Spilhaus responded. "The progression is No. 1,

observing; No. 2, understanding; No. 3, prediction; and No. 4, control." He noted that we are so preoccupied with taking data—in the U.S. at least—that there's no time to analyze it and much of it is unused. "I think one should sit back and say, 'don't just plan to observe things.' Have a hypothesis, see if you have a problem, and then take the appropriate observations to solve that problem."

### Balance Ecology, Economy?

Vadus touched on the new buzzword—ESD ("hopefully with a bigger 'D'") for environmentally sustainable development, resource utilization in harmony with the environment.

we have done in this country I'm sorry to say. You preserve the ecology by using it."

Another favorite Spilhaus subject is sewage disposal at sea. Vadus asked him to ponder the abolishment of such disposal methods within the next two years. "What is it the legislators know about the ocean environment we don't?"

"Well they know nothing about the sea. Our Congress—with a notable few exceptions of good friends of the ocean—neglect the sea completely, as you know. After all, their idea of cleaning Chesapeake Bay is raise billions in taxes—when we've already got a terrible national debt—to clean the bay. Whereas the simplest thing to do is fol-

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***"We should help [industry]. . . In Japan, industry and government are a partnership. Here, industry and government are adversaries. This is a tragic situation."***

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"Yes, of course you develop in harmony with the environment. I remember coining a word about 20 years ago when I was president of the American Association for the Advancement of Science: 'Eco-librium.' The enviromaniacs were loose then and they were all talking about ecology. And I was trying to emphasize this very thing—the balance between ecology and economy. You don't preserve the ecology by ruining the economy, which

low what was done in Lake Erie: stop putting any further effluents into the bay and the bay will clean itself.

"These bays and estuaries are not as fragile as represented. They are fragile, but they will flush themselves in time provided we don't go on.

"But Congress won't do that; that's a simple act. It doesn't cost any money. Doesn't get them any votes. They'd have to clamp down on industry to prevent it from putting effluents into

Chesapeake Bay, and they won't do that," Spilly stated. "Sewage, if it's organic sewage, could only be beneficial to the sea. . . . The land, ocean, and air have a proper function, and always have had a proper function, of accepting foreign substances and incorporating them. But you've got to be careful *what* you put into them. And so to say: 'stop putting anything into the oceans, stop putting anything in the landfills,' where are you going to put it, in your ear?"

In defense of current federal efforts in the EEZ, Vadus noted that NOAA and the U.S. Geological Survey (some 60 percent so far with GLORIA) were already mapping the seabottoms offshore the U.S. coasts.

cases—in extreme cases, of course, where all these impact statements and things have to be filed. The entrepreneurs who wished to go out to do ocean mining and had the wherewithal some years ago were absolutely inhibited because they couldn't get through the paperwork.

"We should *help*. We're talking seriously: we love the United States, but we should be critical of it because we love it. In Japan, industry and government are a partnership. Here, industry and government are adversaries. This is a tragic situation."

On the subject of ocean policy *vis a vis* the civil sector, Vadus asked why there is none and how should the nation develop one or proceed without it.

### Wild Ocean Reserve . . . Islands?

"On the other hand—in line with conserving and use being married—I do believe we should catalog all the uninhabited islands in the ocean and get together a consortium of nations where we agree to keep these islands uninhabited because an uninhabited island is practical to make into a reserve. It can have 200 miles around it and be conserved. It's the nursery of the ocean. I think that is a more practical suggestion than wild reserves in the ocean."

Vadus pressed the point that, unlike the Navy sector, the civil sector is spending billions in basic research—with no one to pick up these ideas and turn them into usable technology. "There's no one to seed them; industry can't simply pick them up because a lot of the ideas are long range, high risk problems and industry has to look for a quick return on investment. What do we do?"

Spilhaus said, "Around the beginning of this century, most of the science and basic research was done in Europe at the great universities there. But the U.S. was full of entrepreneurs who picked up ideas from Europe and turned them into hardware. We were the great people who used other peoples' ideas. *That* was what built the United States. Then, we started developing our own research and, for a time, we developed our own hardware too. But now I'm afraid that what we're doing is all the research and *not* developing the hardware so that we have become the feeders of research to other countries, such as Japan and others. It's a repetition of history."

In all, those who witnessed either the original duel or the newer one came away with a much-needed common-sense short course in the basics as only Athelstan Spilhaus could deliver.

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***"You don't preserve the ecology by ruining the economy, which we have done in this country I'm sorry to say. You preserve the ecology by using it."***

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Spilhaus retorted: "Well, you're mapping and you're observing in the EEZ, but you're not *using* it! When you use something, you *use* it for some goodies that people need."

### Technology Aid for Industry

Moving on, Vadus then tackled the minerals extraction side of ocean resource utilization. He offered that NOAA or some other agency might assist industry to develop some generic technology that would aid the extraction process but that government can't go out there itself and mine and extract.

"No, and therefore you inhibit industry, which can," Spilly declared. "And that is what's happened in a lot of

"You're right. The U.S. has no ocean policy. The U.S. Navy has one—it has to have—and its policy is to be ready in case of war. I have the greatest respect for the Navy's continuing efforts to be ready. I think the poor Coast Guard should be mentioned. Every time a thing is unworkable or laws unenforceable—like the drug laws—the Coast Guard is loaded with the job. They don't give them any more money to do it but just load it with the job.

"It was a suggestion from someone in NOAA that we put reserves in the deep ocean; apart, you know, to keep them as actual wild reserves. Well that's totally unworkable. Its impossible to fence them; would the poor old Coast Guard have to go out into the deep ocean and enforce these reserves?"



## Engineers Confront Impact of Global Integration on Economic Climate and Their Profession

WASHINGTON, March 31 — Leading spokesmen for the engineering community warned colleagues that their profession and the government must adjust to new competitiveness challenges of a rapidly changing world marketplace. In a spirited workshop on global integration, held March 4, engineers were told that this new interdependence will open additional markets and bring about new employment opportunities. But there must be a greater emphasis on making and selling U.S. products abroad it was noted.

"You don't make money from R & D; you make money from products and distribution," said Merrill W. Buckley, Jr., president of The Institute of Electrical and Electronics Engineers, Inc., (IEEE). Buckley called for renewed emphasis on manufacturing competitiveness by U.S. companies, backed by aggressive government policy to promote industrial competitiveness.

"Once you lose market share," said Buckley, "you never get it back."

The global integration workshop, sponsored by the IEEE, highlighted the annual government affairs conference of the American Association of Engineering Societies (AAES). Panelists representing government, academia and industry cited various events that are rapidly changing the marketplace — such as the pending European Economic Union, establishment of a North American Free Trade Zone, the collapse of communism in Eastern Europe, and the growth of Pacific Rim economies. They agreed the U.S. government has a pivotal role in guaranteeing a free flow of products, services, ideas and people in the new global environment. "We helped everyone else," said Buckley. "Now we need to look at ourselves."

A major role of the IEEE, the world's largest organization of technical professionals, is the development and dissemination of standards, noted Marco W. Migliaro, an engineer with Florida Power and Light Co. and vice president of IEEE Standards. "But success is measured by the global acceptance of the standard," he added. "IEEE is transnational."

By the year 2000, nearly half the members of the IEEE will be non-US. citizens, Migliaro said. Today, 250,000 of the organization's 320,000 members reside in the United States.

Robert Myers, a principal economist for the World Bank, suggested that universities add foreign language training for engineers. Walter LeFevre, professor of civil engineering at the University of Arkansas, urged his colleagues to learn the cultures of other countries.

The "right to practice" is another major issue, said LeFevre, who is involved in the process of negotiating agreements over

accreditation and educational standards between the U.S. and other nations. He noted that the U.S. policy of regulation and registration of engineers by state governments is designed principally to protect the public welfare but may discourage engineers' mobility. In many countries overseas, he said, regulations exist which also serve to protect local engineers from competition.

The U.S. is also negotiating copyright agreements on a country-by-country basis, ensuring that computer programs are treated as literary works. Charlotte N. Douglass, principal legal adviser to the general counsel of the U.S. Copyright Office, said bilateral agreements are the first line of defense for intellectual property.

A European perspective was provided by John A. Kennerley of the United Nations, who described the new marketplace emerging in Eastern Europe and the Soviet Union and suggested that U.S. companies and engineers should begin participating.

The former Soviet bloc is vertically integrated, he said, and it has guaranteed supplies and markets and a huge employee pool. "Just remember", he added, "that it also has aging equipment, a collapsing market and a reputation for poor quality and standards." To do business there, one must learn the language and customs and make a long-term commitment. "You have to go on their terms," warned Kennerley, who is deputy director of the Industry and Technology Division of the U.N.'s Economic Commission for Europe.

There was considerable discussion during the workshop about Japanese trade policies and the appropriate U.S. response. Many of the participants noted Japanese companies take a long-range view toward product development and marketing, whereas U.S. companies look to the next quarterly report.

The World Bank's Myers suggested a comparison between the work practices of U.S. and Japanese managers. IEEE's Buckley noted the human factor that produces energized and motivated engineers in Japanese companies.

Every year, Sony introduces a thousand new products, said Will Stackhouse, assistant for high leverage technology at the Jet Propulsion Laboratory in Pasadena, Calif. Since the world population is growing at the rate of 250,000 a day, said Stackhouse, U.S. companies should be thinking about "high-tech, high-volume, low-end" products: "Look at how many Walkmans have been sold."

A full report on the workshop will be available from Chris J. Brantley in the Washington Office of IEEE-USA in the summer.





## Portable Pensions Is Legislative Goal for Highly Mobile Engineering Profession

WASHINGTON, April 24 — Legislation to expand pension coverage, reduce vesting requirements and improve the portability of benefits when people change jobs would also significantly enhance national saving and help improve U.S. competitiveness, say policy spokesmen for the technology engineering profession.

The United States Activities unit of The Institute of Electrical and Electronics Engineers, Inc. (IEEE-USA) is endorsing H.R. 2390, The Pension Coverage and Portability Improvement Act. The 250,000 IEEE members who live and work in the U. S. are being urged to write their representatives in Congress to support the legislation. The bill, sponsored by Representative Sam Gibbons (D-FL), is pending in the House Committee on Ways and Means.

"Most engineers have changed jobs several times in their careers," said George McClure of Winter Park, Florida, head of IEEE-USA's Pension Committee. "As a result, we have long been concerned about the effectiveness of the nation's voluntary pension system as a reliable source of retirement income for America's highly mobile workers."

Among problems he lists are: limited pension coverage among small businesses; vesting requirements that penalize mobile workers; the propensity of plan participants to spend rather than save pre-retirement lump sum distributions; the absence of minimum-benefit standards to ensure that workers will receive adequate benefits when they retire; and administrative requirements that make it increasingly costly for employers to set up and maintain pension plans.

But the problem of greatest concern to IEEE members and to many other mobile professional and technical workers is the lack of portability of earned pension benefits from defined benefit plans, according to Edward C. Bertnolli, who chairs IEEE-USA's National Government Activities Committee.

"Gibbons' bill will improve portability," Bertnolli said. "By permitting terminating employees to transfer their earned benefits to IRAs or other qualified plans and by using the long term cost of money rather than prevailing interest rates to determine the rollover value of such benefits, H.R. 2390 would substantially reduce the losses that currently result when workers change jobs."

"We are not being merely self-serving," adds Bertnolli, an engineering professor at North Dakota State University in Fargo. "Implementing H.R. 2390 will improve U.S. competitiveness. Pension funds provide much of the investment capital in this country, and industrial expansion requires capital."

Under the terms of the bill, employers lacking current retirement plans would be required to offer voluntary salary reduction savings arrangements for their employees. Those wishing to do so could contribute, on a salary-reduction (pretax) basis, up to 25 percent of compensation (or \$30,000) a year. After one year of service, employees would be fully vested, earning a non-forfeitable right to a pension benefit.

Terminating employees would have the option of leaving earned benefits in a former employer's plan or transferring those benefits to another plan or an Individual Retirement Account. The rollover or transfer value of earned benefits would be determined using an assumed (deflated long term) interest rate of three percent, rather than prevailing market rates, to help preserve the purchasing power of such benefits when workers change jobs.

The bill provides for the imposition of a 25 percent penalty tax on pre-retirement distributions that are not transferred to another qualified plan or to an IRA.

If pension coverage and portability do not improve substantially after five years, H.R. 2390 would establish — for those not already receiving equivalent or better retirement provisions — a privately administered minimum benefit pension system to which employers would contribute at least six percent of compensation. Employees would be permitted to make matching contributions.

IEEE members are being asked to write three letters — to their House Member and to the Senators from their state — in support of H.R. 2390.

The addresses are: U.S. House of Representatives, Washington, DC 20515; and U.S. Senate, Washington, DC 20510. Copies should be sent to Vin O'Neil at the Washington Office of IEEE-USA, 1828 L Street, N.W., Suite 1202, Washington, DC 20036.

# Ocean Space Utilization: A NOAA Perspective

John J. Carey

and

Joseph R. Vadus

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Washington, D.C. 20235

## ABSTRACT

The National Oceanic and Atmospheric Administration (NOAA) is the leading U.S. Government Agency providing a scientific, managerial, and supporting role in the development; utilization; and conservation of the oceans and their resources in harmony with the environment. NOAA programs and responsibilities are aimed at national needs and priorities influenced by trends and needs on a global scale. World population growth; greater dependence on the oceans and resources for basic societal needs; development of the Exclusive Economic Zone (EEZ); global environmental change due to warming, natural hazards, and marine pollution; and marine resource degradation and depletion all impact ocean space utilization. Many inter-dependent NOAA programs address these trends and needs with emphasis in four areas requiring international, interagency, and intra-NOAA coordination. These are: the Coastal Ocean Program, Climate and Global Change Program, Data and Information Management Program, and Marine Modernization Program referred to as the Marine Resources and Oceanic Services 2000 Program. Because of the broad scope of NOAA Programs, this paper is limited to providing only a selective overview of marine activities pertaining to ocean space utilization.

## INTRODUCTION

NOAA is the leading civilian U.S. Government Agency involved in a broad spectrum of ocean activities concerned with ocean space utilization. In this regard, NOAA's mission is to: monitor, record, analyze, and predict changes in the ocean environment, including its interface with the atmosphere and land mass; and promote long-term stewardship of the oceans and their resources.

In fulfillment of its ocean-related mission, NOAA's primary responsibilities include:

- Mapping and charting U. S. waters, especially the EEZ.
- Acquiring, analyzing, disseminating, and archiving ocean data.
- Managing marine living resources and protected species.

- Assessing, managing, and restoring the marine environment.
- Environmental monitoring for assessing and predicting changes.
- Assessing, conserving, and managing the ocean and its resources, especially within the EEZ.
- Protecting life and property due to natural and manmade marine and coastal hazards.

These ocean-related responsibilities contribute substantially to the Department of Commerce's goals to: support a vigorous national effort to better manage our ocean and coastal environment; and contribute to the U.S. Global Change Research Program. Through its efforts in assessment, conservation, and management of the ocean and its resources (such as fisheries), NOAA contributes to international trade.

NOAA's five main-line organizations (National Ocean Service; National Marine Fisheries Service; National Weather Service; National Environmental Satellite, Data, and Information Service; and Office of Ocean and Atmospheric Research) perform valuable functions and projects that contribute to fulfilling NOAA's ocean-related responsibilities and major goals. Of these organizations, the National Ocean Service has the broadest perspective in ocean space utilization. To improve execution of its responsibilities through better performance and increased quality of its ocean-related products and services, NOAA is developing a strategic plan for a marine modernization program—Marine Resources and Oceanic Services 2000 Program. NOAA's National Ocean Service will provide the leadership and focal point for developing and implementing such a plan in cooperation with the other four main-line organizations. The National Weather Service is in the midst of implementing their plan for modernizing the weather service which was initiated almost 10 years ago. Now the focus is on planning for the modernization of ocean services. NOAA will continue to maintain close cooperation with other Federal agencies, especially the Navy in the: collection, processing, prediction, and dissemination of ocean-related data and information; and application of advanced technology and new techniques.

The OCEANS '91 Conference, with its theme pertaining to ocean technologies and opportunities for the 90s, is an excellent forum to introduce the technological aspects of marine modernization as it pertains to ocean space utilization.

## TRENDS AND NEEDS

In today's global economy and global phenomenon producing environmental change, global trends and needs are becoming

ing increasingly important, as well as their implications on a national scale. Some of the major trends, problems, and needs are briefly described below.

### **Population Trends**

World population has been growing exponentially and is expected to double over the next 40 years, from over 5 billion to about 9 billion. This steady increase equates to less land per person, doubling the need for food, water, energy, and material resources along with a significant impact on our environment. Even without doubling the population, most of the world population (located mainly in developing nations) need the basic resources of food and energy.

The oceans represent an extremely valuable resource upon which we have become dependent. As we approach the 21st Century and wish to maintain or improve the quality of life, it is an absolute certainty that we will rely more and more on the oceans and their resources. People are attracted to the seashore for better living and recreation. In the U.S. and in other ocean-bounded, developed nations, population and industry are seeking locations closer to the coast and the trend is increasing. In the U.S., over half the population lives within 50 miles of the coast and this could be as high as 75 percent early in the 21st Century. In Japan, the figure is closer to 70 percent due to the relatively uninhabitable mountainous terrain. Japan's need for additional coastal real estate has resulted in a very ambitious coastal revitalization and waterfront development programs, as well as development of artificial islands dedicated to a variety of uses (recreational facilities; offshore international airports; and integrated use providing high-quality living, working, educational, and recreational facilities). Major ports and harbor communities in the U.S. (i.e., Los Angeles, Long Beach, Baltimore, and New York) have begun or plans have been initiated for large-scale ocean space revitalization projects.

### **Exclusive Economic Zone (EEZ)**

Declaration of 200-mile EEZs has significantly expanded jurisdictions of ocean-bordering nations; for example, Japan by almost twelve, the United Kingdom by almost five, and Canada and the United States by almost two. The major beneficiaries in the near term will be the developed nations that have the technology and resources to exploit these vast new domains. About 85% of the U.S. EEZ and its resources are in the Pacific Basin, and the greatest rate of physical and economic development is occurring in Pacific Rim countries. Increased development to satisfy a burgeoning population's needs will mean extracting more resources from the EEZ, with the attendant problems of resource depletion, management of renewable resources, and the potential for continued environmental degradation by ignoring protective commitments, especially in the coastal ocean. The EEZ provides enormous marine resource potential and opportunities for wise development and utilization to meet the burgeoning needs of population growth.

### **Coastal Ocean Space**

Coastal ocean space is defined as the area from the high-tide levels of the coastal region out to and including the continental shelf within the 200-mile EEZ of each coastal nation. A broad spectrum of activities in this ocean space includes: fisheries development, extraction and management, energy and minerals extraction, marine transportation, port and harbor operations, coastal-dependent industrial activities, coastal living, and marine recreation.

Multi-use conflicts within the EEZ and coastal ocean are inevitable and sometimes desirable to obtain the greatest economic and social benefits. These conflicts are major concerns, as well as related issues of inefficiency; delays in production; and losses due to nonuse. These issues affect fulfillment of future needs, economic growth, and international competitiveness. Resolving multi-use conflicts requires a comprehensive, geographically organized information base on geological, physical, biological, chemical, and other characteristics of the coastal ocean. In addition, the data base should contain information on the location and extent of human activities in the coastal ocean region. This foundation, together with an understanding of specific multi-use conflicts, makes it possible to conduct initial, "strategic" assessments to determine the need for more site-specific data.

### **Environmental Consciousness**

A trend exists for greater environmental consciousness and coastal ocean space development in harmony with the environment. In the past, some environmental damage has already been done to coastal regions by marine pollution, coastal erosion, and coastal smog. Environmental programs have begun measuring, monitoring, and assessing environmental health; steps are being taken to stop further pollution and reduce the impacts; and new developments are expected to carefully consider potential impacts to the environment. Some of the environmental degradation problems have international implications and require cooperative efforts.

### **Global Warming**

The phenomenon of global warming over the past century has been attributed to atmospheric accumulation of greenhouse gases such as carbon dioxide and methane which are produced by all forms of combustion, especially automobiles, power generation, and the burning of wood in clearing forested land (i.e., Amazon rain forest). The environment's ability to assimilate carbon dioxide is being reduced because expanding urban development, deforestation, and destruction of rain forests increase the losses of trees and vegetation—the natural assimilators of carbon dioxide. The processes and capacity of our oceans to assimilate or release carbon dioxide is not well known at this time. Though exact figures cannot be predicted, the general consensus is that global warming will increase and produce deleterious effects impacting agriculture, causing sea-level rise, and affecting quality of life while society adjusts to its effects.

Over the past 50 years, the global sea level has risen at about 3.0 millimeters a year (three times the rate of the previous 50 years). If this trend continues or possibly escalates, sea levels could rise as much as 30 to 60 cm by the middle of the 21st Century, flooding some coastal cities and villages. This will create a concern in designing and constructing homes, buildings, ports, and harbors for future coastal communities.

### **Natural Hazards**

Earthquakes, tornadoes, and hurricanes are among the major natural hazards causing severe environmental damage and deaths, resulting in billions of dollars in losses. The U.S. has the highest incidence of severe storms than any other nation in the world. The general causes and effects are well known and documented, and technology for detection, assessment, and prediction is available.

Over the last 40 years, about 25 major hurricanes (Category 3 & 4) were experienced in the U.S., with winds between 160 to 230 km-per-hour and storm surges between 3 to 6 meters; only one Category-5 hurricane was reported in 1969, with winds greater than 230 km-per-hour and surges greater than 6 meters. Over this 40-year period, coastal regions have been developed considerably in the U.S., as well as in other Pacific Rim regions vulnerable to frequent hurricanes or typhoons. A Category-5 hurricane would be devastating to a heavily developed coastal region. Hurricanes have caused considerable loss of lives and billions of dollars in damage from winds and especially storm surges.

### **Coastal Degradation and Depletion**

Overdeveloping coastal areas and reducing natural barriers and buffers created by wetland vegetation (i.e., mangroves, sea grasses, and other aquatic vegetation) have caused serious erosion and damage to valuable coastal properties and resources. Coastal wetlands play a vital role in providing marine habitat and contributing to the complex life cycles of a myriad of interrelated marine life that are part of the overall coastal estuary and fishery food chains. Coastal wetlands throughout the world are being lost due to natural processes and man-induced causes associated with development and human activities. In the U.S., new regulatory policies are evolving to ensure no wetland net loss due to future development or natural causes. However, experience in creating wetlands on deposited dredged materials is still primitive.

In the U.S., Florida and Louisiana account for about 49 percent of the coastal wetlands and Louisiana accounts for a major portion of the losses. The rate of loss in Louisiana has accelerated from about 5 square-miles-per-year to about 50 square-miles-per-year. This is equivalent to losing 1 percent of the remaining wetlands per year. In Louisiana, the intensive wetland system has been greatly altered by the construction of many canals, especially large canals for access to oil and gas wells, laying pipelines, and navigation. This has

resulted in significant wetland loss and further damage by saltwater intrusion into the canals. A variety of engineering approaches has been pursued or proposed to slow the rate of wetland loss.

### **Marine Pollution**

Marine pollution is reaching finite limits in many coastal areas, as highlighted by beach closings, prohibitions on shellfishing, habitat losses, and health warnings to seafood consumers. Many coastal regions around the world, especially near major population centers, have reached critical stages of marine pollution due to sewer outfalls, ocean dumping, land runoff, shipping discharges, and plastic debris from marine recreational activities and marine vessels. In addition, industrial waste and effluents are being discharged in coastal waters, and in rivers and streams that terminate in coastal estuaries. Hazardous materials spills, especially those occurring in coastal waters and within the EEZ, are a major polluting concern. Major oil spills such as the EXXON VALDEZ (spilling 11 million gallons) and the AMOCO CADIZ (spilling 60 million gallons) provide documented results of the damaging effects on marine life, marine habitat, beaches, wetlands, and on the economy and quality of life in coastal communities.

### **Resource Degradation**

Degradation and depletion of fishery resources due to marine pollution and loss of habitat is a serious problem facing the increasing world population and its growing dependence on fish products for protein. Marine pollution in coastal estuaries and the coastal ocean has affected the quality and abundance of the entire fishery food chain. In the U.S., coastal areas are monitored and assessed regarding water quality and safety of fish products. Many areas have been designated as unfit for harvesting fish or shellfish products. In the past 5 years, approved acreage for harvesting shellfish has decreased from 68 percent to 65 percent.

Fisheries management will continue to play a key role in assuring maximum sustainable yields are not exceeded and future stocks are abundant and healthy. Many cases exist worldwide where fishery stocks have been depleted due to overfishing and maximum sustainable yields have been exceeded. To offset these problems, other means are needed to increase abundance.

### **MAJOR MARINE PROGRAMS**

NOAA programs are initiated and structured to carry out responsibilities in accordance with national needs and priorities, and within budget limitations. Presently, four marine-related programs are central to NOAA's activities: the Coastal Ocean Program (COP), Climate and Global Change Program, Data and Information Management Program, and

Marine Resources and Oceanic Services 2000 Program which is currently under development (discussed later).

### **Coastal Ocean Program**

This program is a focused effort to integrate NOAA's scientific and technological capabilities and existing coastal-oriented projects to address major coastal issues and problems in terms of total system—not by bits and pieces. The Coastal Ocean Program will strive to improve research, data collection, modeling, analysis, and prediction capabilities in support of NOAA's operational marine programs. Program objectives are keyed to economic and environmental concerns.

Over 70 percent of the Nation's economically important fisheries species depends on estuarine habitats during some phase of their life, yet these habitats are under increasing pressure from: coastal development, excessive nutrients from agricultural runoff, effluents from sewage treatment plants, and freshwater diversion. An objective of this program will be to increase the ability to predict change in the quality of the coastal environment and its living marine resources to avoid further habitat degradation and to recommend mitigating measures.

Present models used to predict fishery stocks are often too simple to reflect complex marine environments. This results in very large error margins which may lead to over-harvesting, depleting an important stock of fish, or under-harvesting resulting in economic hardships for the fishing industry. A balance between responsible conservation and reasonable harvesting is urgently needed. An objective of this program will be to improve the ability to predict the influence of fishing activities, habitat degradation, and natural forces on living marine resource quality and abundance.

Continued utilization and industrial development of coastal areas, expansion of fisheries, and growth in offshore mineral and oil exploration expose the coastal community to dangers of natural hazards and problems of man-induced impacts. An objective of this program will be to increase the ability to: predict the occurrence of natural hazards; reduce the adverse effects of storms, flooding, and erosion; and provide information for planners to minimize multi-use conflicts.

### **Climate and Global Change Program**

The global environment is constantly changing due to natural processes and periodic events such as natural hazards and man-induced causes, resulting in global warming, ozone-hole creation, marine pollution, and resource degradation and depletion. Many international cooperative programs are underway to measure and assess global environmental change. In the U.S., the centerpiece of activity is the Global Change Research Program that was initiated as a high-priority Presidential Initiative in 1990. The goal of this program is to establish the scientific basis for national and international policy-making relating to natural and human-induced changes

in the Global Earth System. This program involves seven agencies and over 100 global change research projects. NOAA's Climate and Global Change Program is a critical component of this program, focusing on the most societally relevant aspect of global environmental change the Global Climate System. NOAA provides the principal operational monitoring, research, prediction, and information services in this national effort. NOAA's long-term objective is to provide reliable predictions of global climate change and associated regional implications on time scales ranging from a season to a century or more.

NOAA will continue to be responsible for operational in-situ, satellite observations, and monitoring programs; mission-directed research on physical and biogeochemical processes in the climate system involving greenhouse gases, including effects of marine ecosystems; development, testing, and applications of models and diagnostic techniques for detecting and predicting natural and human-induced climatic changes; and the acquisition, maintenance, and distribution of long-term data bases and related climate information.

Planned activities include: filling significant gaps in upper ocean and marine cryosphere observations; implementing a global sea-level monitoring network; providing global change measurement products derived from operational satellites and in-situ observations; and establishing a comprehensive data and information management system. Some major climate-related projects in which NOAA is participating are: World Ocean Circulation Experiment (WOCE); Ocean Topography Experiment (TOPEX); Global Ocean Flux Study (GOFS); and the Tropical Ocean-Global Atmosphere (TOGA) Project.

### **Data and Information Management Program**

In performing its mission to measure, observe, model, analyze, and define the oceanic and atmospheric environment; and describe changing conditions and make predictions, NOAA acquires and processes vast amounts of data and information derived from its own programs and from a large number of external sources.

NOAA acquires about 20 terabytes of data every year; its data management systems are operating at full capacity and are unable to keep pace with the 10 percent growth of the last few years. It is estimated that NOAA will have to handle over 200 terabytes per year by the year 2000. Much of this data is used on a real-time or near real-time basis and then stored for retrospective use. A large portion of this data is marine-related, using data and information collected by a wide variety of instruments and systems deployed on, under, and over the seas.

NOAA presently archives about 200,000 magnetic tapes containing environmental data. Eighty percent of these tapes does not have a backup and half are over 10 years old, approaching the life expectancy of these tapes. Overall, more than half of the storage data is inaccessible, incompatible,

suspect, damaged, or otherwise at risk. Many problems developed over the years stem from the lack of uniform, coordinated data collection and processing procedures, or from aging technological infrastructures which do not have the capacity and capability for adequate data handling, processing, storage, and accessibility. Recognizing past problems and the importance of an integrated and coordinated data and information system, NOAA has initiated the Earth System Data and Information Management (ESDIM) Program to integrate common elements of data and information through infusion of advanced technology and modernization of the technological infrastructure commensurate with research and operational needs. The ESDIM program is a long-term effort that will affect every aspect of NOAA's activities and requires the active participation of industrial, scientific, and academic communities. The ESDIM Program is a network of environmental data centers fully automated and distributed across the agency. There will be several "main" data centers—developed from the existing National Data Centers—and numerous, semi-autonomous "branch" sources of data supporting NOAA's specific Line Offices and Program Offices. An Automated "top-level" master directory will identify all holdings and will enable a user to gain access via a personal computer system coupled to high-speed telecommunication networks.

#### **MARINE PROGRAMS & ACTIVITIES IN SUPPORT OF MAJOR NOAA PROGRAMS**

Some marine programs and activities pertaining to ocean space utilization, in support of major NOAA Programs covered in the preceding section, are briefly described below.

##### **EEZ Mapping**

The U.S. EEZ is the objective of a very ambitious survey program covering 3.9 billion acres or 7.6 million kilometers squared. The U.S. Geological Survey has completed 60 percent of the EEZ in the survey, using the British GLORIA side-scan sonar, projecting a 40-km swath with a resolution of about 500 meters, conferring about 26,000 square-km-per-day. This resolution provides a broad look without the detail needed to conduct many site-specific projects. To provide the increased detail, NOAA in cooperation with the USGS GLORIA Survey Program is using the Sea Beam System projecting a 2.5-km swath with a depth resolution of about 15 meters, covering about 700 square-km-per-day. This higher-resolution NOAA system has completed about 3 percent of the EEZ, using four Sea Beam Survey Ships. At this rate, it will take 100 years to complete; however, not all of the EEZ needs such detail. Computer processing, using graphic techniques combining GLORIA and Sea Beam Data, creates three dimensional images for easier interpretation.

#### **Satellite and Buoy Operations**

The most significant advance in ocean data collection has been the environmental observation and data relay satellite technology. Satellites and satellite communicating systems have enabled the collection of a broad spectrum of data from the world's oceans with an efficiency never before possible. In-situ observations are essential complements to satellite measurements and rely on satellites telemetry for data reply, particularly for real-time data from remote locations. Satellite telemetry enables the NOAA Data Buoy Center's (NDBC) moored buoy and coastal station networks to provide real-time data via the Geostationary Operational Environmental Satellite (GOES). It also enables near real-time receipt of data from more remotely deployed drifting buoy systems via the ARGOS System on NOAA Polar-Orbiting Satellites.

Environmental satellites are equipped with sensor systems for making remote ocean measurements. Capabilities include: imagery (both visible spectrums for cloud patterns and derived upper winds; and ocean color and infrared for ocean fronts and eddies); microwave radiometry (for sea-surface and sea-ice temperatures); radar altimetry (to determine sea-surface topography, ice edge, significant wave height, and wind speed); radar scatterometer measurements (sea-surface wind); and microwave synthetic aperture radar (for directional wave spectra).

Satellite systems provide synoptic coverage on a very broad scale of ocean surface and subsurface characteristics. For example, surface temperature images of the entire gulf stream are obtained from composite data collected by the Advanced Very High Resolution Radiometer (AVHRR) aboard the NOAA Polar-Orbiting Meteorological Satellite. The Tropical Ocean-Global Atmosphere (TOGA) Program uses satellite data to infer changes in mass distribution of the equatorial oceans influencing global weather and climate changes that lead to predictions such as the occurrence of EL NINO in the east central Pacific. To collect data below the sea surface, the NDBC operates one of the most extensive in-situ marine environmental real-time observing networks in the world, consisting of over 50 moored buoys and 40 coastal stations. In addition, NDBC maintains a continuous network of about 50 drifting buoys in the Southern Ocean for the TOGA Program, along with other smaller drifting buoy networks throughout the world's oceans.

A typical moored buoy measures: wind speed and direction, air and surface-water temperatures, significant wave height and period, wave spectra, and barometric pressure. Drifting buoys provide air and sea-surface temperatures, barometric pressure, and ocean current drift track.

##### **Tropical Ocean-Global Atmosphere (TOGA) Program**

As a participant in the U.S. Global Program, NOAA is conducting this major climate project in the equatorial east central Pacific and has demonstrated the existence of interac-

tions between tropical oceans and the global atmosphere. Such interactions are typified by the EL NINO/Southern Oscillation (ENSO) phenomenon, which affects a large segment of the world's population living along the Pacific Rim. TOGA aims to establish an operational climate prediction capability and an observation network to support it. The program is concerned with the: response of the currents and thermal structure of the equatorial oceans to changing patterns of wind shears and other atmospheric forcing; and feedback of the tropical ocean dynamics on the global atmospheric circulation. The program intends to: predict the state of the tropical ocean, including the distribution of sea level, thermocline depth, and sea surface temperature (out to 1 year or more in advance); and specify concurrent anomalies in tropical rainfall, jet-stream locations, and storm tracks. Some success has been achieved in making forecasts of major swings in the ENSO cycle a season or more in advance, using statistical prediction techniques and simple dynamic models of the coupled atmosphere/ocean system. NOAA has a major role in developing and installing an extensive ocean observation network. This includes an array of about 60 moored ATLAS buoys to measure wind speed and direction, air temperatures, and subsurface temperatures to 500 meters and send multiplexed data via an ARGOS satellite transceiver. The TOGA observing network will continue to use data obtained via satellite from about 50 drifting buoys and from many ships of opportunity, traversing the Pacific area. About 120 of the ships are equipped with NOAA's Ship Environmental Data Acquisition System (SEAS) to obtain XBT data, wave characteristics, surface temperatures, atmospheric pressure, and wind speed and direction, transmitted via satellite.

### **Global Sea-Level Measurement**

A global sea-level measurement network is available for measuring absolute sea-level rise rather than sea-level rise relative to a land-based reference which may not be stable over time. This network currently consists of about 16 stations worldwide. Very Long Baseline Interferometry (VLBI) techniques are used to obtain position accuracies of about 1 cm. This is accomplished by having two stations, separated about 10,000 kilometers (km) apart, simultaneously tracking an extra galactic source such as a quasar. Each station receives the same radio signals; however, since each station is at a different geodetic location, the return signal is slightly displaced in time, as measured by a phase difference error. Since the distance between stations is known and triangulation on a quasar is obtained, any land instability due to an earthquake or land subsidence is known within a 1-cm deviation.

NOAA's next generation water-level measurement gages can be referenced to a VLBI geodetic fix for an absolute water-level measurement accuracy of 1-cm or less. Similarly, the Global Positioning Satellite (GPS) System can also be tied into a geodetically accurate system. GPS will consist of about 22 satellites by 1992 and will provide global coverage.

Presently, 26 gages exist in the U.S. and about 10 others in the Atlantic and Pacific are coupled with VLBI and the GPS system to measure sea-level rise. These measurements over time will enable better sea-level predictions to plan for future coastal development and protection against flooding.

### **Status and Trends Program**

This program has been underway at NOAA over the past 6 years and involves: sampling bottomfish, shellfish, and sediments at about 300 sites in coastal waters around the U.S.; making laboratory measurements of over 70 chemical contaminants in sediments, fish livers, and bivalves; and analyzing annual measurements for year-to-year comparisons to determine the status and trends in pollutant levels. Every year, 10 percent of the samples is cryogenically stored at -150°C to permit retrospective analysis as new analytical techniques become available. Based on 6 years of measurements, the highest concentrations of both trace elements and organic contaminants were found near major coastal cities of Boston, New York, San Diego, Los Angeles, and Seattle. Except for a few sites around Florida, contaminant levels at sites in the Gulf of Mexico and southeastern U.S. were relatively low. Even in high concentration areas, sampling was conducted at "hot spots" near waste discharge sites or industrial zones to find concentrations that could cause harmful biological effects.

### **Strategic Assessment Program**

This program provides data and information to multiusers of the coastal environment to enable them to make informed decisions on the use of the ocean and its resources. This program has collected, compiled, processed, and analyzed vast amounts of information on everything in and about the coastal ocean, including: oceanographic characteristics; available resources; industrial and shipping activities; and ocean disposal sites. This information is recorded in atlases for most of the U.S. EEZ. To facilitate entry and access, data and information is electronically-stored and accessed using Geographical Information System (GIS) techniques; and then processed, analyzed, and printed out for hard-copy dissemination. Desktop information systems are used to enable resource managers and researchers to easily access the vast body of available information. These systems include the: CMAS (Computer Mapping and Analysis System) which provides spatial and temporal distributions of coastal ocean living resources; COMPAS (Coastal Ocean Management and Assessment System) which obtains coastal resource information and provides summary analyses in graphic or mapped formats; and GeoCOAST (Coastal Ocean Geographical Information System) which addresses environmental quality issues for management and protection of the coastal area, including the EEZ.

## Hazardous Materials Response Program

NOAA's Hazardous Materials Response Program provides scientific support coordination to the U.S. Coast Guard for all hazardous material spills. This includes critical information on: spill trajectory projections, chemical hazard analyses, and sensitivity assessments of the marine and estuarine environments to spills. Over the last decade, this program responded to 2,000 spills, the largest being the EXXON VALDEZ. Using a desktop computer system, NOAA's Computer-Aided Management and Emergency Operations (CAMEO) Program enables emergency planners and first responders to handle chemical accidents. The program is so successful that over 4,000 systems are now being used by local fire departments, state hazardous materials departments, and port and harbor authorities.

## Storm Surge

Hurricanes have caused considerable loss of lives and billions of dollars in damage from winds and especially storm surge. Storm surge is primarily generated by sustained hurricane-driven winds. NOAA has developed a storm surge numerical computer model technique called SLOSH (Sea, Lakes, and Overland Surge from Hurricanes) that provides early warnings to coastal communities and predicts the hurricane course, storm-surge levels, and extent of penetration over land. Computer models are available for 40 basins around the U.S. Atlantic Coast and Gulf of Mexico. An ordinary personal computer can run the model, using hurricane parameter inputs from NOAA's National Weather Service such as position coordinates storm size, and central pressure. A wind model is incorporated in the computer program. Computer-model inputs are provided every 6 hours, beginning 48 hours before landfall and ending 24 hours after land-fall. Atlases for each basin show the maximum overland excursion of storm surge for different severity levels. This provides city planners with information to identify evacuation routes and locate emergency facilities. The computer program provides emergency personnel with information on the course and severity of the impending hurricane to enable decisions regarding evacuation or other emergency measures.

## Global Ocean Observation System

NOAA has been working towards implementing a global ocean observation network by: incorporating present systems; adding to present systems; and expanding to incorporate new technology and systems. Some of the present NOAA systems include the: National Water-Level Observation Network; Global Sea-Level Rise Network; TOGA ocean-observing array; 9,000 Volunteer Observation Ships (VOS) Program, collecting meteorological and oceanographical data; National Data Buoy Network of over 50 moored buoys, 40 coastal stations, and about 50 drifting buoys in the southern ocean for the TOGA Program; Geostationary Operational Environmental Satellite (GOES); NOAA polar-orbiting satellites; and

access to data from the Navy GEOSAT, and international satellites and data observation networks.

In developing a global ocean observation program, a systematic approach is necessary to keep things in proper perspective after the broad goals and objectives are stated. The first steps involve identifying the major problems and issues and placing some rank order on criticality, timeliness, and importance. Scientific needs and requirements must be identified to address a broad scale of program elements ranging from obtaining a better understanding of the problem, to numerical modeling and long-term verification, and to routine monitoring and analyses. These needs and requirements establish a basis for: design, development, system integration, deployment, operational and calibration protocols, data formatting, collection and dissemination, and field support for logistics and maintenance. Before implementing scientific needs and requirements, an inventory of existing platforms, instrumentation systems, and related supporting systems must be obtained. Many of these systems are already available or can be modified for use.

By systematically collecting, analyzing, and storing data from all national and international observation networks, comparisons of like categories of information can be made on a seasonal, annual, and decadal basis to infer the scope and extent of global environmental change. International cooperation is essential and a central body is needed for planning, coordinating, and exchanging information.

## MARINE RESOURCES AND OCEANIC SERVICES 2000 PROGRAM

This program pertains to the technological infrastructure and facilities used in the aforementioned programs in conducting laboratory and operational research, through data collection, observations, data processing, modeling analyses, and telecommunications. To carry out marine programs, NOAA employs approximately 4000 employees at 30 laboratories or field facilities. NOAA has the largest oceanographic fleet in the world with an inventory of 23 vessels, a data buoy network of 25 large moored units and 50 drifting buoys, and an array of about 16 ATLAS buoys dedicated to the TOGA program in the east central Pacific. NOAA's satellites play a vital role in collecting vast amounts of data from the ocean surface, subsurface, and adjacent atmosphere. From these major platforms, marine scientific instrumentation and measurement systems are deployed along with associated data processing and telecommunication systems.

NOAA's ability to respond to the broad spectrum of high-quality requirements of present and future programs in an efficient, timely, and productive manner will require infusion of advanced technology and modernization of the technological and operational infrastructure.

NOAA's present operational infrastructure suffers from significant deficiencies which result in lower quality data, lost



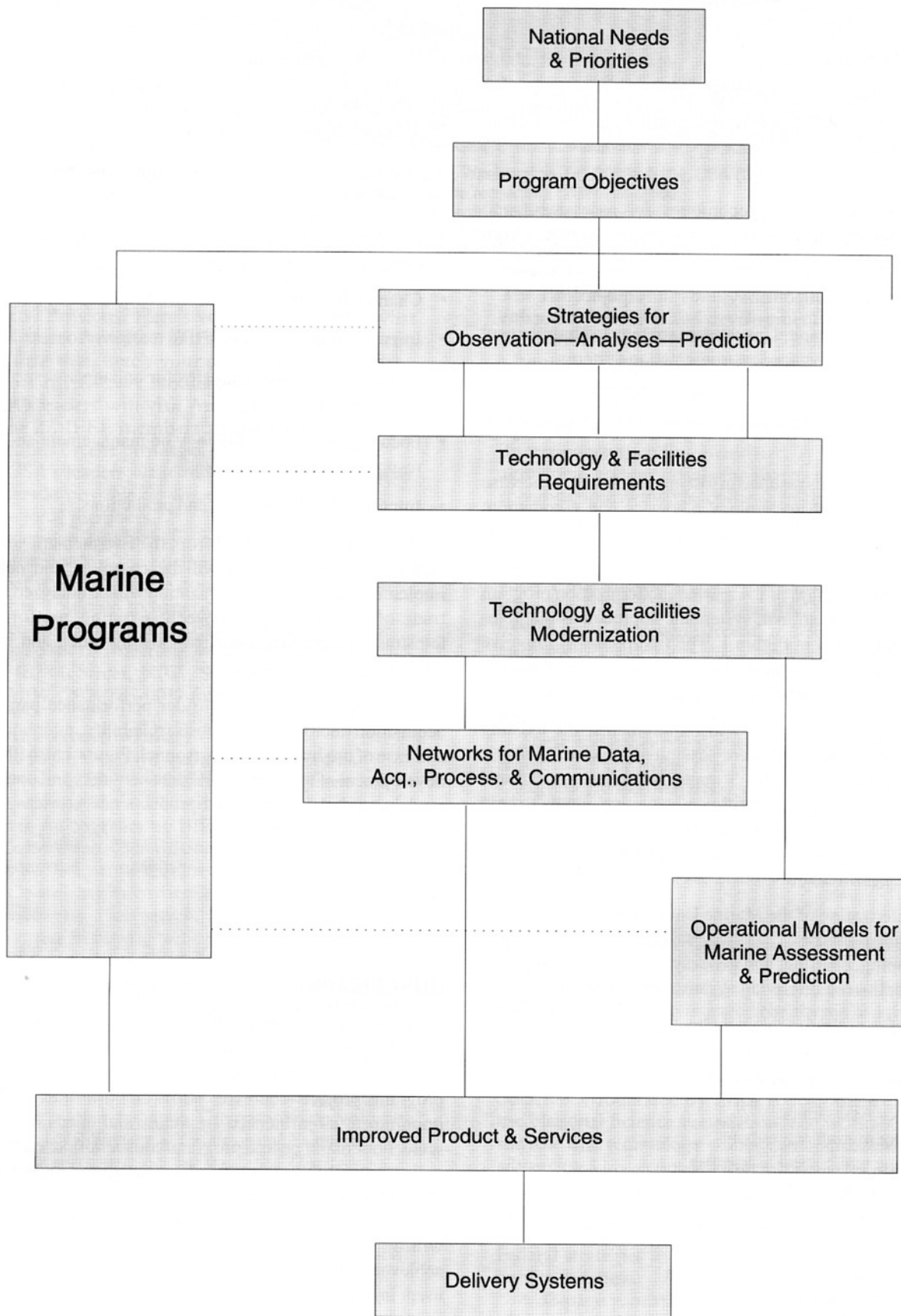


Figure 1. Implementation for Marine Modernization 2000.

data, delays, inefficiencies, reduced productivity; and inhibit successful performance. In general, these deficiencies include:

- Obsolescent or labor-intensive technology for observation, sampling, and analysis (dating in some cases to 1960's state-of-the-art).
- Out-dated operational techniques for assessment and prediction that do not incorporate scientific advances from the 1980s.
- An aging fleet with older systems and equipment.
- An absence of a capital investment strategy to phase-in new platforms and advanced instrumentation systems.
- Ad hoc approaches to the synthesis and dissemination of marine resource data and environmental information to decisionmakers.

These deficiencies resulted in lost opportunities to: increase productivity through technology advances and automation; and to improve the precision and quality of NOAA products and services.

The implementation of the marine modernization program will be based on a rational, systematic approach as diagrammatically illustrated in Figure 1. The first phase will involve identifying program needs and priorities that can be translated into objectives and technical requirements.

In order to derive needs and requirements, the existing marine programs/projects were structured into five thematic areas, allowing each of the 5 major NOAA organizational components to provide scientific and technical inputs to help define the technical infrastructure which can be integrated and efficiently shared in use. The five thematic areas are listed below, along with major constituent elements.

- Characterization of the Marine Environment
  - Marine research
  - Mapping, charting, and geodesy
  - Global ocean observing system
- Prediction of Environmental Change
  - Coastal ocean monitoring
  - Marine forecast and predictions
- Resource Assessment
  - Living marine assessment
  - Marine and coastal assessment
  - Energy and minerals
- Conservation and Management of Resources
  - Marine-protected areas and habitats
  - Coastal and marine management
  - Marine recreation

- Protection of Life and Property
  - Marine and coastal hazards/mapping
  - Marine hazardous response
  - Storm-surge protection

In order to provide initial direction, major program objectives include the following:

- Develop an integrated system for ocean observation, analyses, and prediction.
- Characterize the U.S. EEZ.
- Improve management of living marine resources.
- Develop protection strategies for endangered species and marine mammals.
- Focus science and technology on management and trustee responsibilities.
- Improve marine forecasts and predictions.

All requirements derived from the five thematic areas and initial program objectives will be compiled and needs for implementing marine modernization will be analyzed to make trade-off comparisons between: existing platforms/systems/instrumentation; modified existing units; and new advances.

Trade-off studies will consider performance parameters, acquisition and operational costs, reliability, maintainability, and ease of use by scientific personnel. Figure 1 also illustrates development of modern marine data networks and operational models needed for improved products and services, and related delivery systems.

A strategic plan for this program is currently being developed.

## CONCLUSION

NOAA is the leading civilian U.S. Government Agency providing a scientific, managerial, and supporting role in ocean space utilization. A broad spectrum of NOAA programs/projects addresses needs and priorities of national importance, as influenced by trends and needs on a global scale. Four major central programs are identified, including an important marine modernization program known as the "Marine Resources and Oceanic Services 2000 Program." In developing the strategic plan, the public and private sectors will be solicited to ensure national goals and priorities are achieved, and useful products and services are provided to users in the ocean community.

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## IEEE-USA Open Forum Coming to Anaheim

What are the problems in your area right now? Unemployment? Competitiveness of your industry's global markets? Pensions? Here's your chance to hear what IEEE United States Activities (IEEE-USA) is doing about them. More than that, here's your chance to sound off on what you think IEEE-USA should be doing about them.

IEEE-USA's leaders will visit Anaheim, California on Saturday, June 27. IEEE members are invited to come and speak their minds on the professional problems in their area. IEEE-USA's leaders want and need feedback from as many members as possible on what can and should be done to serve local members.

Enhancing careers and influencing government policy on behalf of members is the business of IEEE-USA. Come and learn what is already being done, and tell the leaders what more they could do to benefit you!

For advance information on IEEE-USA programs, or any questions about the meeting, write, phone or fax IEEE-USA, 1828 L Street, N.W., Suite 1202, Washington, D.C. 20036-5104; (202) 785-0017 (office); (202) 785-0835 (fax).

## Updated Employment Guides Available

IEEE-USA is publishing two updated editions of its popular two-volume *Employment Guide for Engineers and Scientists*. This practical guide to finding or changing employment is put together by IEEE-USA's Employment Assistance Committee. One edition is specifically written for engineers and scientists who have employment experience. Containing information on salaries and solid advice on conducting a job search, this edition also provides assistance in coping with job loss, writing resumes, working with employment services, networking with colleagues and friends, interviewing, evaluating the compensation package, and knowing your legal rights in the employment process.

An alternate edition is written for students and contains basic information about how to conduct a job search. Special features include a list of the 50 most-asked questions during a job interview. The companion volume to both editions is a *Directory of Employers of Engineers*. Listing hundreds of companies by state, the *Directory* includes telephone numbers and contact persons.

IEEE-USA provides complimentary copies of the *Guide* to unemployed U.S. members above student grade. Put your request in writing, including your member number, and mail it to the IEEE-USA Office in Washington, D.C. Both editions are also sold through IEEE's Service Center at a cost of \$14.95 to members and \$19.95 to non-members, plus tax and shipping. To order, call (800) 678-IEEE and request IEEE Catalog No. UH0186-7 for the experienced engineer edition or UH0188-3 for the student edition.

## President's Budget Highlights Research and Development

The Bush Administration continued its emphasis on enhancing research and development as an investment in the Nation's future in its 1993 budget submission to Congress. The proposed budget would provide \$76 billion for R&D, an increase of three percent over FY 1992. This increase, which just keeps pace with inflation, is significant because of tight constraints on domestic discretionary spending mandated by the 1990 budget agreement and proposals for sharp cuts in defense spending following the collapse of the Soviet Union.

Within the FY 1993 budget request, funding for applied research would increase by three percent, to just over \$59 billion. Basic research would grow by eight percent, to approximately \$14 billion. Approximately \$3 billion is slated for R&D facilities. Total R&D for civilian programs would grow by seven percent, to \$36 billion. Key initiatives include increased investments in high-performance computing and communications, advanced materials, biotechnology, U.S. global climate change research, and the space station.

These and other highlights of the Federal R&D budget request and key issues that will help shape action in Congress are summarized in IEEE-USA's Technology Policy Council Report "Electrotechnology in the Federal FY 1993 Research and Development Budget Request," due for release in March 1992. Complimentary copies are available on request to the IEEE-USA Office in Washington, D.C.

## Technology Policy Conference Committee Releases Report

U.S. competitiveness in global markets and national technology policy constituted the theme of an IEEE workshop held in conjunction with the 1991 Engineering Societies Government Affairs Conference, under the auspices of the American Association of Engineering Societies. Moderated by Erich Bloch, former director of the National Science Foundation, the workshop examined the role that technology policy can and should play in advancing U.S. economic competitiveness. In the first of two panel sessions, invited speakers outlined industry perspectives on economic issues and needed incentives. In the second panel, Government speakers described current Federal strategies to promote technological competitiveness.

A 32-page summary report of the workshop, "Competitiveness and Technology Policy," has been released by IEEE's Technology Policy Conference Committee. Copies are free on request to IEEE's United States Activities Office, 1828 L Street, N.W., Suite 1202, Washington, DC 20036.

# IEEE USA HOT LINES

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## IEEE-USA Challenges U.S. Presidential Candidates

IEEE President Merrill W. Buckley, Jr., recently held a national press conference organized by IEEE-USA to decry the lack of emphasis by any of the current presidential candidates on issues of economic importance to U.S. engineers. Stressing that the need for a national technology policy to increase U.S. competitiveness is compelling, Buckley told the national press corps that these issues are not being adequately addressed by either political party or any of the candidates.

Buckley challenged the press to question the candidates about their views on these issues and to obtain clear answers. He provided 10 specific questions to be answered by the candidates and urged IEEE members to ask their candidates for Congress, as well as the Presidency, these questions before deciding on their votes:

If elected, what will you do to:

- Ensure that industrial technology policy is made an integral part of our national economic policy?
- Help industry produce high-quality, marketable products?
- Improve education, in order to ensure a technologically literate work force?
- Rejuvenate our declining electronics industry and restore jobs?
- Encourage long-term investments to revitalize the manufacturing base in the United States?
- Enhance Federal support for the development of commercially relevant civilian technologies?
- Maximize the commercial return on our investment in defense R&D?
- Ensure that foreign acquisitions of U.S. high-technology companies will not threaten long-term U.S. competitiveness and national security?
- Overhaul U.S. antitrust laws to promote strategic partnerships in U.S. industry?
- Improve the global competitiveness of U.S. products through appropriate trade policies?

IEEE-USA plans to monitor the candidates' responses and keep a scorecard on their pronouncements of economic importance to IEEE's U.S. members. These evaluations will also be made available to the press.

President Buckley also announced that IEEE-USA is prepared to sponsor or co-sponsor a nationally televised presidential candidates' debate on U.S. competitiveness. A letter of invitation has been sent to each current presidential candidate, with such a debate scheduled for next fall prior to the November elections.

## USAB Chairman Urges Congressional Action

Arvid G. Larson, 1992 USAB Chairman, recently wrote letters and submitted statements to Congress on behalf of several IEEE-USA committees. The statements and letters expressed IEEE-USA's views on technology policy, U.S. competitiveness, health effects of electric and magnetic fields, engineering R&D policy, and nuclear energy technology.

Larson's letter to Representative James H. Scheuer (D-New York), Chair of the House Subcommittee on Environment, was written on behalf of IEEE-USA's Committee on Man and Radiation (COMAR). Expressing general support for H.R. 3953, the *National Electromagnetic Fields Research and Information Dissemination Act*, the letter offered COMAR's assistance to the Subcommittee as a resource for technical advice and information on health effects of electric and magnetic fields.

Stressing IEEE-USA's concern over declining U.S. competitiveness in emerging technologies, Larson wrote to Senator Herbert H. Kohl (D-Wisconsin), Chair of the Senate Subcommittee on Government Information and Regulation. He expressed IEEE-USA's belief that the Federal Government should play a stronger role in competitiveness through implementation of a coordinated national technology policy.

In his statement to the House Ways and Means Committee, Larson supported the permanent extension of the *Research and Experimentation Tax Credit* on behalf of IEEE-USA's Engineering R&D Policy Committee. He emphasized that research and development of manufacturing process technology should qualify for the tax credit. Also, Larson urged that the tax credit should be made permanent to lend predictability and stability to research planning.

On behalf of IEEE-USA's Energy Policy Committee, Larson wrote a letter to Representative Marilyn Lloyd (D-Tennessee), Chair of the House Subcommittee on Science, Space, and Technology, for the record of its hearing on the Department of Energy's FY 1993 authorization for advanced nuclear energy technology and licensing reform programs. His letter supported revitalizing the nuclear option through developing advanced nuclear technology and implementing a comprehensive nuclear fuel cycle plan that addresses the full range of issues confronting nuclear power.

**Further information about IEEE-USA, engineering career and technology policy issues, and copies of testimony, IEEE-USA Position Statements, and complimentary publications are available from the**

**IEEE-USA Office. Write or phone IEEE-USA, 1828 L Street, N.W., Suite 1202, Washington, DC 20036-5104; (202) 785-0017.**

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## IEEE-USA Endorses NIST, NSF Budget Requests

In statements to authorizing subcommittees of the House Committee on Science, Space, and Technology, IEEE-USA generally endorsed double-digit FY 1993 budget increases requested for the National Institute of Standards and Technology (NIST) and the National Science Foundation (NSF).

Noting the importance of NIST's standards and measurements activities, IEEE-USA urged that Congress fund specific increases requested for electrical and electronics engineering, manufacturing, and computer science. These increases are slated to sustain existing programs and promote such important new initiatives as microwave measurements.

The statement warns, however, that the Administration's request for NIST's Advanced Technology Program (ATP) sends a negative message concerning the government's real intentions toward technological competitiveness. Specifically, the \$67 million request for the ATP falls considerably short of the \$100 million authorized by Congress. ATP provides grants to support pre-competitive technology development by industry. IEEE-USA believes that a properly funded and staffed ATP could fill an important gap in the development cycle between Federal funding of basic research and industry-funded commercial development.

IEEE-USA also endorsed a funding request consistent with the Administration's five-year goal of doubling NSF's budget by FY 1994. The NSF budget request includes new funding for high-performance computing and engineering, advanced materials and processing, and intelligent manufacturing. IEEE-USA concludes that these programs can make significant contributions to sustaining U.S. technological competitiveness. The statement also urged Congress to "encourage NSF to provide opportunities for industry-university cooperation through programs in all directorates—not just engineering."

Copies of these IEEE-USA statements can be obtained on request to the IEEE-USA Office in Washington, D.C.

## IEEE-USA Launches Private Practitioners Task Force

IEEE-USA has established a Private Practitioners Task Force (PPTF), a new service for U.S. members. PPTF will function as a communication medium for the self-employed and will help those who choose private practice as a career path in the future. The Task Force will give these members an opportunity to work together to enhance their professional status and well-being.

Not a replacement for the local IEEE Consultants Networks now operating, PPTF is a national effort to encourage better communication among private practitioners, to

pool their efforts, and to encourage the establishment of new networks where there is an interest. PPTF plans to identify IEEE members who wish to participate in local networks and help them meet other members with similar interests in their areas. For more information on PPTF, contact the IEEE-USA Office in Washington, D.C.

## Employment Assistance Committee Introduces PEER II

IEEE-USA's Employment Assistance Committee is introducing a new system to help unemployed U.S. members find jobs. Advanced technology devices will enter hundreds of classified newspaper advertisements, employment listings at job fairs, and other potential sources of employment for engineers into a data base. A proprietary artificial intelligence program will then match the information with data from a job-seeker's resume.

Known as PEER II (Professional Engineering Employment Registry), the electronic data base is a part of IEEE-USA's employment assistance package. In addition to having their resumes placed on a computerized resume registry for use by prospective employers, IEEE's U.S. members can request data base searches for job openings up to three times per year for a \$15 fee.

Developed under contract by Success Systems of Torrance, California, the electronic data base correlates such data as job title, job description, benefits, and salary ranges. Counseling is also available from the contractor, as well as IEEE-USA's newly revised job-hunting manual and other employment assistance materials.

PEER II is also available to employed engineers who are uncertain about their company's stability or who are seeking new employment for other reasons. These members may request use of "blind resumes" to protect their confidentiality, with their names and addresses released only under specified circumstances.

For further information about PEER II, contact the IEEE-USA Office in Washington, D.C.

## Intellectual Property Committee Member Runs for Congress

Glenn Tenney, a member of IEEE-USA's Intellectual Property Committee, has announced his bid for the 12th Congressional District in San Mateo, California. Stressing his campaign goal of providing better and more accessible representation in Washington, D.C., for the Bay Area on economic and technology issues, Tenney said that technology is the key to the future of the United States.

In addition to serving on IEEE-USA's Intellectual Property Committee, Tenney is a Senior Member of IEEE, and was a member of the Program Committee for IEEE's first Conference on Computers, Freedom, and Privacy held last year.

# Isn't it time we got together?



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