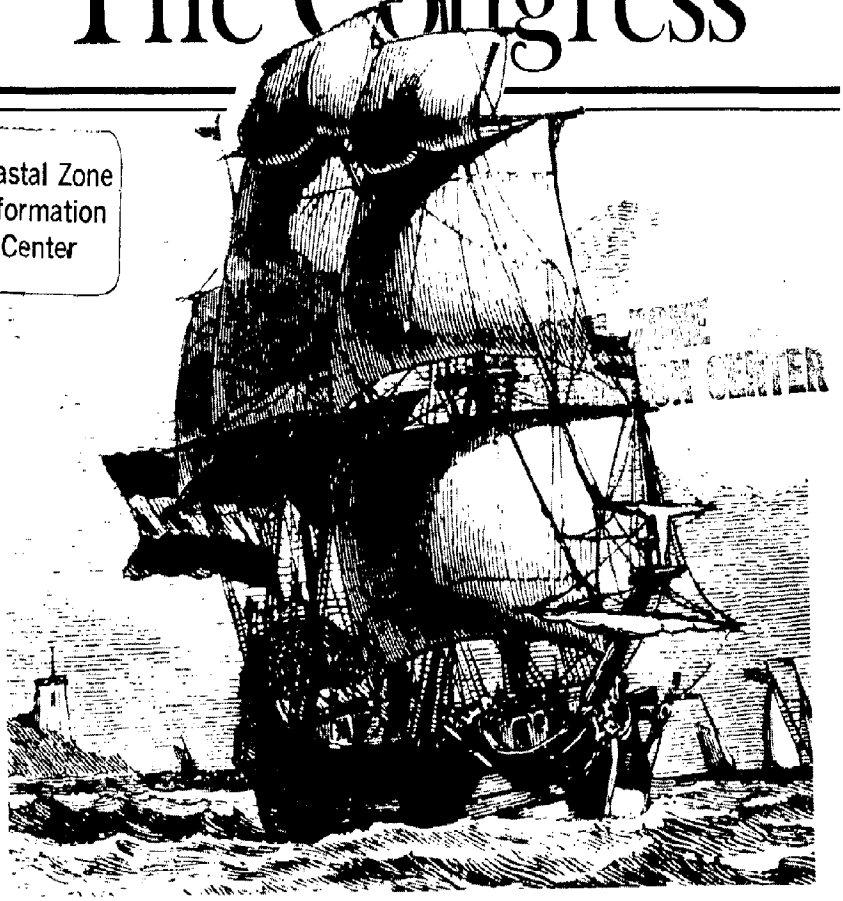
A Report to:

The President and The Congress



Fourth Annual Report June 30, 1975

4 National Advisory Committee on Oceans and Atmosphere

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A Report to:

The President and The Congress

by the

National Advisory Committee on Oceans and Atmosphere

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June 30, 1975

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NATIONAL ADVISORY COMMITTEE
ON
OCEANS AND ATMOSPHERE
Washington, D.C. 20230

To the President and the Congress:

Sirs:

I have the honor to submit to you the Fourth Annual Report of the National Advisory Committee on Oceans and Atmosphere.

The Committee was established by P.L. 92-125, approved on August 16, 1971, and was directed to submit a comprehensive annual report to the President and to the Congress setting forth an overall assessment of the status of the Nation's marine and atmospheric activities.

This report is sent via the Secretary of Commerce as provided for by the statute.

Respectfully,

William J. Hargis, Jr.
Chairman

June 30, 1975

FOREWORD

In the four years since it formed, the National Advisory Committee on Oceans and Atmosphere (NACOA) has selected for attention specific urgent maritime and atmospheric issues which it felt it could treat with balance and authority.

In our first annual report, the connecting theme was the need for developing international approaches to oceanic and atmospheric affairs. The second dealt with key steps needed for improving the Federal management of oceanic affairs in the context of a more centralized approach to management of all the Nation's natural resources. The third addressed the manner in which unprecedented world demands for energy and food, current and projected, generate new imperatives to understand the behavior of the oceans and the atmosphere, particularly the way in which ocean-atmosphere linkages create and change climate and affect the balance in world food supply or impose a limit to the waste heat which man's energy use can safely exhaust into the atmosphere.

NACOA, in its Fourth Annual Report, addresses three themes: rational management of an extended marine resources zone, making ready for tomorrow with ocean research and development today, and dealing effectively with weather, climate, and the ozone shield.

SUMMARY OF RECOMMENDATIONS

NACOA, NOTING that the Law of the Sea Conference has been unable to come to agreement after a protracted period of preparation and negotiation, and FINDING that pressure on living resources and the marine environment off our coasts requires urgent action to bring their use under positive rational management, RECOMMENDS that:

Legislation be enacted asserting United States jurisdiction over resources within a zone, out to 200 miles off the United States coast, which should be identified as the Economic Resource Zone of the United States.

The United States undertake to create within its Economic Resource Zone, as a matter of policy, a model system for rational use of the zone and its resources which incorporates due regard for international obligations.

Management of fisheries within the Economic Resource Zone be based on the principles of conservation and full utilization of living resources, in that order, with preferential rights for U.S. fishing interests, both sports and commercial. Such principles must be based on the maximum biological yield, taking into account economic and environmental factors of concern to the United States within the Economic Resource Zone.

Legislation be enacted to encourage and regulate deep seabed mining by United States private industry to the end that the minerals of the deep seabed will be available to decrease United States dependence on foreign sources and to increase world supply.

The Outer Continental Shelf Lands Act of 1953, or the Coastal Zone Management Act of 1972, be amended:

To assure reasonable state input to Outer Continental Shelf development plans and production, to expedite state management planning related to the consequences of offshore oil and gas development, to assure that proposed Outer Continental Shelf exploration and development programs are fully consistent with state plans, and to provide adequate information and technological data to assist in coastal zone planning and decision making.

To give negatively impacted States compensation for the effects imposed upon those States.

Private industry continue its role in oil and gas exploration and development on the Outer Continental Shelf under explicit Federal permit and lease-hold guidelines to assure a balance between development, conservation, and environmental protection.

Environmental impact assessments of Outer Continental Shelf exploration and development plans in frontier areas where there has been no previous production be made in stages commensurate with the differences in hazard between resource *exploration* and resource *development*.

Less detailed environmental impact statements should be accepted for exploration plans, but the review process leading to approval of production plans should be accompanied by thoroughly detailed environmental impact statements.

NACOA, FINDING that the informational needs of state coastal zone managers are of great variety and unprecedented detail, but that common problems of information management exist for many States in knowing what is and what isn't available, in having the information cast in useful form, and in filling the gaps that exist, RECOMMENDS that:

The Office of Coastal Zone Management of the National Oceanic and Atmospheric Administration (NOAA) expand its informational services to fulfill the function of a federal coastal information coordinating center and to assure effective intercommunication with State centers and Federal and other sources.

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NACOA, FINDING that support is fading and understanding diminishing for some important Navy programs having to do with the support of basic research in the oceans, and that the relation with the university oceanographic community and scientific community as a whole which has been of such national importance since World War II is currently declining, RECOMMENDS that:

The Navy renew the vitality of its basic research in oceanography by reaffirming, as has the Air Force for Air Force programs, the fundamental contribution of basic research to the Navy's broad long-range mission in the ocean, and the Navy take steps to reaffirm the desirability of conducting a significant part of this work at the universities while strengthening its own capability as well.

NACOA, FINDING that there has been a tendency for mission-oriented agencies of the Federal Government to establish in-house research laboratories and during periods of financial stress, to support these laboratories preferentially over the support of research with industrial and academic institutions, risking decline in the quality and quantity of non-government scientific and engineering output so important to the Nation's oceanographic and atmospheric programs, RECOMMENDS that:

Administrators of all Federal ocean and atmospheric programs involving research and development maintain a reasonable balance between funds expended inside and outside of the Federal Establishment in order to insure that they sustain, stimulate, and draw ideas and vigor from the entire spectrum of organizations engaged in oceanic and atmospheric research and development.

NACOA, FINDING that the Sea Grant Program in concept provides a means for applying the considerable and varied scientific and technological skills of the Nation's scientific and academic institutions to solution of national, regional, and local problems, but NOTING that after almost a decade of activity questions arise about its performance, organizational structure, location within the Executive Branch and support, RECOMMENDS that:

The Sea Grant Program funding be adjusted to cover the effects of inflation and to permit maintenance of its full program, and its performance and future support level be evaluated in the light of statutory expectations, national, regional, and local needs and its effectiveness and productivity.*

In a special report to the Secretary of Commerce, NACOA, FINDING that the absence of an organization whose responsibility it would be to stimulate and catalyze research on ocean engineering to make available the technical alternatives needed as new engineering decisions arise, has caused drift and loss over the last decade, RECOMMENDS that:

There be established by legislation or by Executive Order a modestly sized Institute for Engineering Research in the Ocean, reporting to the Administrator of NOAA, whose functions would be to develop standards in ocean engineering, to fund germinal ideas in the field, and to animate technical transfer and professional communications.

Until this Institute of Engineering Research in the Ocean is established, NOAA, in cooperation with the National Academy of Engineering, devise a specific interim program in ocean engineering which can contribute toward these same ends and to the developing Institute.

In a special study for the Director of the National Science Foundation, NACOA, FINDING that NSF has developed, for the International Decade of Ocean Exploration, a means for carrying out complex, long-term research projects involving the cooperative effort of numerous scientists, disciplines, and institutions from this and other nations, without the necessity for creating new permanent organizations in each case and that there are many ocean-related areas of study, including

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* It is the intention of NACOA to undertake such a review during the coming year.

atmospheric processes as well which require such a large-scale integrated approach, RECOMMENDS that:

NSF maintain its capability for assisting and supporting research programs on large-scale, complex oceanographic and atmospheric problems which require a multidisciplinary, multi-institutional, cooperative approach apart and distinct from its traditional support of science, discipline by discipline, when the decade of IDOE ends in 1980.

NSF take steps to improve and expand the participation for foreign ocean scientists, especially from developing countries, as a means for increasing the efficiency and economy of ocean data collection in the long run.

NACOA, NOTING that the responsibility for overseeing fleet adequacy for ocean research on a national basis is nowhere assigned, and FINDING that a shortfall is developing in the capacity of the oceanic research fleets to carry out agency-approved five-year research plans, and other programs taking shape in the scientific community, RECOMMENDS that:

NSF be designated lead agency for funding the academic fleet coordinated by the University-National Oceanographic Laboratory System (UNOLS).

NOAA be designated lead agency for the Federal fleet for civil oceanographic research and survey missions except for special purpose ships unique to a given agency.

NSF, and the Navy, develop coherent and comprehensive long-range plans for the design, procurement, and operational support of oceanographic research ships for the federally funded academic fleet in the light of long-term development in research and the long lead times in ship planning and construction.

* * *

NACOA, FINDING that better coordination of the widely diverse Federal efforts in weather modification research under a single lead agency is needed to emphasize basic work required for more rapid progress, such as cloud physics, RECOMMENDS that:

NOAA be designated as lead agency for a coherent national program of research in weather modification, taking into account the major stake in this work by mission agencies such as the Department of Agriculture, the Department of the Interior, the National Science Foundation, the Department of Defense, the Energy Research and Development Administration and others.

NOTING that agriculture is a principal potential beneficiary of weather modification, and that there is growing national and international concern over the future adequacy of the world's food supply, NACOA RECOMMENDS that:

The Department of Agriculture mount a substantial program in weather modification research, coordinated with the NOAA program and including the social, economic, ecological, environmental, and institutional aspects.

NACOA, FINDING that, while a variety of issues concerning climate and climate change—especially those related to food supply and energy consumption—are receiving increasing attention, and that the needs for a national climate program have become critical, RECOMMENDS that:

A coherent national climate program be established cooperatively by NSF and NOAA with special emphasis on predicting short-term climatic fluctuations.

NOAA and the Department of Agriculture develop a crop-assessment and planning system which will recognize the national implications of simultaneous climatic variation upon agricultural production worldwide.

NACOA, FINDING that variations in the earth's ozone shield are important to health and agriculture, and that human activities may significantly influence the adequacy of this shield, RECOMMENDS that:

A direct stratospheric sampling effort be continued, and where necessary expanded, as an essential element of a monitoring and research program to establish a sound basis for pollution control measures.

Operation of this stratospheric sampling program be formally assigned to NASA and conducted under plans developed in close coordination with NOAA.

NACOA, FINDING that DOD and NOAA agree that weather reconnaissance by aircraft equipped with the best available instrumentation is an essential element in the national hurricane prediction and warning service, and that the Department of Defense is best suited to fly the missions as a collateral responsibility for existing squadrons, but FINDING that there is a question about who should fund and defend the budget for the activity, RECOMMENDS that:

The necessary funding for storm reconnaissance by aircraft equipped with the best available instrumentation properly remain a responsibility of the Department of Defense, and that the required funds be defended and supported by DOD and NOAA as for a national program essential to civilian needs, and that the funding be identified separately and not forced to compete in the Defense budget against strictly military priorities.

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Introduction

Behind the specific ocean-related items addressed by NACOA in this year's report lies the continuing need for a central focus for marine affairs in the Executive Branch.

There has been little overt disagreement on the necessity for such a focus, but there has been disagreement between the Executive and Congress on how to proceed and no evidence of major interest in resolving the differences. Congress is presently the more active in the matter of broad ocean affairs, and recognition of the need to get our marine house in order persists there. This need may, in fact, begin to be satisfied as the Senate's National Ocean Policy Study moves from the stage of conducting investigations and issuing reports to one of producing legislation.

At least two elements of the debate on oil and gas resources development on the Outer Continental Shelf (OCS) are further evidence that a marine focus is desirable and are relevant to Federal organization. One element is the unmanageable variety of agencies which have responsibility for pieces of the OCS development process as a result of historic responsibilities acquired for other reasons. The other is the difficulty in achieving cooperation between the States and the Federal Government when disputes are exacerbated by the number of agencies involved.

Nevertheless, much can be done using existing arrangements. Our chapter on Management of an Economic Resource Zone identifies some critical steps that must be taken to develop oil and gas on the Outer Continental Shelf and to manage the fisheries in our coastal waters. This chapter also discusses the need for developing and exchanging information between States and with the Federal Government if we are to manage our offshore resources in a sensible manner.

Perhaps the most worrisome trend in both marine and atmospheric affairs is the growing skepticism about the value of basic research to understand the oceanic and atmospheric environment. "Research" has

been coupled with "development" for so long that it has begun to share the onus of development cost and the burden of specific justification and proof of practical benefit which, for research, can be self-defeating. In both marine and atmospheric affairs a host of programs, with valid claims on national priority, are losing vitality and a sense of commitment by their sponsors. NACOA in its chapters on "Making Ready for Tomorrow" and "Atmospheric Matters" wishes to call the attention of the responsible executive agencies and the Congress to the issues in each of the cases treated.

Management of an Economic Resource Zone

Although the Law of the Sea Conference failed of agreement in 1975, national extension of jurisdiction over fisheries to 200 miles is only a matter of time. We must give thought to the specifics of managing an extended resource zone if only to conserve living resources and to develop non-living resources in an environmentally and economically sound fashion. Several classes of activities are involved—those which interact with foreign policy such as fisheries and marine research, and those of purely domestic concern such as the development and transport of the oil and gas resources in the region which reaches out to the edge of the continental margin if beyond 200 miles. There is need to clarify the role of the Federal Government in the management of this zone and to enact legislation which, at the very least, regulates for the general good the activities of our own citizens. We discuss in some detail the relations of coastal zone management to oil and gas development and the informational needs of coastal zone managers.

LAW AND THE SEA

Despite protracted periods of preparation and negotiation the Law of the Sea Conference has been unable to reach agreement. The pressures on the living resources and the marine environment are such that the feeling grows we cannot afford to wait, but must take action now, even if interim. We urge extension of national jurisdiction seaward to 200 miles noting that the United States will gain management jurisdiction over resources of considerable importance.

The first requirement is to identify the key policy issues on which we must take a stand. The United States should establish a model of management for coastal nations. The second is to take a stand that is in our long-range interests as well as in response to our immediate needs and to take it with due regard for the consequences for international affairs.

Issues With Foreign Policy Impact

There are two groups of management issues involved in extended jurisdiction—be it de facto, by international agreement, or by legislation. One has to do with matters primarily domestic but involving foreign policy (fishing, research, deep sea mining); the other has to do with domestic entities only (oil and gas resource development).

Last year at this time we advocated patience with the slow pace of the Conference but not beyond the 1975 Session. Patience has been exhibited. Bills on fisheries management in an extended resource zone and on deep sea mining were poised in various committees of the Congress awaiting the outcome of the meeting in Geneva. The Conference did not produce agreement, and the committees are now working on this legislation. NACOA had advocated patience so as not to press national interests which might jeopardize international agreement over broad ocean areas. Now the issue is how to press national interests yet set an example of international responsibility in those areas over which we assert resource control.

The major new challenge is *fisheries management.* Instead of the living resources of the sea belonging to no one, a world consensus is developing which would place the exclusive jurisdiction of most fisheries and other living resources with the coastal nation. For the United States, with one of the longest coastlines of any nation and some of the richest fishing areas of the world ocean, this virtual ownership of vast fisheries resources, which may well be capable of producing on the order of ten million tons of food per year, presents a new opportunity for our people and a new responsibility for our Government.

Many of our fishery resources have been overfished. Some of the overfishing has been caused by U.S. fishermen, but in recent years serious depletion of some of the largest and most important resources found off our coast is traceable to the influx of hundreds of foreign fishing vessels.

The challenge is to initiate a new management program which stresses the conversion and rational allocation of these resources. A wise and forward looking program will rehabilitate our domestic fisheries while permitting controlled fishing by foreign fleets on those stocks not used or not fully used by U.S. fishermen.

The National Marine Fisheries Service of NOAA, in response to a recommendation from NACOA, has been developing a National Plan for Marine Fisheries. The Committee has had an opportunity to advise the Service, and we have been briefed on the development of the Plan from time to time. While the final version has not been completed, NACOA approves the broad approach being taken. We believe that this Plan, in conjunction with national legislation asserting jurisdiction over

the living resources of a 200-mile Economic Resource Zone, and establishing some effective national control over fishing in this Zone by U.S. and foreign fishermen, will for the first time in our history, give our Nation and fishermen a greater opportunity to benefit economically and increase our food supply from these resources, while at the same time place on our Government the obligation to conserve and wisely use our fisheries.

Current fragmentation of authority between the States and the National Government must be corrected. This can be done, NACOA believes, by greater cooperation between the Federal Government and the States. Management should be lodged to a considerable degree at the State or local level but in compliance with national standards developed throughout the country. This would permit regional control to exist as long as country-wide standards were observed. Primary consideration of fishery management plans should normally begin in the various coastal regions but should not preempt national or federal action when this seems in the Nation's interest.

The Plan must take into account the special management requirements of highly migratory species such as tuna and must provide for protection and control of anadromous species, such as salmon, which migrate far beyond the 200-mile limit. This means that tuna-like species of fish must continue to be managed through international and multinational agreements. The opportunity for continued access to those resources must be afforded our fishermen. At the same time our program must protect both Atlantic and Pacific salmon since they migrate far to sea beyond the 200-mile Economic Resource Zone.

The proposed management of fisheries should follow certain principles:

- Management should be by species wherever possible, and the jurisdictional base should extend throughout the areas of major economic distribution.
- Initially, management should encompass only the more important species.
- Continuing and effective monitoring of these species is necessary.
- Harvesting, both sport and commercial, should be limited to the amount which may be taken without endangering the productivity of the resource being managed.
- Full use of the resources located off our coast must be permitted, including use by foreign fishermen where our fishermen are not fully utilizing the allowable annual catch and where such use does not seriously interfere with the conservation of other fish stocks of importance to the United States. As our domestic capability to use a resource increases, it is understood that foreign fishing for

those species will be reduced. Our Government must also negotiate with those countries off whose coasts our fishermen fish in order to provide continued access by U.S. fishermen.

Deep Sea Mining does not occur within the Economic Resource Zone but it involves a similar mix of private domestic activity constrained by U.S. international interests and an uncertain future in international agreement. It is not a matter here of the United States catching up with foreign industry, but of the United States maintaining its acknowledged lead. More importantly, it is a matter of the United States developing its raw material resources to decrease its vulnerability with respect to foreign sources of critical materials. These ocean minerals would provide an alternative supply of nickel, cobalt, and manganese, which the United States does not now have, and would supplement the copper supply. In addition, the world supply of these minerals would be increased to the benefit of consumers everywhere.

In seabed mining the United States sees no justification in waiting until the developing nations decide how and in what way they wish to catch up. Nevertheless, the United States cannot afford to disregard the concerns and rights of other nations. Therefore, NACOA recommends that steps be taken to encourage ocean mining taking into account the legitimate rights of other nations.

Capital requirements for seabed mining are so great, it would be desirable to provide U.S. investors assurance that the Government would not change reasonable rules of the game without appropriate compensation. Legislation should be designed to permit development and exploitation until international agreement is reached. It should guard against direct loss by reason of the agreement itself, and provide an investment atmosphere which does not hobble United States industry and technology but yet does not preclude United States international agreements. Care must be taken that the development of these resources is encouraged in such a way that our national need for resources is accommodated and our long-term commitment to international action is maintained.

In short, NACOA feels that it is in the national interest to encourage U.S. citizens and corporations to utilize the resources of the deep seabed. All of the alternatives for Government action are not yet clear, but legislation, such as S. 713 and H.R. 1270, has been introduced into Congress which is along the lines required to accomplish this encouragement. Although the Committee believes reasonable safeguards should be provided by such legislation, the Committee has not yet developed detailed recommendations regarding specific provisions.

The *freedom of science issue* apparently was never considered a major piece in the Law of the Sea game by the United States. Science was considered important enough to be a pawn, but not important

enough to affect strategy in the large. Science may be better served by regional or bilateral arrangements which extend relatively easy access to foreign scientists, preferably on a reciprocal basis. Government can help, first by adopting a "freedom of research" policy within our own Economic Resource Zone and second by facilitating the arrangements with other nations being negotiated by our scientific institutions. This will require augmenting State Department staff, a move we have considered urgent for several years, but which has been neglected by the Executive.

Domestic Policy Issues

The expeditious development of marine coastal and offshore resources is clearly an urgent national objective. Oil and gas may head the list, but siting of power plants and of hazardous or unsightly structures is also of importance, as are offshore, deep-water ports. All would have marked effects on the coastal zone where population pressure continues to increase the demand for beach and near-shore recreation, for permanent housing, industrial development, and for many other uses.

Although a virtually unprecedented level of attention in both the public and private sectors has recently been brought to bear on the present and potential uses of these regions, one result has been a near stalemate between land developers, mostly in the private sector, and those—both in and out of government—anxious about development's impact. The long delay in proceeding with OCS oil and gas development is one example. Ignoring the current economic squeeze, the delay of placement and operation of offshore power plants is another. It is still moot whether the conventional interplay between the Legislative and Executive Branches will suffice to resolve the deadlock over oil and gas development, in which state governments and private industry also have such a stake, or whether one should use a less conventional ad hoc forum. Whatever the mechanism, the important thing is to get sufficient agreement to permit the lengthy exploration phase to get underway.

In the sections of the report immediately following, we address the major issues of oil and gas development in the Outer Continental Shelf as well as the significant but necessary question of providing information to the managers of the coastal zone. We believe there is a need for clarification of the national objectives and of the role of the Federal Government in the management of this zone. Accordingly, we recommend that:

—National policy be established to assure full development and conservation of the resources and uses of the coastal and offshore area extending to the limits of the Economic Resource Zone.

—Recognizing the unique physical, chemical, biological and geographical properties of the offshore region, national policy be established to provide for the overall management of activities in the Economic Resource Zone in a unified and coordinated fashion with due regard for their interaction and degree of mutual compatibility, and with due regard for the rights and interests of other countries.

—The role of the Federal Government be generally to provide policy guidance, regulations, law enforcement and general scientific, technical, and other services; and the role of industry be to carry out the development of resources and the exploitation of other practical uses of the region subject to governmental policy guidelines and regulation.

—As a practical matter, the Federal Government strive to simplify and centralize the responsibility for regulating industry and other users of the Zone, with specific attention to the obtaining of permits, licenses, leases, and other forms of authorization needed.

COASTAL ZONE MANAGEMENT AND OIL AND GAS DEVELOPMENT ON THE CONTINENTAL SHELF

Controversy surrounds the present plan for accelerated leasing for Outer Continental Shelf (OCS) oil and gas development, particularly in "frontier" areas where there is not now any production. There are three main reasons:

- State and local governments have had almost no role in planning the timing and location of the development and have not been able to plan ahead for onshore impacts.
- Provisions for safeguarding the environment and for resolving multiple-use conflicts are feared by many to be inadequate.
- Under current procedures, no provision is made for Federal financial aid for States that may be negatively impacted by OCS oil and gas development, a matter of prime importance to the States involved.

In its Second Annual Report in June 1973, NACOA noted that the most promising way to increase our domestic energy resources was an intensified exploration and production effort on the Outer Continental Shelf. Events since then have served to strengthen that view. At the same time questions of how to proceed with due regard for environmental protection, and for State and local interests and economic dislocations have come to the fore, and seem to be stalling energy resource development.

NACOA has testified on the issues of State role, environmental protection and the resolution of multiple-use conflicts, and Federal financial

assistance to the States before the Congress in response to invitations from the Senate and the House. We will summarize the discussion here, first detailing the issues and their consequences.

The Role of the States: Representatives of the coastal States, including the National Governors Conference, are standing firmly by their position that States should be provided a more substantial role in Outer Continental Shelf decision making. In general, the States wish to participate in decisions relating to leasing of Federal submerged lands for oil and gas production, including the right to recommend denial of any proposal which involves high potential danger to the environment or which would be incompatible with other high-value uses of the coastal zone. The Supreme Court, in settling the case of the U.S. *vs.* Maine, *et al.,* in March 1975, has affirmed Federal ownership of submerged land beyond the three-mile limit. But the oil and gas from the Federal lands must cross three miles of submerged state lands to get ashore. This means that an accommodation, both financial and jurisdictional, has to be reached because the state can refuse access. Considering that neighboring states don't necesarily see eye-to-eye, nor do the States and smaller local jurisdictions, nor do the States and the Federal Government, there is a lot of delay in the making.

Environmental Hazards and Use Compatibility: The need for protecting the marine and coastal environments is widely recognized. In addition to oil and gas resource development, the coastal zone and the adjacent waters support a complex mix of varied activities—recreation, fishing, transportation, etc. The National Environmental Policy Act requires that detailed assessments be made of the possible environmental impact of proposed activities. Impacts of alternative courses of action must also be considered. The Coastal Zone Management Act of 1972 requires in addition that the consequences of all Federal actions be consistent "to the maximum extent practicable" with federally approved coastal State management plans.

Under current procedures, environmental impact statements are prepared by the Department of the Interior prior to each lease sale. A problem is that prior to discovery of oil in commercial quantities, there is no way to make a valid estimate of the production facilities and supporting onshore infrastructure that may be required, particularly in "frontier" areas where producing fields have not yet come in and where there is no existing experience in handling onshore impacts. Thus it is almost impossible to make a valid and comprehensive environmental impact statement in advance of the extensive exploration and exploratory drilling required and the subsequent preparation by the industry

of its development and production plan. And until States have time to complete their coastal zone management plans, the consistency test for oil and gas proposals cannot be made.

The difficulties here are very great. Neither state nor federal officials, environmentalists, nor the developers are satisfied with simple assurance from the others that everything will be taken care of as soon as it comes up. The result is frustration and delay which helps no one.

Financial Assistance: Significant initial costs will accrue to affected States as a result of the exploitation of oil and gas resources offshore. These "front end" costs are associated with the activity required of the State before lease sales take place and continue at least through initial development and production. Then, depending on the extent of the offshore exploration and production activity, new population groups may be brought to relatively undeveloped areas with resultant costs for roads, schools, police and fire services, water, sewers, etc. These, too, are costs which are borne by State and local governments.

Some, perhaps most, of these onshore services may eventually be recovered by reasonable and usual taxes on the activities and the population providing, utilizing, and supporting the services. However, the States have indicated a need for financial assistance to support early planning efforts and to provide for the public services that will be required, whose initial cost may exceed a State's ability to finance or may outrun the added revenues.

NACOA's Position

NACOA recognizes as warranted the concern of the coastal States regarding the impacts and risks that are associated with OCS oil and gas development and their desire to be involved in the decisions to go ahead. We also recognize the importance of these resources to the overall economy and security of the Nation as a whole and believe that they will be most quickly found and efficiently developed if private industry continues its role in exploratory drilling and production, and the Government continues to provide guidelines and regulations.

NACOA believes that the Nation is fortunate to have ready, in the Coastal Zone Management Act of 1972, a mechanism through which States can play an appropriate role in the Outer Continental Shelf oil and gas development decisions, provided it is strengthened and provided authorization for exploratory drilling is "decoupled" from approval of initial production development plans. Decoupling would permit both industry and government authorities to associate the most demanding environmental assessment with approval of the activities that present

the possibility of greatest hazard. Decoupling would permit *exploration* to get going without delay while acquiring the facts needed to assess the decisions to proceed with *production*. Decoupling could be accomplished by requiring a full-scale environmental impact statement as part of the review process prior to the issuance of initial production permits but not before authorization to explore where a less detailed statement should be accepted as sufficient.

Industry is currently required to prepare both exploratory drilling plans and field development plans. The development plan review has normally been an uncoordinated technical matter handled largely by the Area Oil and Gas Supervisor (of the U.S. Geological Survey). We believe that the review process associated with approval of a general field development plan could become the means for assuring a second look, a means for assuring State input and for assuring consistency of the development with state coastal zone management plans. The field development plan is really also a production plan and contains proposed locations for production platforms, pipelines leading to shore, and the location of required onshore facilities. The plan also includes features pertaining to pollution prevention and control and structural interpretations based on available geological and geophysical data.

Exploration and exploratory drilling in a leased site continues long after production drilling and other production operations have begun. Oil and gas exploration activities are inseparable from those of development and production but only in the sense that exploration does not stop with the decision to produce, but continues. There is, however, a change in purpose. The exploration before a development decision is made is exploration to determine whether an area has oil and gas in suitable quantity for commercial exploitation. Exploration during development is for the purpose of further defining and getting the best out of a field. It is a different throw of the dice and the initial commitment to permit exploration need not be an automatic commitment to permit production if leases clearly indicate conditions under which production may not be allowed or if leases or permits are written in such a way that changes can be introduced where new information from any type of exploration or production comes in.

The high level of both Congressional and public interest in OCS oil and gas development has stimulated recent statements of support from the Secretary of the Interior for greater cooperation between Federal, State, and local government in applying the principle of Federal consistency with State plans generated under the Coastal Zone Management Act. We applaud this point of view, but we believe that the existing

statutes should be amended to assure that this mechanism is fully utilized.

NACOA agrees that financial assistance should be provided the coastal States to enable them both to plan for and to handle the onshore impacts of OCS oil and gas development. Grants authorized by an amended Coastal Zone Management Act or by an amended OCS Lands Act could provide the "front end" funds which will be required for advanced planning specifically for OCS oil and gas impacts, for the technical information needed for decision making, and for the initiation of long leadtime projects requiring investment capital. Revenue-sharing could also provide the States with a long-term stake in adjacent OCS oil and gas development and could be important in ameliorating negative impacts but how compensation should be handled, from what sources, and in what amounts, is a complicated and highly political matter we do not feel competent to address in detail.

In summary, NACOA recommends that:

- The Outer Continental Shelf Lands Act of 1953, or the Coastal Zone Management Act of 1972, be amended:

  To assure reasonable State input to Outer Continental Shelf development plans and production, to expedite State management planning related to the consequences of offshore oil and gas development, to assure that proposed Outer Continental Shelf exploration and development programs are fully consistent with state plans, and to provide adequate information and technological data to assist in coastal zone planning and decision making.

  To give negatively impacted States compensation for the effects imposed upon those States.

- Private industry continue its role in oil and gas exploration and development on the Outer Continental Shelf under explicit Federal permit and lease-hold guidelines to assure a balance between development, conservation, and environmental protection.

- Environmental impact assessments of Outer Continental Shelf exploration and development plans in frontier areas where there has been no previous production be made in stages commensurate with the differences in hazard between resource *exploration* and resource *development*. Less detailed environmental impact statements should be accepted for exploration plans, but the review process leading to approval of production plans should be accompanied by thoroughly detailed environmental impact statements.

INFORMATIONAL NEEDS OF COASTAL ZONE MANAGERS

In our annual report last year, we remarked on the need of coastal zone managers for augmented information and analyses, and recommended that the Coastal Zone Management Act be amended to provide States with funding for management-oriented research and technical services. The Secretary of Commerce, noting the existence of programs of direct use to coastal zone managers such as Sea Grant, asked us to look further into the informational needs of these officials and provide a more detailed assessment of deficiencies and how to meet them. What follows is a summary of this effort, which we plan to report on in greater detail at a later date.

Information: Management's Foundation

In order of occurrence, effective coastal zone management requires a sound data base, analysis, planning and organization, implementation, and monitoring. NACOA's concern here involves the States' informational requirements and the difficulties of their fulfillment. It is a problem of first importance upon which the level of achievement in all other tasks depends.

The informational needs of coastal zone managers include those of comprehensive land management plus those imposed by the contiguous marine and Great Lakes environments. It is a bigger, more exacting task than land-use management alone, for not only are there two quite different environments involved, each with its own set of resources and problems, but also these environments and their respective human activities interact in ways that are always complex, often subtle and frequently significant.

To understand this dynamic, interactive system so as to be able to manage it, coastal zone managers require detailed quantitative descriptions of:

- natural environments and ecologic systems;
- the overlay of human activities and artifacts;
- functional requirements, interrelationships, and impacts;
- constraints applied through legislative and regulatory enactments by the several levels of government;
- resource use and consumption capacities; and
- present and prospective land and water use demand.

Of the stated informational requirements, demographic and economic data, generally speaking, are both adequate and accessible. Social attitudes, cultural traditions, and expectations of the coastal zone population are either already in hand or susceptible of local acquisition. Natural environment and ecological descriptive data and information are in much

shorter supply than had been hoped-for—in some cases the supply is very marginal indeed. Baseline inventory data are sorely lacking and, so far, difficult to develop. In terms of its suitability for planning and management, knowledge of interactive relationships among important plant and animal species and their responses to different conditions is described as "virtually non-existent." Information on the environmental and economic impacts of human activities generally is considered unsatisfactory because it is not retrievable, does not exist, or is not trusted because of its adversary origin and/or the bias of the sources—including some Federal agencies. Information on present and anticipated means of controlling adverse impacts of both human activities and natural phenomena is known to exist, but retrieval by coastal zone managers is difficult and, once retrieved, is hard to evaluate.

Partly a Problem of Information Management

A part of the problem is simply information management: ascertaining what usable knowledge does or does not exist, expediting retrieval of that which does, and providing for development of that which does not. In this context, the information problem breaks down into three parts: retrieval, utility, and data voids. (In addition, there are the problems of transferral and actual use but we will not treat them further here.)

Retrieval—Much information exists which is not retrievable by those who need it because they do not know it exists or, if they do, they do not know where to find it or how to ask for it. In large part this is a communications problem, the cure for which is more effective exchange and dissemination of information on sources and availability. In part, too, it is a problem of the sheer volume of data and the complexities and number of interactive relationships. Efforts should be made to identify key facts and relationships as a means of reducing the size of both the data-gathering, retrieval, and analysis tasks. Least acceptable levels of detail and accuracy should be ascertained so as to avoid costly overkill in data acquisition. Standardization of units, scales, resource classification schemes, etc., is essential for aggregation into inventories, development of composite area description, and the reasonable employment of analytical methods and should be a qualifying requirement for Federal financial assistance in its acquisition.

Utility—Much existing information is not adaptable to management needs. All categories of information are included but particularly those relating to environmental and ecological descriptions and dynamics. In the past most such data were acquired within the constraints of single scientific disciplines solely to serve the purposes of specific projects.

Whether such primary data sets can be converted, aggregated, or otherwise made useful for management purposes often is a matter of last-minute individual judgment and the degree of desperation in specific situations, and the results, at best, are almost always marginal. Mostly, this cannot be done in time, at a reasonable cost or, most commonly, at all. Thus, much information previously assumed to be available for coastal zone management, in fact, is not. The long-term solution requires a new emphasis on problem- or management-oriented research, including surveys, monitoring, and "fire-fighting" activities.

Data Voids—Some data voids depend only on budget support for timely fulfillment, while the realization of others will be slower and more difficult. In the former category are information and data routinely collected and disseminated by the Federal Establishment, but where coastal zone coverage is either non-existent or hopelessly out of date. These include: Soils mapping by the Soil Conservation Service (SCS), where coverage of coastal counties is less than 10 percent; land-use and resources mapping by the Geological Survey (USGS), where some coastal coverage is 30 to 40 years old; and coastal bathymetry, Mean High Water and Mean Low Water mapping by the National Ocean Survey (NOS), which are either slow by their nature or suspended by budget restrictions.

Coastal zone managers place a high priority on knowledge of the agricultural, engineering and other relevant characteristics of soils and subsoils to serve as guidelines for best, permissible, and prohibited land uses. They would like to see more resources-use, boundary, ownership, and other information on the maps—perhaps in the form of overlays. They want maps which do not stop at the coastline, but which, for example, contain both bathymetric and topographic information, as appropriate, on the same sheet. They need these at scales that are useful to them—e.g., land and land-water maps at a scale of 1:24,000 and offshore bathymetry no smaller than 1:100,000 for planning purposes, with larger scales of certain areas for management purposes. A scale on the order of 1:2,400 to 1:10,000 is considered appropriate as a prime legal basis for tidal datums needed for management and enforcement purposes by coastal zone authorities. And, a majority of the ocean coastal States express a need for detailed bathymetry and bottom-sediment charts to a distance of 200 miles from shore, in anticipation of a 200-mile Economic Resource Zone.

Both separately and cooperatively SCS, USGS, and NOS are considering or have begun programs to fulfill these requirements. However, they are constrained by Federal budget and personnel ceilings and by competitive priorities. Special attention needs to be given to problems

of accelerating both NOS and SCS programs. This same information is vital not only to coastal zone management, but also to Federal agencies in preparing Environmental Impact Statements and to the process of winning local acceptance of vital coastal energy programs. It is the view of NACOA, therefore, that a higher priority should be assigned to these efforts. The high and growing degree of cooperation among SCS, USGS and NOS to produce mapped data that is responsive to real needs is commendable and should be encouraged.

Less easily filled information voids occur randomly throughout the whole range of coastal zone needs. Environmental descriptions and resource and resource-use inventories, are unique to each coastal zone. Most of the latter are probably best acquired by local authorities, including State agencies and academic institutions. One of the more difficult areas is inventory—quantitative determinations of living and non-living resources. While some of this is susceptible of rapid aerial acquisition —wetlands, forest and other terrestrial plant species—much can only be obtained through field work on the ground. Funding for inventories has been hard to find, and encouragement should be given to its support by appropriate Federal programs, such as RANN and Sea Grant. Such support should require a minimum level of standardization in the way such data are gathered, aggregated, and published so as to facilitate the production of regional and national inventories, which are lacking even more than those locally.

Research and Services Directly Supporting Coastal Zone Managers

There are of course many existing research, development, and information-generating programs of great current value to coastal zone managers. The Sea Grant Program is one, NOAA's Environmental Data Service, National Ocean Survey, and National Marine Fisheries Service are others. There is NSF's RANN Program, many Department of the Interior services, the Environmental Protection Agency, the Corps of Engineers, to say nothing of organizations within the State apparatus or in the private sector. The Coastal Zone Management Office in NOAA itself operates a small information service. We are aware that in many States, coastal zone managers have to a significant extent come to rely on such programs. We would hope this situation would spread.

But what is crucial here are timeliness and relevance. The States need a service whose key element is quick expert response to abrupt demands for technical information to assist decision makers in evaluating their options. What we mean is well expressed by the position of the

Coastal States Organization.* After noting that "substantial technical support and information is needed to make coastal zone management programs viable," the brochure goes on to say, "CSO supports an amendment to the Coastal Zone Management Act (P.L. 92-583) authorizing additional funding to state coastal zone management agencies for support of applied research needed . . . *to provide state management entities with specific findings in support of particular management decisions.* This is in addition to general research efforts that can be performed by academic groups." We endorse this recommendation.

In Conclusion

Virtually without exception the institutional means for fulfilling the informational needs of coastal zone managers exists. The majority of the informational requirements is probably most economically and most responsively filled locally by local institutions—in some cases with and in some cases without supplemental Federal financial support. The degree of financial support by the Federal Government should relate to the extent to which national goals are served.

To deal with this on-going problem, we recommend:

- The Office of Coastal Zone Management of NOAA should expand its informational services to fulfill the function of a Federal coastal information coordinating center and to assure effective intercommunication with State centers and Federal and other sources.
- The Coastal Zone Management Act of 1972 be amended to provide for adequate information and technological data to assist in coastal zone planning and decision making.

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* See, for example, its December 1974 brochure entitled, *The Coastal States Speak.*

Making Ready for Tomorrow

Of the $864 million budgeted for federal ocean programs in FY '76, NACOA discusses five elements which, though not major in dollars, are large in importance because they are at the cutting edge. The programs of the Office of Naval Research, Sea Grant, and the International Decade of Ocean Exploration are all concerned with the support of ocean research. A recent NACOA proposal for an Institute for Engineering Research in the Ocean and a recent analysis of the adequacy of the capital structure underlying oceanic and atmospheric research also have important bearing on organizing foresight today to make ready for tomorrow's needs.

SCOUTS OUT

NACOA has, before this, commented in detail on Federal programs having to do with the oceans and the atmosphere largely in response to specific requests—as, for example, in the Agnes report for the Administrator of NOAA (1972), the report on Engineering in the Ocean for the Secretary of Commerce (1974), and the forthcoming report on the International Decade of Ocean Exploration for the Director of the National Science Foundation (1975).

But the details of many individual programs are made known to the Committee in the course of its work. In fact, they form the bulk of the briefings given NACOA during its monthly meetings. Facts, accomplishments, proposals, findings, problems, plans, and lively discussions on what's wrong and what's needed form the basis on which NACOA's more general pronouncements are made.

The field covered is wide and varied. We set atmospheric matters aside for the next chapter and deal largely with marine programs in this. The Federal Ocean Program is running at more than three-quarters of a billion dollars a year—$788 million estimated for FY '75, and $864 million proposed for FY '76. In the budget proposed for FY '76, the Department of Commerce has drawn abreast of the Department of Defense: $236 million for Commerce, $225 million for the Department of Defense (military) plus $33 million for the DOD (civil), and $143 million for the Department of the Interior. Nine other agencies trail. We reproduce the fiscal data in Tables 1 and 2.

Table 1—Federal Ocean Program—Agency Budgets*

(In millions of dollars)

	Estimated by Fiscal Year		
	1974	1975	1976
1. Department of Defense–Military	224.9	219.8	229.3
2. Department of Defense–Civil Works	31.8	31.9	33.1
3. Department of Commerce	189.9	214.2	236.1
4. National Science Foundation	63.4	70.1	69.1
5. Department of Transportation	52.1	73.1	73.4
6. Department of the Interior	53.7	107.1	142.9
7. Environmental Protection Agency	16.9	23.3	24.3
8. Department of State	12.0	13.1	13.6
9. Department of Health, Education, and Welfare	8.0	7.0	7.2
10. Atomic Energy Commission/Energy Research and Development Administration	7.4	13.2	14.3
11. National Aeronautics and Space Administration	4.9	12.7	18.1
12. Smithsonian Institution	2.9	2.9	2.6
Total	667.9	788.4	864.0

* Source: Interagency Committee on Marine Science and Engineering, January 1975.

Table 2.—Federal Ocean Program—Budget by Major Purpose Categories*

(In millions of dollars)

	Estimated by Fiscal Year		
	1974	1975	1976
1. International Cooperation and Collaboration	12.0	13.2	13.7
2. National Security	108.2	97.1	97.7
3. Living Resources	90.8	105.5	117.6
4. Transportation	35.2	37.9	33.8
5. Development and Conservation of the Coastal Zone	98.7	117.5	131.1
6. Non-Living Resources	25.7	83.2	117.4
7. Oceanographic Research	116.4	128.7	135.7
8. Education	8.0	8.5	8.2
9. Environmental Observation and Prediction	39.8	41.3	40.2
10. Ocean Exploration, Mapping, Charting and Geodesy	96.4	102.3	109.1
11. General Purpose Ocean Engineering	25.7	38.6	46.4
12. National Centers and Facilities	11.0	14.6	13.1
Total	667.9	788.4	864.0

* Source: Interagency Committee on Marine Science and Engineering, January 1975.

It may thus seem a little out of place to pluck a $20 million program here and another there for emphasis and let others, of similar merit and size, go without comment. But this year the Committee has become increasingly concerned with the ebbing of understanding, sympathy, and support for a group of marine programs, none of which is major in its own right but, because they have to do with the future, have more importance than their size suggests.

After years of relatively willing support of research activity, the questioning is heating up. This is fair enough, even necessary, but at the same time, the support seems to be weakening in a number of areas at once. This comes about not so much as the result of cleaning things up after careful scrutiny, it seems to the Committee, as because of a change in attitude from: "What might you do for me tomorrow?" to: "What are you doing for me today?"

This could be very serious for the future of United States activities in the oceans.

A report by the Congressional Research Service for the National Ocean Policy Study says:

> Intelligence sources indicate that the Soviet Union is expected to continue to improve its oceanographic resources by continued new construction of ships, qualitative improvements of their research fleet, and continued input of trained oceanographic technicians to supplement the professional ocean scientists. In contrast, U.S. oceanographic research has been poorly funded in recent years. . . .*

The Committee wishes to discuss some of the programs which are key in marine affairs.

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* "Soviet Ocean Activities: A Preliminary Survey," Committee on Commerce. Print dated April 30, 1975, p. 44.

WHAT MRS. McGILLICUDDY SAW*

Three Presidents have directed that each Department and Agency of the Federal Government support basic research in fields connected with their missions and responsibilities. Yet the spirit is being drained from Navy oceanographic research. Our evidence is the continuing raid on oceanographic research funds in favor of practical research programs which, however meritorious on their own right, have a larger resource base at their disposal than their budget-line neighbor from whom funds are being transferred.

Has basic research become an easy touch in the Navy, vulnerable to the narrowest interpretations of the old Mansfield Amendment and subject to the construction that only *applied* research is justifiable for the Navy? NACOA is concerned that this narrow view may have taken hold. The Navy is the major operator in the oceans. Is it wise to allow support of basic research in the ocean, unless in direct connection with weapons systems, to slip, with an exaggerated sense of delicacy, to the National Science Foundation and to the National Oceanic and Atmospheric Administration, to the Environmental Protection Agency and the Bureau of Land Management? Each of these agencies has direct responsibilities in ocean research; all fund research in the oceans.

But, these agencies, however well they do their jobs, do not look after Navy needs. In our last annual report, we found, ". . . that the ocean science program within the Navy, already weakened by restrictions on funding for research, is being further diminished by transfer of funds from oceanographic research to underwater acoustics . . ." and recommended that: "The Navy review its planned diversion of funds from the basic oceanography program, long one of the mainstays of ocean research in the country, and make the effort to maintain the basic science research program at a strength sufficient to the Navy's and the Nation's long-term needs."

There has been no noticeable effect.

It is not exasperation which prompts us, but a sense of despair that the pioneer agency in the United States to encourage and develop science and technology of the ocean, the Navy, whose history and long experience has demonstrated the value of this strategy of support of basic research, should become indifferent to the dwindling effort maintained on its behalf.

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* By Agatha Christie, 1957. Mrs. McGillicuddy saw a murder being committed in a train running along a parallel track and had a hard time proving to the authorities the event really took place.

Let us look at the record. ONR contract research effort, primarily at universities except where noted, has been as follows—despite the effects of inflation—one *decade* apart:

Category	FY 1966	FY 1975
All Scientific Research	$108M	$105M
Oceanography (including in-house effort)	$ 28M	$ 28M
Oceanography—Code 480 (University Contract)	$ 18M	$ 18M

Except for one or two years, ONR's oceanography program has been level-funded for ten years while the Navy RDT&E budget increased 89%.

Even the level funding is more apparent than real. Details of the oceanographic budget of ONR (Code 480) show that in 1972 ocean acoustics was reacquired (without funds) from the exploratory development program to which it had been transferred in the early '60's (with funds). Ocean acoustics under the level funding of "basic" research has therefore grown in the last few years at the expense of other elements of ocean science, principally physical oceanography.

The issue we raise is not parochial, nor a comment on the relative merits of various aspects of oceanography to the Navy. It is a comment on short-sightedness. It is clear that whatever the semantics of pure vs. applied research, or basic vs. exploratory research that almost a quarter of the Navy's funding for basic oceanographic research is suddenly and currently being guided into a directed acoustics program largely at the expense of university contract basic research in oceanography. Despite the fact that the Navy expends vast sums in developing, purchasing, and operating acoustic gear, funds to support more advanced research in acoustics comes out of the hide of research in other oceanographic areas. This is not only wrong on principle, it is wrong on the practical grounds of failing to hedge one's bets.

It is essential for the Navy to have close relations with the leaders of the oceanographic community so that these leaders have the knowledge of and concern for the Navy's problems and needs, so that scientists are instantly available in moments of crisis, and to promote professional competition and keep the in-house laboratories in technical tone. This has proved itself in the past and there are many examples—the origin of the Polaris concept not the least among them—of oceanographers' contribution to the modern posture of the Navy.

Transferring funds from undirected to directed programs, as has been done in shifting from physical oceanography to ocean acoustics, is more than a change of dollars. It is a change in emphasis, a change in direc-

tion, in attitude, in awareness, and in approach. It could be a step in transferring funds out of the universities to in-house laboratories.

The Government in-house laboratories and the university laboratories each have their own strengths, but they are different strengths and, in particular, many types of basic research do not in general lend themselves to the more administered, programmed, and directed work of the mission-oriented in-house laboratory. There are exceptions, of course, but the considerable strength of Government laboratories lies in mission-oriented research. That is another reason why the Navy needs universities and other outside research institutions. The moves described above are chipping away at that support.

The good people in these oceanographic fields will find other sponsors. From these other contacts they are bound to develop other interests, and from these other interests they are bound to develop other emphases. The Navy would not quickly be able to redevelop the understanding which has provided a solid background of empathy for Navy problems. It is this empathy which many observers see slipping.

What is happening in the Navy is in sharp contrast to what is happening in the Air Force in which the Assistant Secretary for R&D officially reaffirmed Air Force dependence on the quality of the research program as part of overall Air Force R&D effort, the need to protect research funding from the competition of development and production programs, and the need to have such research performed predominantly through the Universities.*

NACOA therefore recommends that the Navy renew the vitality of its *basic* research in oceanography and reestablish its standing relationship with the university oceanographic community where it has led the field for so many years since World War II and which is now fading.

Postscript

On a number of occasions during the past few years, NACOA has discussed questions of in-house versus out-of-house research support and especially the tendency for the latter to absorb the major impact of budget cuts when there is direct competition for support. The result is that the support level for outside research is generally pumped down to maintain the support level for in-house research.

Each class of effort has its place, of course, but the probability of a new idea emerging or being developed into a workable concept is in direct proportion to the number of minds with a bent toward the problem area

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* Memorandum for the Chief of Staff from the Assistant Secretary of the Air Force (R&D) dated October 19, 1974, "The Program for Research Within the Air Forces."

in question. Thus, while the concept of Government laboratories to work through special mission-oriented problems is a good one, it is essential that they have access to the larger number of scientists outside of Government and that the funding policies insure the vigor of extramural institutions.

SEA GRANT

How has Sea Grant done? Has it lived up to its legislatively assigned responsibilities and to Legislative and Executive intent? Has it contributed? Is it in the agency best suited to its purpose? How can its ability to serve the Nation's marine affairs programs be improved?

NACOA has kept itself informed on the general progress of the Sea Grant Program as a matter of continuing interest in this important segment of the Nation's marine affairs programs. We are aware of faltering budgetary support and of questions being raised in some quarters with regard to the purposes of the Program and the way these purposes are being carried out.

Despite our continuing interest and general familiarity, the Committee is in no position to evaluate the Sea Grant Program in detail at this point. NACOA has been apprised of Sea Grant progress and status regularly since 1971, and our annual reports have reflected our interim finding that the Program provides a means for applying the considerable and varied scientific and technological skills of the Nation's scientific and academic institutions to solution of national, regional, and local levels. But after a decade of activity, it is time for a thorough review of Sea Grant performance, and what might be an appropriate level of funding. However, until such study is made, NACOA is convinced that the program should continue and its funding level cover the effects of inflation and allow a viable program.

It is our intention to undertake this review during the coming year. A NACOA panel has been formed to handle the review.

THE INSTITUTE FOR ENGINEERING RESEARCH IN THE OCEAN

When it comes to ocean engineering, the problem is not one of a program once strong and now languishing, but of a program that hasn't happened. This is a brief recapitulation of a special report NACOA issued last fall.*

NACOA recommended in its Second Annual Report that the Oceanographer of the Navy be appointed Federal Coordinator for Marine Tech-

* "Engineering in the Ocean," a Report for the Secretary of Commerce by NACOA, November 15, 1974.

nology Development to oversee and facilitate the transfer of Navy expertise into the civilian sector. This was based on the Navy's considerable competence and expertise in ocean engineering. The Secretary of Commerce, who coordinates the responses of the Federal agencies to NACOA's annual reports, gave the job back to NACOA. He wrote requesting that NACOA look at national civilian ocean engineering needs and specify applications to which Federal programs could address themselves, and indicate what should be industry's role and what should be the role and effort of the Government.

It turned out, when a NACOA panel looked into the matter, that technical transfer was not enough. "Communications," the "military/civilian gap," "proprietary knowledge" were all part of the picture, but not so essential that overcoming them by simply facilitating the transfer of technology would do the job. The then Chairman of NACOA, William A. Nierenberg, wrote Secretary of Commerce Dent,

> There turned out to be no obvious consensus in the answers to the questions you have asked. Reasonable suggestions for improving the national effort have been made by many—in studies over the last decade and in the interviews staff conducted during the last year. There were persuasive arguments for developing various aspects of engineering in the oceans. But no specific applications of ocean engineering to civilian needs swept the field as critical, urgent, national in scope, yet neglected.*

Rather than specific applications, the Chairman wrote, NACOA's panel found that,

> . . . the paramount national civilian ocean engineering need is not a specific number of projects in ocean engineering, but rather a modest organization whose function it would be to:
>
> a) work on and develop standards which presently, in ocean engineering, lag other engineering;
> b) fund good ideas in meeting basic engineering needs to the point where they could generate support on their merit or fade away on their lack of it; and
> c) animate technical transfer and professional communications.
>
> The basic needs would be concerned not so much with systems as with special materials, techniques, and engineering characteristics required for many different kinds of marine operation.

The Panel, when looking for specifics, wanted to know why they had not been named and tackled before. They found no dearth of sensible

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* "Engineering in the Oceans," *op. cit.* All quotations are from that report.

suggestions, but they found no agreement on what ought to be done first. Perhaps what needed doing was being done and if it weren't, maybe it wasn't important.

But ocean engineering didn't prove that easy to put away. The Panel also had a pervasive sense of discomfort with the lack of action on mid-range requirements three to five years off. Experienced engineers reported that when practical requirements arose it was often too late to develop the technology to avoid expensive, hasty, and often unsuccessful engineering efforts and the Panel became convinced that matters should no longer be allowed to drift. Technical alternatives should be on hand when decisions are made to avoid being trapped into "expedient, possibly environmentally detrimental actions." This need surfaced again and again and could not be ignored.

The Panel hadn't expected to end up suggesting an organization, but some continuing capability seemed called for which would stimulate the right sort of support for the right activity at the right time without getting locked into expensive, long-range demonstration programs. To meet this need, the Panel proposed an Institute for Engineering Research in the Ocean and the full Committee, after careful deliberation, concurred. The task of this Institute, ". . . would be to support work and act as a catalyst in new areas of special materials and techniques," the Chairman wrote, "which would serve a multiplicity of marine activities. It would have a central responsibility for improving professional communications and encouraging the development of standards."

NACOA did not propose details of the organization, but suggested that it might borrow what was most fitting from such as the Office of Naval Research, the National Advisory Committee on Aeronautics, the National Institutes of Health, Det Norske Veritas (a Norwegian technical research and standards-setting agency) and so forth.

The Institute should report to the Administrator of NOAA as Federal Coordinator for Marine Sciences and Technology, but must develop strong bonds to all Government Departments with marine responsibilities and the outside ocean engineering community. The Panel suggested an independent Board of Governors as a device for overseeing a broad execution of responsibilities. Until such an Institute is established, NACOA recommends that NOAA, in cooperation with the National Academy of Engineering, devise a specific interim program in ocean engineering which can contribute to these same ends and to the developing Institute.

There has been a lot of talk about ocean engineering over the years, but action has been forced by immediate need and was therefore insufficiently forearmed. Now is the time, NACOA feels, to do something which would add foresight and planning to our expanding ocean activities for reasons of cost, of safety, and of environmental soundness.

THE INTERNATIONAL DECADE OF OCEAN EXPLORATION

The International Decade of Ocean Exploration (IDOE) was conceived in the late 1960's to accelerate the acquisition of scientific and technical knowledge needed to make sound decisions concerning ocean-resource utilization and marine environmental protection on a global scale.

NACOA has, from time to time, reviewed the contributions the program is making to the oceanic and atmospheric sciences. This past year NACOA, in response to a request from Dr. H. Guyford Stever, Director of the National Science Foundation, conducted a mid-term review of IDOE to consider what course it should take during the remainder of the decade, and what should happen afterward. This is a brief summary of the major findings and conclusions of a report to Dr. Stever which is in the final stages of preparation.

The IDOE was intended as a major international effort under the auspices of the United Nations to devote the decade of the '70's to a series of long-term, continuing, cooperative investigations leading to more effective utilization of the ocean and its resources. However, the U.S. contribution to the IDOE, which is managed by the National Science Foundation, is a major national program in its own right, and it is with this effort that NACOA's review was concerned. No attempt was made to assess programs carried out by other nations nor the value to them of the U.S. program. We have noted questions raised over the level of foreign scientific effort involved in the IDOE, especially from developing countries, despite NSF effort to encourage foreign participation. Because, in the long run, it will be necessary to use data and manpower from every source, and because of the increasing costs of ocean data collection, it is important that greater efforts be made by the NSF to involve scientists from developing and other countries.

NSF's IDOE program has been concerned with studies of the open ocean, as opposed to coastal and estuarine waters, and with problems having global significance as opposed to those of a purely local character. It has concentrated its effort in four scientific areas: environmental quality (which primarily involves chemical and biological aspects of the marine environment and marine pollution); environmental forecasting (which is concerned with oceanic motions and with interactions between the oceans and the atmosphere); seabed assessment (concerned with the geology and geophysics of the sea floor and the processes of plate tectonics and metallogenesis); and living resources (which is concerned with marine ecosystems and the biological productivity of the oceans). Selection of these four areas for concentration of effort has minimized jurisdictional overlap with other marine programs, as has the choice of studies of an open-ocean, global nature. IDOE projects are further distinguished by

being typically long-term, multidisciplinary, multi-institutional endeavors and thus distinctly different in nature from the research projects typically associated with funding agencies such as the National Science Foundation and the Office of Naval Research, and from the research carried on in the Sea Grant Program which, while multidisciplinary, places more emphasis on applications and is more local in character.

In its management of the U.S. program, NSF has drawn upon the strengths and capabilities of existing institutions rather than creating new organizations with their own rigidities. It has generated a willingness on the part of scientists to think in terms of multi-institutional cooperative efforts. It has fostered the growth of international cooperation in oceanic research, and has grown from what was primarily a U.S. effort into a program with an increasing amount of international participation. It has stimulated marked improvements in data standardization and data exchange, nationally and internationally. And it has provided a vehicle for the initiation and carrying out of long-term, expensive, cooperative research projects which has made possible a number of comprehensive oceanic studies which would have been unlikely to take place had not IDOE existed. The IDOE has, in its first five years, produced significant achievements having scientific, technical and economic value, and shows promise of more.

It is important to keep in mind that the level at which the IDOE has been funded (approximately $15 million per year) is far below that anticipated when the program was being developed and is not sufficient to permit taking on all the work that needs to be done. Further, NSF is constrained from supporting research falling within the jurisdiction of the Federal mission agencies.

NACOA believes that the NSF's IDOE program has successfully addressed serious deficiencies in our knowledge of ocean processes and ocean resources, has fostered inter-institutional cooperation among scientists of many disciplines working together in the cooperative efforts required to tackle these deficiencies, and has made progress in generating a spirit of international cooperation in this area where little existed previously, although some additional efforts are needed in the area, especially as it refers to developing countries. NACOA looks forward to continuing steps to build on the base that has been established.

When it came to the question of what should happen after 1980, the Committee found itself faced with a paradox. It liked the program, but the label gave it problems. NSF's IDOE Office has been unique among the Federal agencies supporting research in the oceans, in acting as a surrogate institution when it comes to the support of programs which require a great deal of advance planning because they are large in physical area covered, in scope, in numbers of people, in disciplines, and in

number of institutions involved, and this function, the Committee felt, should be retained. At the same time, the Committee was uncomfortable with the idea of perpetuating a special "decade" as such.

This point is an important one, because it is not at all clear that the value of this surrogate institutional arrangement, which avoids the creation of permanent organizations each time a large problem is addressed, is appreciated within the traditional discipline-by-discipline support of the sciences. Equally important, the Committee noted, is the fact that there are many worthy program areas of the IDOE sort calling for study. They lie generally in the need for integrated studies of the oceans and atmosphere to understand better the processes of weather and climate, studies of biological productivity of the oceans, and studies of the processes of metallogenesis including areas which lay under the sea when the process began but lie on land today. No other place in the Federal Establishment is set up for the purpose of supporting such large-scale cooperative studies —and they are of increasing importance to the Nation and to the world. They impinge upon weather and climate, food production on land and sea, maritime commerce, and many other important human activities. Such efforts often encompass large geographical areas or involve extremely complex questions or both, requiring sizable multidisciplinary effort, usually involving several institutions and agencies, and often demanding or encouraging international participation.

The Committee therefore recommends that there should continue within the National Science Foundation a means by which large programs involving the cooperative efforts of many individuals, institutions, disciplines, nations, ships, aircraft, etc., can be handled without building an organization to do it each time. IDOE has been filling that bill. The NSF should see to it that by some means, perhaps an Office of Ocean Exploration in the NSF, this continues to be done should the IDOE end.

The Committee also recommends that during the remainder of the IDOE, NSF place greater emphasis on stimulating international cooperation in ocean research, on the development of standard techniques for the collection of oceanographic data suitable for use by all nations, including the less developed ones, and on fostering the growth of worldwide oceanographic expertise and understanding.

THE ADEQUACY OF THE CAPITAL STRUCTURE UNDERLYING OCEANIC AND ATMOSPHERIC RESEARCH

The Problem:

In its Second Annual Report, NACOA expressed concern for what it sensed was the start of a decline in the capital structure for marine—and possibly atmospheric—research. The facts were not available to allow:

- judgment about whether, in what way, and how much a decline in capital structure mattered;
- definition of the steps needed to remedy impending deficiencies;
- assessment of the process by which the decisions to invest, or not, are made.

The Secretary of Commerce, noting that this could be a serious matter, asked the Chairman of the Federal Council for Science and Technology (FCST), Dr. H. Guyford Stever, to review the situation. Dr. Stever, in turn, assigned the task of ascertaining the facts to the appropriate subcommittees of the FSCT: ICMSE* for oceanographic research, and ICAS** for atmospheric research. These subcommittees engaged a contractor to develop and analyze the basic data. The studies were completed this spring and discussed with NACOA in May. They reveal that there is indeed cause for deep concern for the future of the research fleet and its capabilities, and therefore of the programs which depend on it. They also reveal cause for concern over the future availability of aircraft, submersibles, and habitats, and—in the case of atmospheric research—for "fifth generation" computer facilities and probably aircraft for high-altitude atmospheric measurements.

Perhaps more fundamental in importance is the evidence that the present process for arriving at capital investment decisions and for acquiring major items, particularly ships, is not orderly; it is hit or miss. For example, there has been no shipbuilding program for fleet replacement, or for additions to the inventory since the late 1960's, according to the ICMSE report. While other facilities such as submersibles, aircraft, computers, habitats, etc., have planning problems, nowhere are they so acute as with ships.

To remedy the impending ship facility shortage will require recognition of what factors permitted this to happen, and their correction. We will briefly indicate how such shortage could arise, but cannot go beyond that to recommend at this time any specific replacement program or strategy, because the contractor studies have a major limitation—they are essentially inventories. They inventory the state of the capital strucure across the spectrum of users. They inventory agency-approved statements of utilization "requirements" for these items for the next five years. They compile utilization levels and costs characteristic of these items in the past. The studies then combine these inventories and compilations, in several ways. For example, they project future utilization levels avail-

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* Interagency Committee on Marine Sciences and Engineering.

** Interdepartmental Committee for Atmospheric Science.

able under various investment and retirement assumptions which, when subtracted from agency-approved "requirements," equal "shortfalls." Unfortunately, the "costs" associated with methods of meeting shortfalls are developed within the artificially restricted time of five years (set by the reach of agency-approved programs) and so a very limited examination of alternative fleet replacement choices is presented.

The consequence is that there is no firm ground for knowing what to do and how much it would cost. Nevertheless, these studies clearly show for the first time the nature and magnitude of the problem across the entire Federal agency structure and do provide a start in identifying corrective measures. Some have to do with funding policy; others with organizational structure.

Marine Research Capital Assets

Ships are—and will continue to be—a critical component of the marine capital assets structure. As of the end of FY '75, there are 90 in the inventory (see Table 3) and, unless obsolescent ships are retained after they should be retired, their number can only go down during five years while demand for their use goes up.

Table 3*—Research and Survey Ship Inventory

	FY '75	FY '79**
NOAA	25	23
Interior	7	7
Federally funded academics	32	29
Navy	16	13
AEC/EPA/USCG/NSF	10	7
Total	90	79

The major findings by the Chairman of ICMSE in his report*** to Dr. Stever are, very briefly:

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* From Table 2, page 8, "The Capital Structure for Ocean Science: Final Report of the Ocean Science and Technology Resources Study (ORS)", Center for Naval Analyses, Arlington, Va., March 1975.

** Under current agency retirement standards, which vary between 25 and 35 years, with no replacement.

*** "The Capital Structure for Ocean Science," *op. cit.*, ICMSE, FCST, May 15, 1975.

- There is strong likelihood of inadequate shiptime to meet ocean research requirements through 1980. More serious shortfalls threaten thereafter.
- Given the leadtime involved in designing, budgeting for, and constructing new ships, reestablishment of the shipbuilding program even at the first available opportunity, FY '78 and FY '79, will not remedy the significant shortfalls for the early 1980's. This may force conversions and leasing, which can be both costly and unsatisfactory.
- Innovation and improvements in ship design are lagging.
- An entire new class of activities is developing in the inshore region which suggests that the greatest new ship needs will be for small-size vessels.
- Today, underutilization of federally funded ships is common, it appears, from lack of operating funds rather than from lack of demand.
- Submersible facilities exist in many types and in adequate numbers. Federal operating funds are so small, however, that agency usage of civilian-operated submersibles (American Bureau of Shipping classification) has been less than 10 percent of available time over the past few years.
- The situation with respect to aircraft is less clear and will require further study. Aircraft for ocean-related activities are generally not supported out of ocean science funds. If these "free" aircraft were to require funding out of ocean budgets, there would be significant shortfalls in the availability of such facilities.

There is insufficient information on which to recommend specific levels for the research fleet of the future or assess its cost, but we have great misgivings about the current agency-by-agency approach to providing and managing a national capability of the sort required. We also have misgivings about project-by-project funding of ship operations. Ships certainly, and perhaps submersibles, habitats, and aircraft, should be annually block-funded for efficient scheduling and maintenance. We recommend, therefore, that the Administration give serious consideration to greater centralization of the responsibility for planning, budgeting, and operating the research fleet and its major auxiliary systems and so state in our "Recommendations" below.

The academic and NSF-owned fleet comprises a natural unit for unified management, particularly since elements of the academic community have already formed a central planning, scheduling, and analysis body, the University National Oceanographic Laboratory System (UNOLS) representing those laboratories operating federally funded ships, and NSF is already working with UNOLS. We recommend that the Federal responsibility for this fleet also be centralized and that NSF be assigned this role.

The Navy-operated ships and special unique-purpose agency ships

should, of course, continue under present management. But these important ships aside, it seems similarly advantageous to combine both planning and operational responsibility for multiple-purpose agency research vessels in a single agency, particularly as future needs for fleet expansion are considered. NOAA is very close to this already and should be so designated.

Finally, none of this will be meaningful without a commitment to an aggressive planning effort by the "lead" agencies and an answering commitment by the Administration to the kind of advance and orderly funding policies suited to long leadtime and long lifetime procurement.

Assets for Atmospheric Science

The study of capital assets inventories and projections for atmospheric science posed fewer problems conceptually and practically than in the case for marine science. This appears to be in part due to the lower unit cost and shorter leadtimes and lifetimes of radars, aircraft, and even computers when compared to ships. It also appears in part due to the fact that, unlike the case for ships, there has been recent investment in the assets considered.

Nevertheless, this study too has important limitations and indicates the need for the atmospheric agencies, perhaps through ICAS, to reexamine their plans and particularly the assumptions on which its analysis is based. For example, utilization rates, shared usage percentages, and non-Federal inventory availability were all assumed by the study to remain constant over time. Comparisons were made on averages, not peak demands, and the actual geographic distribution of facilities was not taken into account in matching them with requirements.

We particularly regret that the question of fifth generation computers was passed over as a matter awaiting new technology and therefore beyond immediate concern as a capital investment. It is ICAS and agency responsibility to go beyond mere inventory. We urge that ICAS and other interested parties in the FCST focus attention on what this means for the progress of research and what means are available and worth the cost to expedite fifth generation computer availability.

Recommendations

Regarding marine research facilities and other capital assets, we strongly support the ICMSE plea that the trend toward degradation of the capital assets structure be arrested as a matter of national policy, that a comprehensive fleet replacement and construction plan be developed and maintained, and that the concept of "optimum utilization" of existing ships be adopted as the basis for budgeting annual operating costs. We also urge that ICMSE itself undertake responsibility for standardizing

and improving Federal ship utilization data, assuring emphasis on parameters of optimum use and interagency comparability, for assessing agency needs for submersibles and habitats and coordinating their utilization, and for making a detailed review of aircraft requirements for marine science programs, all of which it recommends.

With regard to responsibility for long-range planning and funding, we urge that NSF be designated lead agency for funding the academic fleet and supplemental platforms coordinated by UNOLS institutions; that these assets be considered national assets, and that NSF and Navy work closely with UNOLS to develop a coherent and comprehensive plan for the fleet's long-term development, procurement, and operation tied to the major thrust of research trends and projections, not to annual project-by-project "requirements."

Similarly, we recommend that NOAA be designated lead agency for the Federal fleet for civil oceanographic research and survey missions, except for the Navy and special purpose ships whose function is unique to a given agency.

Regarding atmospheric research facilities and platforms, we urge that the problem of lagging technology for fifth generation computers—a matter of general concern to the scientific community—be assessed by the FCST, and the impact of the expected delay on the progress of atmospheric science be determined. We also recommend that FCST/ICAS undertake the development of a long-range capital assets plan for investment in aircraft and supplementary or alternative platforms.

Atmospheric Affairs

Once again NACOA presses for rationalization of the fragmented research in weather modification on the grounds that dispersing its management to a spread of user-oriented agencies is premature. This is not a question, NACOA repeats, of more funding, but of using that now expended more effectively. The chapter also discusses the status of work on climatic variation and stratospheric pollution. It concludes with a discussion of how to resolve the dilemma of who should perform hurricane reconnaissance and who should pay for it.

In the everyday aspect of weather reporting and prediction, NACOA is pleased to note the response of the Federal Government to the need for modernizing weather data transmission and presentation. NOAA's Automation of Field Operations and Services (AFOS), which we discussed in our Second Annual Report, is progressing rapidly, and promises to make weather information available more efficiently and accurately for the use of forecasters and the public. We heartily urge the continued support of this system so that it may be extended over the rest of the Nation as soon as is practicable.

In other areas the situation is less auspicious. Repeated recommendations, by NACOA and others, for a coherent national program of weather modification research in place of the present inefficient, fragmented Federal effort, have gone unheeded. In the area of climate variation, given emphasis in NACOA's Third Annual Report, there has been progress—but too little and too slow. Also, during the past year, worldwide attention has been directed to the possibility that the ozone layer in the stratosphere, which protects life on earth from the damaging effects of ultraviolet radiation, is subject to depletion due to engine emissions from high-flying aircraft and chlorofluorocarbon compounds released at the earth's surface which make their way to the upper atmosphere. Insufficient understanding of the processes involved prevents us from assessing the extent of the danger but the need for measurement and monitoring is clear. Finally, in

the list of atmospheric matters we shall discuss, is the long standing program of hurricane reconnaissance by aircraft. It may today be in jeopardy due to a difference of opinion about which Federal agency should be responsible for funding the program.

WEATHER MODIFICATION

In previous years we, along with many others, have urged that the fragmented Federal effort in weather modification research be consolidated under NOAA as lead agency with greater emphasis on basic studies of cloud physics and dynamics, and that the legal, social, and economic impact of weather modification be examined and appropriate legislation sought.

We note with regret that there has been no action in response to these recommendations. The Office of Management and Budget, we are told, takes the view that weather modification represents one of the many options available to a mission agency facing weather-related problems, and that research with an eye to user requirements within the using agency itself would be more effective than if it were centralized and susceptible to working up momentum for its own sake.

This view seems to ignore the critical inadequacy that, with a few exceptions, weather modification is not yet an operational tool. Considerable basic research is needed before it can become dependable and predictable, in fact before one can be sure that it can be safely used in any consistent way.

Progress in weather modification at this point calls for field experiments for which no one agency has the complete facilities, and progress calls for a greater emphasis on cloud physics. That means that the funding should be managed with an eye to scientific priorities and that the field experiments should in many cases be cooperative projects. They must be planned in advance and carefully coordinated. Yet typically each agency's contribution, while essential to such a combined effort, is of sufficiently low priority within the agency's primary mission that it is always in danger of being cut and sometimes is. Without coordinated effort the individual agency programs can be leaned on more heavily for practical application than their actual scientific strength warrants. This could be dangerous in a touchy business.

What seems most important at this time is that a coherent, integrated national program of research be established, with NOAA designated as lead agency, emphasizing: (1) research on the basic processes in the formation of rain, snow, hail, etc.; (2) closely controlled and integrated field experiments; and (3) an evaluation of the legal, economic, sociological, and political aspects that should be incorporated in legislation

and subsequent regulation for the control of weather modification activities in both the public and private sectors.

We are not necessarily recommending that more money be put into weather modification research, but rather that the funds currently alloted to weather modification be managed more effectively by designating a lead agency, i.e., an agency with primary responsibility for coordinating and for defending a sound and balanced program.

We believe this agency should be NOAA, because it has the necessary meteorological expertise. But all must recognize the major role in this field of activity to be played by the mission agencies such as the Department of Agriculture, the Department of the Interior, the National Science Foundation, the Department of Defense, the Energy Research and Development Administration, etc. In particular, the Department of Agriculture, since food production is the principal prospective beneficiary of weather modification, is urged to undertake a substantial effort in weather modification research coordinated with the NOAA program which would include the social, economic, ecological, environmental, and institutional aspects.

As we write this, the Federal effort in weather modification is once again under review, this time by the Domestic Council Subcommittee on Climate Change. We hope that this review will, at last, be followed by action which suits the state of the art.

Climate Variation

Climatic change has become of increasing concern in the past few years, and we devoted considerable attention to it last year. NACOA recommended increased Federal support for climatic research, urged an intensified effort to apply existing agricultural and climatological data to crop and crop-storage planning, and cautioned that the release of large quantities of waste heat to the atmosphere from concentrated power generating facilities might have significant environmental impact which was not being adequately considered.

We are pleased to note that the Federal Government has taken steps in each of these areas. We note, however, that there does not yet seem to be a clear sense of priority in the Federal plans. The question of year-to-year variation is currently more important than whether or not a few centuries or millenia from now a new ice age will engulf the northern continents. There is a need for more research than heretofore on attempts to predict weather conditions during the growing season, in order to assess crop prospects, and, during the heating season, in order to assess prospective fuel needs in various parts of the Nation. There is need also to take more advantage of statistical information already available to assess climate variation probabilities a few years ahead and to make that assessment part of contingency plans for both food and fuel.

The Domestic Council last year established a Subcommittee on Climate Change. This Subcommittee has prepared a report calling for a national climate program, but thus far no action has been taken. Various Federal agencies are taking what steps they can, in the absence of strong direction from the White House. Plans are being made for a major study of climatic change, with emphasis on the role of the oceans, as part of the Global Atmospheric Research Program—possibly in the form of a Climate Dynamics Decade during the 1980's. NSF has established a new Office of Climate Dynamics, and NOAA is planning to increase its effort in ocean/atmosphere climate research, climate modeling, and impact assessment. There is a cooperative effort under way between NOAA and the Department of Agriculture directed at short-term agricultural planning, including a joint experiment with NASA on the use of satellites to make current assessments of the global wheat crop.

The 1974 Energy Reorganization Act directed the Nuclear Regulatory Commision to conduct a national survey aimed at identifying sites suitable for nuclear energy centers, including an evaluation of the environmental impact associated with these centers, and an assessment of whether concentrating energy facilities in such centers will have greater or lesser environmental impact than siting them separately. NRC is to report the results to the Congress and to the Council on Environmental Quality by October 1975.

As indicated above, these actions are welcome but not enough. We urge the Domestic Council to act on its Subcommittee report and to establish a coherent national climate program. Meanwhile, it is important that NOAA and the Department of Agriculture step up their effort to develop an up-to-date system of crop assessment and planning taking into account what we already know, or have within our reach, about the likelihood of simultaneous climatic fluctuations* in different crop-producing regions of the world and their probable impact on food production. This requires no predictive ability based on physical models, but uses past experience to assess the probability of events.

Stratospheric Pollution

A related problem that has come to national attention recently concerns the effect of stratospheric pollution on ozone. The ozone layer in the upper atmosphere plays a role in the earth's thermal balance and

* By weather we mean an individual occurrence such as a thunderstorm, a dry spell, or a cold snap, whereas by climate we mean an averaging of weather by season, by year or years, or by area. Fluctuation is change about a mean; variation is a more general term including both trends and fluctuations.

thus affects climate, but more significantly, it absorbs ultraviolet radiation which, if allowed to reach the earth's surface in increased amounts could have serious manifestations in plant and animal life—not least of which is an expected increase in the incidence of skin cancer in humans. The problem first came to attention in connection with the engine emissions of nitrogen oxide expected from substantial numbers of supersonic aircraft operating in the stratosphere. More recently a second cause for concern has arisen in connection with certain chlorofluorocarbon gases which are widely used as aerosol spray propellants and as refrigerants in home and automobile air conditioners. In both instances these gases are ultimately released to the atmosphere. These gases, often known under a trade name such as Freon, are chemically relatively inert, but upon reaching the stratosphere are decomposed by the more vigorous ultraviolet radiation there present, releasing chlorine which then participates in a chain reaction in which one chlorine atom destroys many ozone molecules. The seriousness of this effect is under active study. The problem is further complicated by the fact that at the moment there appears to be no remedy other than restricting the manufacture of these gases with the attendant drastic impact on industrial processes that depend on them.

The Department of Transportation's Climatic Impact Assessment Program, and a companion study by the National Research Council's Climatic Impact Committee, have produced reports* addressing the aircraft emission problem. Both of these reports indicate that, while much uncertainty exists, it is likely that the climatic impact of ozone depletion resulting from aircraft operations (both supersonic and subsonic) in the stratosphere will be minor for the earth as a whole, although there may be significant local effects. The biological effects of increased ultraviolet radiation, however, appear to be more serious. There is general agreement that to avoid a serious problem in the future, new engine technology and cleaner fuels will be required. The technology is believed to be available today but development will require time and money.

The Freon problem arose too late to be included in the above studies in any detail and is now under examination by a specially created Interagency Task Force on Inadvertent Modification of the Stratosphere, which is issuing a report this summer summarizing available information on the Freon problem evaluating possible impact and alternatives, and

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* "The Effects of Stratospheric Pollution by Aircraft—Report of Findings," by A. J. Grobecker, S. C. Coroniti, and R. H. Cannon, Jr., Department of Transportation, Climatic Impact Assessment Program, December 1974.
"Environmental Impact of Stratospheric Flight", National Academy of Sciences, 1975.

recommending Federal action.* It is also under study by the National Research Council's Climatic Impact Committee, with an interim report due this summer and a complete report expected in the spring of 1976. NACOA intends to keep in close touch with these study efforts.

The difficulty of dealing with the stratospheric pollution problem is compounded by the absence of adequate observations and the consequent need to extrapolate or extend laboratory or theoretical findings to infer many of the effects of concern. When dire consequences can be avoided only by drastic remedies, determining the physical facts becomes imperative. Accordingly, we support those who emphasize the necessity of a stratospheric monitoring program. We cannot make effective national decisions, let alone persuasively advocate international ones, without the kind of results confirming other findings that only a continuing direct stratospheric sampling program can produce. At present the capability resides in NASA, having been developed in connection with its space shuttle program. Since time is of the essence here, we recommend the responsibility for carrying out an adequate sampling program be formally assigned NASA in close coordination with NOAA, pending a reassessment of its early and projected effectiveness in meeting the need.

HURRICANE RECONNAISSANCE

The population along the Gulf and Atlantic coasts is still exploding. Many millions of these people have never experienced a hurricane. Many are likely to be unprepared and thus vulnerable if surprised by a catastrophic tropical storm. It is essential that reliable advance warning be made available to minimize as much as possible the consequences of a hurricane along those coasts. Only aircraft can obtain some of the essential information and for many years the Department of Defense has been performing this function in support of the NOAA requirement.

The importance of this function was underscored following Hurricane Camille in 1969, when the Secretary of Commerce was directed by the President, "to make certain that all appropriate aircraft with the *best available equipment* be used on all future occasions." The Secretary of Commerce in turn requested assurance from the Secretary of Defense that appropriate Department of Defense aircraft would continue to support NOAA operational requirements for aircraft reconnaissance of tropical storms. The DOD, after some years, has raised the natural question: Who pays?

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* As we go to press, this report is scheduled for release on June 30th. A press conference has, however, already been held on its major findings.

The primary observing systems used by the National Weather Service in collecting the data needed for hurricane prediction and warning are satellites, reconnaissance aircraft, and weather radars. Each of these systems collects a unique set of data, and all are required if the prediction and warning service is to be effective.

The most important benefit from the continued availability of well-instrumented aircraft for hurricane reconnaissance is to provide early warning time and to reduce the size of the area that must be alerted for hurricane passage. Hurricane prediction models currently in use are highly sensitive to errors in the observed initial position and track, and in detailed knowledge of the characteristics of the storm's environment.

Although satellite data has decreased the requirement for aircraft data far from shore, at this time meteorologists feel that the satellites cannot provide the type of detailed and accurate information within the storm needed for prediction of the storm's movement and intensity. Reconnaissance aircraft are the only means available today to measure the initial position, track, and structure with the precision required to reduce safely the extent of areas warned. The average extent of coastline warnings for 21 recent hurricanes that struck the United States was 275 nautical miles. Even in a severe hurricane the swath of major damage is generally less than 75 nautical miles wide. Warnings posted over the much larger area are a result of uncertainties both in the observations and in the forecasts and, if reduced, could result in significant savings by cutting down areas unnecessarily alerted and increasing confidence among the people in the alerted area that action *must* be taken.

The provision of aircraft for storm reconnaissance is clearly an essential national requirement but one primarily for the protection of the civil populace. In the Department of Defense, funds and resources for aircraft storm reconnaissance for national programs for this purpose do not have relatively high priority in competition with funds more directly affecting its primary mission.

In response to the President's directive after Hurricane Camille, there remains the operational need to bring to bear the existing state-of-the-art capability in instrumentation for aircraft weather reconnaissance. This capability, which has been tested, greatly improves the accuracy in positioning hurricanes and in measuring their central structure and circulation. By satellite observation, positional errors of tropical cyclones average in excess of 25 nautical miles; by existing weather reconnaissance aircraft, in excess of 20 nautical miles; whereas, the now-available capability can fix the wind eye of hurricanes within two nautical miles and measure winds with an accuracy well within three knots. In addition, the new

system measurement of pressure, temperature, and humidity are appreciably more accurate. By hurricane prediction methods including computer models now in use and well along in development, this information from better measurement systems will greatly improve the forecast accuracy of hurricane intensity and movement. It is expected that for twenty-four hours ahead, a 50% position accuracy improvement would be realized that would greatly reduce the current warning area threatened by hurricanes.

The entire weather reconnaissance operation is running about $24 million per year of which about $4-5 million is attributable to the expansion of effort required to meet the civil protection requirements for the U.S. over and beyond other military requirements.

The information available from aircraft weather reconnaissance is very important for alerting the islands of the Caribbean and the countries on its periphery. In addition, the storm reconnaissance data is vital for typhoon warnings to the islands of the Pacific and to Japan, Korea, China, Taiwan, Okinawa, Hong Kong, the Philippines and the countries of Southeast Asia. The importance of this program in minimizing the loss of life and destruction of property to these heavily populated countries cannot be overemphasized. No other country has this aircraft storm reconnaissance capability at this time.

Both the Department of Defense and NOAA agree that the most cost-effective approach to aircraft reconnaissance of tropical storms is for DOD aircraft to continue to fly the storm reconnaissance missions. The DOD has taken the position that, beginning in FY '77, they must be reimbursed for reconnaissance flown specifically in support of the civil requirement. NOAA feels the reimbursement approach could lead to management difficulties and complexities that would be avoided if the necessary funds were programmed and protected by the agency executing the operation.

Though the dollar amounts are small, the policy aspect is not. NACOA has looked into both, including other options such as having NOAA operate its own fleet of aircraft, or NOAA using the U.S. Coast Guard as aircraft operators, or continuing the current arrangement with the DOD. We take the position, as do both NOAA and the DOD, that it would not be wise or cost-effective to do anything but continue the operation of the aircraft storm reconnaissance fleet by the Department of Defense.

On the funding issue, NACOA urges that responsibility for budgeting the funds necessary for satisfying the national civil and military requirement for aircraft storm reconnaissance including the upgrading of the

navigational and observational equipment be retained by the operating agency, the Air Force, but that those funds be identified as for a *national program* to meet *national requirements* for the protection of the *civilian* population and be defended and supported by NOAA and the DOD and be protected by the funding-approval bodies in the Executive and Legislative Branches from trade-offs with non-comparable items in the Department of Defense budget.

Appendix I

Public Law 92-125
92nd Congress, H. R. 2587
August 16, 1971

An Act

85 STAT. 344

To establish the National Advisory Committee on the Oceans and Atmosphere.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, There is hereby established a committee of twenty-five members to be known as the National Advisory Committee on Oceans and Atmosphere (hereafter referred to in this Act as the "Advisory Committee"). National Advisory Committee on Oceans and Atmosphere, Establishment.

SEC. 2. (a) The members of the Advisory Committee, who may not be full-time officers or employees of the United States, shall be appointed by the President and shall be drawn from State and local government, industry, science, and other appropriate areas.

(b) Except as provided in subsections (c) and (d), members shall be appointed for terms of three years.

(c) Of the members first appointed, as designated by the President at the time of appointment—

(1) nine shall be appointed for a term of one year,

(2) eight shall be appointed for a term of two years, and

(3) eight shall be appointed for a term of three years.

(d) Any member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed only for the remainder of such term. A member may serve after the expiration of his term until his successor has taken office.

(e) The President shall designate one of the members of the Advisory Committee as the Chairman and one of the members as the Vice Chairman. The Vice Chairman shall act as Chairman in the absence or incapacity of, or in the event of a vacancy in the office of, the Chairman. Chairman and Vice Chairman

SEC. 3. Each department and agency of the Federal Government concerned with marine and atmospheric matters shall designate a senior policy official to participate as observer in the work of the Advisory Committee and to offer necessary assistance. Senior policy official.

SEC. 4. The Advisory Committee shall (1) undertake a continuing review of the progress of the marine and atmospheric science and service programs of the United States, and (2) advise the Secretary of Commerce with respect to the carrying out of the purposes of the National Oceanic and Atmospheric Administration. The Advisory Committee shall submit a comprehensive annual report to the President and to the Congress setting forth an overall assessment of the status of the Nation's marine and atmospheric activities and shall submit such other reports as may from time to time be requested by the President. Each such report shall be submitted to the Secretary of Commerce who shall, within 90 days after receipt thereof, transmit copies to the President and to the Congress, with his comments and recommendations. The comprehensive annual report required herein shall be submitted on or before June 30 of each year, beginning June 30, 1972. Duties. Reports to President and Congress.

SEC. 5. Members of the Advisory Committee shall, while serving on business of the Committee, be entitled to receive compensation at rates not to exceed $100 per diem, including traveltime, and while so serving away from their homes or regular places of business they may be allowed travel expenses, including per diem in lieu of subsistence, in the same manner as the expenses authorized by section 5703(b) of title 5, United States Code, for persons in Government service employed intermittently. Pay. 80 Stat. 499.

SEC. 6. The Secretary of Commerce shall make available to the Advisory Committee such staff, information, personnel and administrative services and assistance as it may reasonably require to carry out its activities. The Advisory Committee is authorized to request from any department, agency, or independent instrumentality of the Federal Government any information and assistance it deems necessary to carry out its functions under this Act; and each such department, agency, and instrumentality is authorized to cooperate with the Advisory Committee and, to the extent permitted by law, to furnish such information and assistance to the Advisory Committee upon request made by its Chairman, without reimbursement for such services and assistance. Department of Commerce and other agencies, assistance.

SEC. 7. There is hereby authorized to be appropriated to the Secretary of Commerce $200,000 for the fiscal year ending June 30, 1972, and each succeeding fiscal year to carry out the purposes of this Act. Appropriation.

Approved August 16, 1971.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 92-201 (Comm. on Merchant Marine and Fisheries).
SENATE REPORT No. 92-333 (Comm. on Commerce).
CONGRESSIONAL RECORD, Vol. 117 (1971):
May 17, considered and passed House.
Aug. 2, considered and passed Senate, amended.
Aug. 5, House concurred in Senate amendments.

Public Law 92-567
92nd Congress, H. R. 15280
October 25, 1972

An Act

86 STAT. 1181

To amend the Act of August 16, 1971, which established the National Advisory Committee on Oceans and Atmosphere, to increase the appropriation authorization thereunder.

National Advisory Committee on Oceans and Atmosphere. Appropriation authorization, increase. 33 USC 857-12.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 7 of the Act of August 16, 1971 (Public Law 92-125; 85 Stat. 344), is amended to read as follows: "There are hereby authorized to be appropriated to the Secretary of Commerce, for the fiscal year ending June 30, 1973, and for each of the two fiscal years immediately thereafter, such sums, not to exceed $400,000, as may be necessary for expenses incident to the administration of this Act, and for succeeding fiscal years only such sums as may be authorized by law.".

Approved October 25, 1972.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 92-1467 (Comm. on Merchant Marine and Fisheries).
CONGRESSIONAL RECORD, Vol. 118 (1972):
Oct. 11, considered and passed House.
Oct. 13, considered and passed Senate.
WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, Vol. 8, No. 44:
Oct. 28, Presidential statement.

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

September 22, 1975

The President
President of the Senate
Speaker of the House of Representatives

Sirs:

I have the honor to transmit, in accordance with Public Law 92-125, August 16, 1971, the Fourth Annual Report of the National Advisory Committee on Oceans and Atmosphere (NACOA).

Enclosed also are my comments and recommendations that are required by the Act. These comments are also submitted in satisfaction of the requirement of section 6(b) of the Federal Advisory Committee Act (5 U.S.C. App. I).

Sincerely,

Rogers Morton

Secretary of Commerce

Enclosures

COMMENTS AND RECOMMENDATIONS OF THE SECRETARY OF COMMERCE ON THE FOURTH ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE ON OCEANS AND ATMOSPHERE

PREFACE

Public Law 92-125, which established the National Advisory Committee on Oceans and Atmosphere (NACOA) requires that the annual report of the Committee "shall be submitted to the Secretary of Commerce who shall within 90 days after receipt thereof transmit copies to the President and to the Congress with his comments and recommendations." Accordingly, I have reviewed the Fourth Annual Report of NACOA and have incorporated the viewpoints of all interested Federal agencies in these comments and recommendations. The comments have been organized to parallel the presentation in the Committee report and under the same chapter headings.

INTRODUCTION

I welcome this Fourth Annual Report of the National Advisory Committee on Oceans and Atmosphere (NACOA). This is the first opportunity that I have had to comment directly on the findings and the recommendations of the Committee in my new capacity as the Secretary of Commerce. Previously, as the Secretary of the Interior, I worked with the Committee on matters of interest to the Department of the Interior (DOI). This opportunity to express my views is most welcome because of my deep conviction that the economic and environmental welfare of our Nation will increasingly depend on the wise use of the seas and atmosphere around us. While in the Congress, and since joining the Administration as a Cabinet Officer, oceanic and atmospheric programs have had my warm support and endorsement.

The findings and recommendations in this Fourth Annual Report of NACOA touch upon a broad variety of issues. Some of them are related to major international and domestic policy problems which the Administration is presently addressing. Others relate to certain program funding and institutional arrangements. However, all of the findings and recommendations are significant, and deserve comment and response. Absence of comment on other textual material should be taken to imply neither concurrence nor lack thereof.

Common agreement on goals to insure strong oceanic and atmospheric efforts responsive to national needs is not always accompanied by agreement on means for achieving those goals or the timing of actions that will bring them about. The choice of courses of action must sometimes be conditioned by international economic and other factors that lie beyond the realm of oceanic and atmospheric consideration.

> *NACOA, NOTING* that the Law of the Sea Conference has been unable to come to agreement after a protracted period of preparation and negotiation, and FINDING that the pressure on living resources and the marine environment off our coasts requires urgent action to bring their use under positive rational management,
>
> *NACOA RECOMMENDS THAT:*

- Legislation be enacted asserting United States jurisdiction over resources within a zone, out to 200 miles off the United States coast, which should be identified as the Economic Resource Zone of the United States.

- The United States undertake to create within its Economic Resource Zone, as a matter of policy, a model system for rational use of the zone and its resources that incorporates due regard for international obligations.

- Management of fisheries within the Economic Resource Zone be based on the principles of conservation and full utilization of living resources, in that order, with preferential rights for U.S. fishing interests, both sports and commercial. Such principles must be based on the maximum biological yield, taking into account economic and environmental factors of concern to the United States within the Economic Resource Zone.

- Legislation be enacted to encourage and regulate deep seabed mining by United States private industry to the end that the minerals of the deep seabed will be available to decrease United States dependence on foreign sources and to increase world supply.

- The Outer Continental Shelf Lands Act of 1953, or the Coastal Zone Management Act of 1972, be amended:

To assure reasonable state input to Outer Continental Shelf development plans and production, to expedite state management planning related to the consequences of offshore oil and gas development, to assure that proposed Outer Continental Shelf exploration and development programs are fully consistent with state plans, and to provide adequate information and technological data to assist in coastal zone planning and decision-making.

To give negatively impacted states compensation for the effects imposed upon these states.

- Private industry continue its role in oil and gas exploration and development on the Outer Continental Shelf under explicit Federal permit and lease-hold guidelines to assure a balance between development, conservation, and environmental protection.

- Environmental impact assessments of Outer Continental Shelf exploration and development plans in frontier areas, where there has been no previous production, be made in stages commensurate with the differences in hazard between resource *exploration* and resource *development*. Less detailed environmental impact statements should be accepted for exploration plans, but the review process leading to approval of production plans should be accompanied by thoroughly detailed environmental impact statements.

The following comments are responsive to the Law of the Sea (LOS) aspects of this NACOA finding and its recommendations. There are additional aspects of several of these recommendations which are treated later on.

The National Advisory Committee on Oceans and Atmosphere 1975 Report to the President and Congress includes discussion and recommendations on several of the basic areas at issue in the LOS negotiations. The Committee's support for unilateral promulgation by the United States of a 200-mile economic resource zone and for

enactment of interim deep seabed mining legislation, as well as the treatment of the issue of marine scientific research, relate directly to the U.S. position at the next session of the LOS Conference scheduled to open next March in New York. Administration views on these portions of NACOA's report have thus been coordinated through the National Security Council Interagency Task Force on the Law of the Sea.

With regard to the NACOA recommendation that the United States unilaterally enact a 200-mile economic resource zone, the Administration believes that unilateral action is extremely dangerous and incompatible with the thrust of the LOS negotiations. Unilateral extension of resource jurisdiction on our part would doubtless trigger unilateral actions on the part of others and such claims might not be limited to resources but could restrict navigation and other important ocean uses.

Multilateral agreement through the LOS Conference remains the best means for establishing a rational order in the uses of the oceans and ocean resources. The Administration recognizes, however, that the United States cannot indefinitely accept unregulated foreign fishing off our coasts. Agreements have been concluded with nations fishing in these areas, including the USSR, Japan and Poland. Much more needs to be done. In order to protect fishery resources and protect our fishing industry prior to the conclusion of the LOS negotiations, the United States intends to negotiate more effective interim arrangements with other nations to conserve the fish stocks and to ensure effective enforcement, as a transition to international agreement on the 200-mile economic zone jurisdiction in a comprehensive LOS treaty.

It is both appropriate and important to continue to develop the management system for rational use of coastal fisheries resources within an eventual 200-mile zone. Such a framework would include conservation of coastal and anadromous fisheries stocks and optimum utilization of the stocks, including an obligation to allow foreign states to fish for surplus in the allowable catch that the coastal state is itself unable to harvest. These principles are incorporated in points included in NACOA's recommendations. It should be noted, however, that protection of U.S. interests in anadromous species such as salmon and highly migratory species such as tuna are particularly dependent upon international agreement.

With regard to deep seabed mining, it has been and remains the position of the United States that the mining of the deep seabed beyond the limits of national jurisdiction may take place as a legitimate use of the sea under existing international law. At the same time, the United States believes that international agreement on the regime and machinery for deep seabed mining is in the interest of all nations, those possessing the technology and those whose economic development could be assisted from the benefits of exploiting the mineral resources of the deep seabed. The United States, however, is not prepared to give up its basic deep seabed objectives for the sake of achieving an otherwise acceptable treaty. Accordingly, the treaty must provide for guaranteed access and security of tenure for U.S. firms to seabed minerals; and the international organization to be established must reflect the balance and interests of participating states, with no power to control prices or production rates of seabed minerals. Though we would prefer international agreement to provide a stable legal environment before mining actually begins, such mining activities cannot be deferred much longer. Hence, the Administration is considering appropriate steps to protect investments in deep seabed mining and to ensure that these investments are also protected in the treaty, including consultations on such steps with other potential seabed producers.

Treatment of the issue of marine scientific research in the NACOA report merits a clarifying rejoinder. The United States is committed to the principle of freedom of scientific research. Encouraging marine scientific research for the benefit of all mankind has been a major U.S. objective at the LOS Conference since its inception. It continues to be our view that this objective can best be achieved through a single international treaty rather than relying upon regional or bilateral agreements.

The following comments relate to certain management aspects of the first NACOA finding and its recommendations and are not necessarily related to the existence of an economic resource zone.

> *NACOA RECOMMENDS THAT:* The United States undertake to create within its Economic Resource Zone, as a matter of policy, a model system for rational use of the zone and its resources which incorporates due regard for international obligations.

The establishment of a rational system for management of the resources under the jurisdiction of the United States is a central

tenet of U.S. policy. Any system for use of the resources in the zone which does not provide for the proper regard for the international obligations of this country would be unacceptable.

As the Committee realizes, there are many different users of the waters and resources of the economic zone, with conflicting needs. The Congress, over the years, has enacted the statutory basis for the present system for the management and regulation of the resources in this zone. It is presently formulating additional measures. Certainly, laws such as the Federal Water Pollution Control Act; the Marine Protection, Research and Sanctuaries Act of 1972; the Fish and Wildlife Coordination Act; the Outer Continental Shelf Lands Act; the Coastal Zone Management Act of 1972; the Northwest Atlantic Fisheries Act of 1950, as amended; the Federal Boat Safety Act of 1971; the Ports and Waterways Safety Act of 1972; and the Deepwater Ports Act of 1975; all represent important steps by the Congress and the Executive Branch to establish systems for use of the resources in the economic zone. The Administration, in implementing these laws, has established a framework which can evolve into a more comprehensive approach to the management of the resources of this zone. As a goal, I concur heartily with the recommendation of the Committee. It would be useful if the Committee could further explore this concept and provide its views on the framework for possible model systems.

> *NACOA RECOMMENDS THAT:* Management of fisheries within the Economic Resource Zone be based on the principles of conservation and full utilization of living resources, in that order, with preferential rights for U.S. fishing interests, both sports and commercial. Such principles must be based on the maximum biological yield, taking into account economic and environmental factors of concern to the United States within the Economic Resource Zone.

We are working diligently on the development of a National Marine Fisheries Plan and possible management systems for fisheries resources. Both the draft National Marine Fisheries Plan and the management concepts supported by this Department are based upon the principles of conservation and utilization of living resources that take into account, not only the biological yield but also economic and environmental factors. We have chosen to call this

the optimum sustainable yield, and believe it should be the fundamental basis for fisheries management. The Committee in its report has suggested management by species. While we believe that any management system must consider individual species as a necessary condition, we believe that the total biomass must provide the basic framework because of species interrelationships.

We have been pleased that NACOA has, in a number of its reports, emphasized the importance of rational fisheries management. As a result of the prior recommendations of the Committee, we have devoted considerable effort to the development of a National Marine Fisheries Plan. We have attempted to involve members of the fishing industry, recreational interests, and all other groups that have a concern about the fisheries resources of the United States in this process.

Similarly, both the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Coast Guard have carried out special studies, NOAA on management regimes for fisheries and the Coast Guard on enforcement plans for extended fisheries jurisdiction, that could apply within an economic resource zone and would achieve the objectives of the Committee. The Committee has been informed of these studies.

> *NACOA RECOMMENDS THAT:* The Outer Continental Shelf Lands Act of 1953 or the Coastal Zone Management Act of 1972 be amended to assure reasonable state input to Outer Continental Shelf development plans and production, to expedite offshore oil and gas development, to assure that proposed Outer Continental Shelf exploration and development programs are fully consistent with state plans, and to provide adequate information and technological data to assist in coastal zone planning and decisionmaking. In addition, to give negatively impacted states compensation for the effects imposed upon those states.

We agree that those states and communities where offshore development may take place have special interests in the conduct of the Outer Continental Shelf (OCS) leasing program and have need to be both involved and informed.

The states now have opportunities to participate in the leasing process and to play an important role in making decisions at several stages—the design and conduct of environmental baseline studies, tract selection, the review of environmental impact state-

ments, public hearings, planning of pipeline right-of-ways and location of onshore facilities. To further encourage participation of the coastal states in the decision-making process, representatives of the Department of the Interior met with those of the coastal states and other Federal agencies on May 21, 1975, to determine how to best structure a Federal-State interface. A decision was made to draft a charter for an OCS policy board that would provide a formal mechanism for policy discussion and recommendations between the Federal Government and the states. We see establishment of this board as a significant step forward in providing for state input into the national and regional issues associated with OCS development.

In addition to establishment of the OCS Policy Board, the Department of the Interior is preparing amendments to the Outer Continental Shelf Lands Act to permit greater participation of the states in the review of industry development plans. The proposed amendments will require that operators, at the time they submit development plans, provide copies of all nonproprietary portions of the plans to the governors of the adjacent states and that the states have 60 days for completion of review of the plans.

The Committee calls for expediting state management planning related to the consequences of offshore oil and gas development. The President has been sensitive to this need. He requested a supplemental appropriation of $3.0 million for coastal zone planning grants in FY 1975 for this purpose. The funds were appropriated late in the fiscal year. This increases the amount of money available to the states for coastal zone planning from $9.0 to $12.0 million.

The Coastal Zone Management Act of 1972 provides an excellent framework within which the proposed OCS exploration and development programs can be made consistent with the plans of the individual states. It is my feeling that the Federal consistency provisions of that Act provide mechanisms to accomplish this objective. I wish to assure the Committee and the Congress that I will take all necessary steps to implement these provisions of the Act.

The views of the Committee that the Federal Government should provide adequate information and technological data to assist in coastal zone planning and decision-making are well taken. There are many programs underway that can provide a larger amount

of useful information to the coastal states; for example, the Coast Guard effort in cooperating with states to provide effective information to assist in guaranteeing the safety of persons and small craft in the congested coastal zone. Also, efforts of the Department of the Interior/Bureau of Land Management to secure baseline information about our coastal waters in frontier areas represents a highly focused effort to acquire information on the marine ecological, physical, and geophysical conditions surrounding oil and gas development on the OCS. The Federal investment in such programs has quadrupled in two years, from $25.0 million to $117.0 million.

Many other programs of long standing, such as NOAA's National Sea Grant Program, have supported research related to coastal zone management and planning. In addition, NOAA, through its National Marine Fisheries Service, its Environmental Data Service, its National Ocean Survey and its National Weather Service, can provide amounts of already existing data. Programs of other agencies, such as the National Science Foundation, the Corps of Engineers, DOI, the Environmental Protection Agency, and the U.S. Coast Guard, are pertinent to many aspects of the coastal zones of the United States. This information and data need to be more accessible. Recommendations of the Committee that the Office of Coastal Zone Management (OCZM) of NOAA attempt to focus more strongly on the information needs of the states is well taken, and I have directed NOAA to take steps to implement these needs as they fall within its statutory purview.

The Committee raises the issue of compensation to coastal states which are negatively impacted by the effects of OCS oil and gas development. The Administration is now studying both the possible need for such impact assistance and potential methods for delivering such assistance if it should be concluded that it is needed. The alternatives being considered range from compensation only for demonstrated negative impacts to coastal states out of general funds appropriated as needed to OCS revenue-sharing systems allocated on a formula basis. Many factors need consideration.

NACOA RECOMMENDS THAT: Private industry continue its role in oil and gas exploration and development on the Outer Continental Shelf under explicit Federal permit and lease-hold guidelines to assure a balance be-

tween development, conservation, and environmental protection.

We agree that private industry should continue its traditional role in oil and gas exploration and development on the OCS. Under existing laws and with increasing experience, the Department of the Interior has been able to and will continue to upgrade Federal permit and lease-hold guidelines that aim at achieving the balance between development, conservation, and environmental protection desired by all. As an example, Interior's Geological Survey recently issued a general revision of its Outer Continental Shelf Orders for the Gulf of Mexico Area, incorporating recommendations of a variety of independent studies by groups such as the National Academy of Engineering and University of Oklahoma, as well as changes resulting from experience and advances in technology.

NACOA RECOMMENDS THAT: Environmental impact assessments of Outer Continental Shelf exploration and development plans in frontier areas where there has been no previous production be made in stages commensurate with the differences in hazard between resource *exploration* and resource *development*. Less detailed environmental impact statements should be accepted for exploration plans, but the review process leading to approval or production plans should be accompanied by thoroughly detailed environmental impact statements.

I believe that the principle advocated by the Committee in this recommendation is sound. That there is a difference in the risk of environmental damage between the phases of resource exploration and resource development is recognized. Therefore, the detail with which environmental impact statements are drafted should reflect this different level of risk. Environmental impact statements prior to resource exploration can be programmatic and, hence, will require less detail than those required prior to the beginning of production. The Department of the Interior is exploring how to accomplish the objectives of this recommendation and still fully carry out the provisions of the National Environmental Policy Act.

NACOA, FINDING that the informational needs of state coastal zone managers are of great variety and unprecedented detail, but that common problems of information management exist for many states in knowing what is and what isn't available, in filling the gaps that exist,

NACOA RECOMMENDS THAT: The Office of Coastal Zone Management of the National Oceanic and Atmospheric Administration (NOAA) expand its informational services to fulfill the function of a Federal coastal information coordinating center and to assure effective intercommunication with state centers and Federal and other sources.

I have already indicated that I concur a need exists for expanded informational services to the states to facilitate carrying out their responsibilities under the Coastal Zone Management Act. I have directed the Administrator of NOAA to take steps to implement this recommendation within the resources available. It is our intention to bring to bear upon this problem the full environmental information capabilities of NOAA, including those of our Environmental Data Service, our Sea Grant Program, and our Environmental Research Laboratories under the coordination of the Office of Coastal Zone Management. I am asking that this office also insure that the information and data resources of other agencies are brought to bear to address the needs outlined by NACOA.

In fact, OCZM has been attentive to the informational needs of the individual state agencies charged with preparing state programs. For instance, when the OCS leasing issue became controversial, OCZM prepared a comprehensive document outlining the OCS process and providing sources of additional, more detailed information so that state officials could become familiar quickly with the issues under debate. Technical assistance in such areas as mapping and defining boundaries has been and will continue to be supplied in timely fashion to the states.

NACOA, FINDING that support is fading and understanding diminishing for some important Navy programs having to do with the support of basic research in the oceans, and the relationship of the Navy with the university oceanographic community and scientific community as a whole which has been of such national importance since World War II is currently declining,

NACOA RECOMMENDS THAT: The Navy renew the vitality of its basic research in oceanography by reaffirming, as has the Air Force for Air Force programs, the fundamental contribution of basic research to Navy's broad long-range mission in the ocean, and the Navy take steps to reaffirm the desirability of conducting a significant part

of this work at the universities while strengthening its own capability as well.

The Secretary of Defense has asked that I communicate the following views of the Department of the Navy:

The Navy shares with NACOA concern over the adequacy of support for basic ocean research. While the Navy support of base technology programs has been essentially level-funded over the past decade, the Navy has maintained its commitment to a strong program of basic research in the oceans. The FY 1976 funding request, besides offsetting inflationary effects, will provide for about a three-percent increase in actual research effort and about four percent in actual exploratory development. Increases will be assigned over all activities on the basis of a careful evaluation of eventual returns to the Navy. Emphasis, however, will be maintained for ensuring a responsive oceanographic program. It is expected that universities will continue to make significant contributions to this program.

> *NACOA, FINDING* that there has been a tendency for mission-oriented agencies of the Federal Government to establish in-house research laboratories and, during periods of financial stress, to support these laboratories preferentially over the support of research with industrial and academic institutions, risking decline in the quality and quantity of non-government scientific and engineering output so important to the Nation's oceanographic and atmospheric programs,
>
> *NACOA RECOMMENDS THAT:* Administrators of all Federal ocean and atmospheric programs involving research and development maintain a reasonable balance between funds expended inside and outside of the Federal establishment in order to insure that they sustain, stimulate and draw ideas and vigor from the entire spectrum of organizations engaged in oceanic and atmospheric research and development.

While I am not prepared to subscribe fully to the findings of NACOA, I concur with this recommendation. All Government agencies should, in planning and carrying out their research and development, draw upon all the institutions of our Nation which can contribute effectively. No single institution of our society has a monopoly on talent, capability, or motivation. If we are to carry out increasingly complex national efforts in a successful way, we must build networks of institutions with the necessary expertise.

NACOA, FINDING that the Sea Grant Program in concept provides a means for applying the considerable and varied scientific and technological skills of the Nation's scientific and academic institutions to solution of national, regional, and local problems, but noting that after almost a decade of activity questions arise about its performance, organizational structure, location within the Executive Branch and support,

NACOA RECOMMENDS THAT: The Sea Grant Program funding be adjusted to cover the effects of inflation and to permit maintenance of its full program, and its performance and future support level be evaluated in the light of statutory expectations; national, regional, and local needs; and its effectiveness and productivity.

It is with some surprise that I have read the finding and recommendation of NACOA on the Sea Grant Program. The Committee has been briefed extensively on the Sea Grant effort over the years and has found the program in excellent condition. Furthermore, many members of NACOA have been affiliated with this program through other contexts. The Administrator of NOAA brought to the Committee a full presentation of the conditions surrounding the budget cuts in this program with a view to eliciting an assessment by NACOA. The finding and recommendation of NACOA have failed to answer the questions posed to it by the Administrator of NOAA. I look forward to the review of the Sea Grant Program which the Committee proposes to undertake. I have asked the Administrator of NOAA to provide whatever assistance the Committee may require in carrying out this review.

NACOA, FINDING in a special report to the Secretary of Commerce that the absence of an organization, whose responsibility it would be to stimulate and catalyze research on ocean engineering to make available the technical alternatives needed as new engineering decisions arise, has caused drift and loss over the last decade,

NACOA RECOMMENDS THAT: There be established by legislation or by Executive Order a modestly sized Institute for Engineering Research in the Ocean, reporting to the Administrator of NOAA, whose functions would be to develop standards in ocean engineering, to fund germinal ideas in the field, and to animate technical transfer and professional communications. Until this Institute of Engineering Research in the Ocean is established, NOAA, in

cooperation with the National Academy of Engineering, devise a specific interim program in ocean engineering which can contribute toward these same ends and to developing Institute.

Former Secretary of Commerce Dent, upon receipt of the recommendation of NACOA on the establishment of an Ocean Engineering Institute, recommended to the Office of Management and Budget (OMB) that the establishment of such an institute be considered in connection with decisions surrounding the FY 1977 budget. Alternatives for improving the coordination and effectiveness of Federal ocean engineering programs are currently under review within the Administration. The NACOA recommendation is being considered in this review.

NACOA, FINDING in a special study for the Director of the National Science Foundation, that the National Science Foundation has developed for the International Decade of Ocean Exploration, a means for carrying out complex, long-term research projects involving the cooperative effort of numerous scientists, disciplines, and institutions from this and other nations, without the necessity for creating new permanent organizations in each case and that there are many ocean-related areas of study, including atmospheric processes as well which require such a large-scale integrated approach,

NACOA RECOMMENDS THAT: NSF maintain its capability for assisting and supporting research programs on large-scale, complex oceanographic and atmospheric problems, which require a multidisciplinary, multi-institutional, cooperative approach apart and distinct from its traditional support of science, discipline-by-discipline when a decade of the IDOE ends in 1980; the National Science Foundation take steps to improve and expand the participation for foreign ocean scientists, especially from developing countries, as a means for increasing the efficiency and economy of ocean data collection in the long run.

The NSF is gratified by NACOA's recognition of the value of the procedures developed for carrying out the types of research projects supported by the IDOE. It also concurs with the recommendation that the NSF maintain the capability to handle such large-scale cooperative programs beyond the conclusion of the Decade in 1980, as well as with the recommendation concerning

the need to strengthen the international cooperation in ocean research during the remainder of the IDOE. Implementation of these recommendations will require considerable deliberations which will begin as soon as NACOA has submitted the findings of its special IDOE study to the Director of the Foundation.

> *NACOA, NOTING* that the responsibility for overseeing fleet adequacy for ocean research on a national basis is nowhere assigned, and Finding that a shortfall is developing in the capacity of the oceanic research plans and other programs taking shape in the scientific community,
>
> *NACOA RECOMMENDS THAT:* NSF be designated lead agency for funding the academic fleet coordinated by the University National Oceanographic Laboratory System (UNOLS) and, NOAA be designated lead agency for the Federal fleet for civil oceanographic research and survey missions except for special purpose ships unique to a given agency; NSF and the Navy develop coherent and comprehensive long-range plans for the design, procurement, and operational support of oceanographic research ships for the federally funded academic fleet in the light of long-term development in research and long lead times in ship planning and construction.

The recommendation of the Committee is largely based upon the results of the study of the Interagency Committee for Marine Science and Engineering (ICMSE) of the Federal Council for Science and Technology (FCST) which has found that there is an expected shortfall in the availability of ships for carrying out agency-approved five-year oceanographic plans. As I indicated in my letter of transmittal of that report to the Committee, I feel we must make sure that there is an adequate ship facility program to carry out the national oceanographic effort. The Committee has recommended lead agency responsibilities to NSF in connection with the academic fleet, to NOAA for the Federal civil fleet, and has asked NSF and the Navy to develop long-range plans for the design and procurement of ships that could be used for the academic fleet. I believe that with some modification these recommendations make sense.

The recommendations pertaining to the academic fleet are in large measure being implemented. The NSF and the Navy, specifically the Office of Naval Research, have long shared "lead agency" responsibility for support of the academic fleet. The combined

contributions of NSF and the Navy has exceeded 90 percent of the total annual fleet cost for most years between 1960 and 1975. This support has matched or exceeded the requirements for ship-time needed to carry out the research projects funded by these agencies. The actual award of ship operating funds has not, however, been on a project-by-project basis but rather on an annual block grant or contract from each agency to each ship operating institution based on projected needs for the coming operating year. This NSF/Navy relationship has resulted in the evolution of the University National Oceanographic Laboratory System (UNOLS) and of a formal system for coordinating the support of ship operations, accounting for actual ship use, monitoring ship material condition and developing plans for ship construction and conversion. It is inconsistent to suggest, as the Committee does, that the Navy be stripped of its shared "lead agency" role with respect to the academic fleet at the same time that the Committee has so forcefully called for renewed vitality in the Navy's basic research support program.

Finally, since programs of several other agencies, notably the United States Geological Survey, the Bureau of Land Management, and the Energy Research and Development Administration, are beginning to make increased or new demands on the academic fleet, it is likely that the NSF/Navy coordinating mechanism will need to be expanded to include these agencies on a full-time basis. Their funding support should become a significant source of future funds for the academic fleet.

Designation of NOAA as lead agency for civilian oceanographic research and survey missions needs careful definition. All research vessels are special-purpose ships that are outfitted to conduct unique aspects of the operating agency missions and are manned by specialists and crews familiar with the mission objectives. At the same time, we recognize that most vessels can also serve as platforms for other purposes and that better utilization for these purposes can be achieved.

Recognizing that all ship assets need better coordination to insure that national needs are met, ICMSE of FCST has established a subcommittee on ships. The subcommittee has recently initiated a continuing review on the status of the Federal fleet, both agency and academic ships.

NACOA, FINDING that better coordination of the widely diverse Federal efforts in weather modification research under a single lead agency is needed to emphasize basic work required for more rapid progress such as cloud physics,

NACOA RECOMMENDS THAT: NOAA be designated as lead agency for a coherent national program of research in weather modification taking into account the major stake in this work by mission agencies, such as the Department of Agriculture, Department of the Interior, the National Science Foundation, Department of Defense, Energy Research and Development Administration and others.

The weather modification activities of the several agencies are presently being coordinated through the Federal Council of Science and Technology. As Chairman of the Environmental Resources Committee of the Domestic Council, I have asked a subcommittee, under the chairmanship of Dr. R. M. White, Administrator of NOAA, to examine the Federal role in weather modification and to consider the need for any changes in the organization or coordination of these programs.

NACOA, NOTING that agriculture is a principal potential beneficiary of weather modification, that there is a growing national and international concern over the future adequacy of the world's food supply,

NACOA RECOMMENDS THAT: The Department of Agriculture mount a substantial program in weather modification research, coordinated with the NOAA program and including the social economic, ecological, environmental, and institutional aspects.

The Secretary of Agriculture has asked that I inform the Committee and the Congress that, in his view, an expansion in USDA cloud seeding research is not required at this time. His Department maintains close liaison and good communications with all Federal agencies that are active in weather modification research and will continue to keep abreast of developments in cloud seeding technology and its applicability to agriculture weather problems.

The USDA research program will continue to emphasize those aspects of weather modification which are not adequately covered in other programs. Work on shelter-belt development and radiation and evaporation control have high priority in the Department of Agriculture plans for weather modification research.

> *NACOA, FINDING* that while a variety of issues concerning climate and climate change, especially those related to food supply and energy consumption, are receiving increasing attention, and that the needs for a national climate program have become critical,
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> *NACOA RECOMMENDS THAT:* A coherent national climate program be established cooperatively by NSF and NOAA with special emphasis on predicting short-term climatic fluctuations, NOAA and the Department of Agriculture develop a crop-assessment and planning system which will recognize the national implications of simultaneous climatic variation upon agricultural production worldwide.

As a result of similar recommendations by the Committee last year, a number of actions have been taken. The Domestic Council, through its Subcommittee on Climate Change, has prepared and issued a report on a National Climate Program which is now being considered for possible action. NSF has established an Office of Climate Dynamics, and has increased funding for this activity. NOAA has established a new Center for Climatic and Environmental Assessment directed at achieving some of the goals recommended by the Committee. NASA has climate variability research efforts underway focused on earth radiation budget, ocean studies, numerical modeling and simulation. In addition, the Department of Agriculture, with the cooperation and support of NOAA and NASA, has embarged on an experimental program aimed at establishing the feasibility of estimating production of a major crop through the use of data from Land Satellite (LANDSAT) and conventional ground-based meteorological measurements. If this effort is successful, it conceivably could be expanded into a global monitoring system on an operational basis to provide a planning tool for natural agricultural programs.

A coherent national climate program must of necessity involve a strong international component. The United States has taken the leadership within the World Meteorological Organization

(WMO) to bring about improved international cooperation on problems of climate. At the last Congress of that organization in May 1975, strong measures for climate-related international actions were adopted. Further development of the Global Atmospheric Research Program which will lead to an improved understanding of the dynamics of the climate was strongly supported. In addition, the WMO took steps to insure that technical assistance to the meteorological services in developing countries would be provided to enable it to assist in improving agricultural productivity.

> *NACOA, FINDING* that variations in the earth's ozone shield are important to health and agriculture, and that human activities may significantly influence the adequacy of the shield,
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> *NACOA RECOMMENDS THAT:* A direct stratospheric sampling effort be continued, and where necessary expanded, as an essential element of a monitoring and research program to establish a sound basis for pollution control measures. Operation of this stratospheric sampling program be formally assigned to NASA and conducted under plans developed in close coordination with NOAA.

The Administration has been deeply concerned with the possible impacts on the ozone layer of the earth's atmosphere resulting from human activities, such as the use of fluorocarbons. As a result, the Administration has over the years supported extensive research to investigate possible impacts. DOT has completed a three-year investigation of the effects of the oxides of nitrogen on the ozone layer. A report on its findings has been issued. Similarly, through the joint action of the Council on Environmental Quality and the Federal Council for Science and Technology, 14 Federal agencies have recently completed a report on possible influence of fluorocarbons on the ozone layer. This report calls for further investigation by the National Academy of Sciences to be followed by rulemaking to control the use of fluorocarbons if this is found to be necessary. On the international front, the United States and Canada are serving as "lead countries" to gather information for a report to the Organization for Economic Cooperation and Development (OECD) on international production and use data for fluorocarbons. The report, to be presented to the Environment Committee of the OECD in November 1975, will also include information on

scientific studies being conducted worldwide on the relationship between fluorocarbons and stratospheric ozone.

The need for direct stratospheric measurements is recognized and is considered to include sampling where necessary. NASA has been asked to develop the necessary instrumentation for this monitoring and the work is being carried out as recommended by the Committee in coordination with NOAA.

> *NACOA, FINDING* that DOD and NOAA agree that weather reconnaissance by aircraft equipped with the best available instrumentation is an essential element in the national hurricane prediction and warning service and that the Department of Defense is best suited to fly the missions as a collateral responsibility for existing squadrons, but FINDING that there exists a question about who should fund and defend the budget for the activity,
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> *NACOA RECOMMENDS THAT:* The necessary funding for storm reconnaissance by aircraft equipped with the best available instrumentation properly remains a responsibility of the Department of Defense, and that the required funds be defended and supported by DOD and NOAA as a national program essential to civilian needs, and that the funding be identified separately and not forced to compete in the Defense budget against strictly military priorities.

This issue is one of significant importance for the proper conduct of the hurricane and severe storm weather reconnaissance in the Nation. An interagency committee with representatives of the Department of Defense, NOAA and OMB has been reviewing the most appropriate manner in which to proceed. I can assure the Committee that whatever the administrative and funding arrangements, there will be no diminution in the aircraft weather reconnaissance required to protect the citizens of this Nation from the onslaught of hurricanes and severe storms. I have taken action to bring the recommendation of the Committee directly to the attention of the Director of OMB so that he may have the Committee's views before making the final decision on this matter.