GUIDE TO NOAA R&D

Revised January 1986

Prepared by

NOAA/NESDIS Office of Research and Technology Applications

- Technology Transfer and the NOAA ORTA
- A Guide to R&D Activities in NOAA (Mission Descriptions)
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INTRODUCTION

This is the second and revised edition of the Guide to NOAA R&D. The first edition was distributed in November 1984. It contains information provided to the Center for Utilization of Federal Technology (CUFT) for inclusion in the **Directory to Federal R&D Resources** (the preparation of the Directory was in response to the Congressional mandate of P.L. 96-480 that the CUFT disseminate information on Federal R&D to state and local government and the private sector). The CUFT is in the process of updating their Directory and a new edition will be published in the Spring of 1986.

We have assembled the information in this Guide to NOAA R&D in order to make it available to all in NOAA who may find it useful. It provides an easy to use guide to sources of expertise in NOAA. The first edition was well received; an initial distribution of 43 copies resulted in requests for over 200 additional copies.

Comments or suggestions concerning the content of the Guide to NOAA R&D can be sent directly to the NOAA Office of Research and Technology Applications, FB#4, Room 3316, Suitland, Maryland 20233 or telephone 763-2418. We will be happy to discuss any questions you may have about our activities.

TECHNOLOGY TRANSFER
and the
NOAA OFFICE OF RESEARCH AND TECHNOLOGY APPLICATIONS
(ORTA)

Technology transfer can be defined as the process of transmitting new techniques and methods from those who develop them to those who can use them. It is a key step in the innovative process necessary to ensure the improvement of national productivity through fuller exploitation of the results of R&D; it is an effort to bring the results of research and development to new users. In the sense of the Stevenson-Wydler Technology Innovation Act of 1980 (P.L. 96-480), those new users are defined as state and local government and the private sector. However, from the NOAA ORTA point of view, users can be NOAA researchers as well. We are part of a growing network of ORTAs in all Federal agencies and laboratories; a network of people dedicated to technology transfer. Through the NOAA ORTA, that network is available to NOAA scientists and engineers as an additional means of obtaining information on new technologies developed as a result of R&D in other Federal agencies. Our efforts, therefore, will be directed both externally and internally; we can contribute to T^2 "in" as well as T^2 "out".

The purpose of P.L. 96-480 is to stimulate the development and use of new technology "to improve the economic, environmental, and social well-being of the United States." Section 11 of the Law addresses the need to exploit more fully the results of Federal R&D. The NOAA Office of Research and Technology Applications (ORTA) was established in compliance with the Law to ensure that the four functions described in Section 11 are carried out in NOAA. These four functions are:

- to assess the potential for non-Federal applications of technology developed as a result of each R&D project;
- to disseminate information on technologies that are assessed to be of potential value to state and local government and the private sector in developing new or improved products, processes, and services;
- to cooperate with other organizations which link the R&D resources of the Federal Government as a whole to potential non-Federal users; and
- to provide or arrange for technical assistance in response to requests from state and local governments.

To assist with these efforts, a Technology Transfer Working Group was organized when the ORTA was originally established. This Working Group consists of one representative from each NOAA Line Office and members act as Line Office contacts for the technology transfer effort. The TTWG members are:

OAR -- Donald West, WSC5, Room 925, Rockville, MD 20852, FTS 443-8971

NESDIS -- Patricia Atkinson, FB#4, Room 3316, Suitland, MD 20233
FTS 763-2418

NMFS -- Bob Wolf, Page 2, Room 181. Washington, DC 20235
FTS 634-7466

NOS -- Dr. Donald Beaumariage, WSC1. Room 181. Rockville, MD 20852
FTS 443-8026

NWS -- James Harrison, Gramax Building, Room 1214, Silver Spring, MD 20910
FTS 427-7745

The TTWG assists the Office of Research and Technology Applications (ORTA) with its NOAA-wide technology transfer activities. These include the annual survey of NOAA R&D activities to determine if any research projects have non-federal application, compiling the mission statements used in this Guide, and general advice on other technology transfer projects undertaken by ORTA.

The ORTA uses Application Assessment Abstracts provided by NOAA researchers to develop "NOAA Technology Briefs." These "Briefs" are disseminated through several channels including the Center for Utilization of Federal Technology (CUFT), part of Commerce's National Technical Information Service (NTIS). The CUFT publishes the "Briefs" in NTIS Tech Notes, a monthly subscription publication. The "Briefs" are also entered into Dialog and available for online retrieval.

The object of this activity is to allow a wider distribution of information on the results of NOAA R&D products and services, and to provide NOAA researchers with an opportunity to see their efforts put into action, perhaps in ways they hadn't thought of originally. This is the basic objective of P.L. 96-480 and is technology transfer "out."

As part of the ORTA's activities, we participate in a network of Federal agencies and laboratories doing technology transfer. Through this network, known as the Federal Laboratory Consortium (FLC) for Technology Transfer, we continually receive information on new developments and services provided by other agencies. Some of this information could be useful to NOAA researchers. Therefore, the ORTA has initiated an aperiodic publication, distributed to all interested NOAA offices, containing information from such agencies as Department of Navy, U.S. Army Corps of Engineers, Department of Energy, NASA, Agricultural Research Service and others. We also receive some information on university research which we will share. We are making this effort as members of the T^2 network with the hope that NOAA components will benefit from our efforts toward technology transfer "in."

Other services that the ORTA can provide include information on how NOAA scientists and engineers should proceed in obtaining a government patent and the possible benefits to them if the patent is licensed, as well as information on proposed or new legislation which affects patents and technology transfer.

Increasingly technology transfer is being recognized as an important factor in maintaining our competitive edge. More and more corporations are looking to government laboratories for new findings which they can further develop and market. The public sector is looking for ways in which they can improve the cities and states. In the "big picture" we all benefit from participating in this national network. The NOAA ORTA's goals is to provide an additional avenue for the flow of information on new technology into and out of the agency. Call us if you want to know more.

SECTION I

An Alphabetical Listing of

NOAA R&D Activities

This section contains an alphabetical listing and the addresses of NOAA laboratories, R&D Program/Project Offices, and Data and Information Centers. The name of a designated information contact (or if one has not been designated, the activity director) is also included. Mission descriptions for these activities are provided in Section II, where they are listed under the appropriate NOAA Line Office.

ALPHABETICAL LISTING OF NOAA LABS,
R&D PROGRAM/PROJECT OFFICES, AND
DATA AND INFORMATION CENTERS

SECTION II

Mission Descriptions for
NOAA Laboratories, R&D Project/Program
Offices, and Data and Information Centers

The activities and mission descriptions contained in this section are listed alphabetically by NOAA component. R&D project and program offices of the component headquarters (NOAA Line Offices) are also provided.

OAR

OFFICE OF
OCEANIC AND
ATMOSPHERIC
RESEARCH

OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH

WSC5, Room 908
6010 Executive Blvd., Rockville, MD 20852
Assistant Administrator, Dr. Joseph O. Fletcher
(301) 443-8344, FTS 443-8344

MISSION DESCRIPTION: Conduct research that is relevant to NOAA service and resource management programs and that will provide sound technological and scientific information to enable the Nation to achieve the maximum benefit and the minimum hardship from environmental conditions and processes. The major programs and activities of the Office of Oceanic and Atmospheric Research are:

- Marine Resource Development Research, including Marine Advisory Services
- Ocean and Great Lakes Prediction Research
- Weather Observations and Prediction Research
- Climate and Air Quality Research
- Solar-Terrestrial Services and Research

ENVIRONMENTAL RESEARCH LABORATORIES
Room 657, 325 Broadway, Boulder, CO 80303
Director, Dr. Vernon E. Derr (303) 497-6000, FTS 320-6000

MISSION DESCRIPTION: The mission of the Environmental Research Laboratories (ERL) is to conduct an integrated program of fundamental research, related technology development, and services to improve understanding and prediction of the geophysical environment comprising the oceans and inland waters, the lower and upper atmosphere, the space environment, and the Earth. The Environmental Research Laboratories plan, develop, and conduct an integrated research program, including theoretical and analytical studies, laboratory experiments, and the collection of observations in the field by all appropriate techniques, including ships, aircraft, balloons, rockets, and satellites. They perform research in selected areas for other NOAA components and agencies. The Laboratories perform selected service functions which are closely related to their research programs. They disseminate results of research efforts for use in governmental decisionmaking involving the geophysical environment, and they participate actively in the work of the science community at large, both nationally and internationally.

OFFICE OF CLIMATIC AND ATMOSPHERIC RESEARCH
WSC5, Room 825, 6010 Executive Blvd., Rockville, MD 20852
Acting Director, Orville Scribner (301) 443-8415, FTS 443-8415

MISSION DESCRIPTION: To develop, manage, and coordinate projects of atmospheric and oceanic research that are largely interagency and/or international in scope; and to coordinate NOAA's climate research activities.

OFFICE OF SEA GRANT AND EXTRAMURAL PROGRAMS
WSC5, Room 804, 6010 Executive Blvd., Rockville, MD 20852
Director, Dr. Ned A. Ostenso (301) 443-8923, FTS 443-8923

MISSION DESCRIPTION: OAR's Office of Sea Grant and Extramural Programs administers a broad program of ocean-related research and marine resources development, primarily through grants and contracts to colleges and universities.

The purpose of this office is to direct the development of capabilities in these institutions and to provide project coordination among them in the areas of basic and applied marine scientific research, education, and extension services to coastal constituents.

As NOAA's link to the academic community in ocean science and marine affairs, the Office of Sea Grant and Extramural Programs is able to assist the agency in meeting its other objectives and legislated responsibilities in these areas while fostering the wise use, conservation and development of the Nation's marine resources.

The National Sea Grant College Program is a network of colleges and universities in all 30 coastal and Great Lakes states and Puerto Rico which work in partnership with NOAA to meet the marine resources development needs of the Nation through scientific research, education at all levels, and marine advisory/extension services.

The National Undersea Research Program (NURP) supports scientific research in the sea while developing the capabilities of scientists from academia and government to conduct subsurface investigations. NURP is developing a network of undersea research facilities on the east and west coast, in the Caribbean, and in Hawaii.

LABORATORIES, GROUPS, AND COOPERATIVE INSTITUTES OF THE ENVIRONMENTAL RESEARCH LABORATORIES

AERONOMY LABORATORY
325 Broadway, Boulder, CO 80303
Director, Dr. Eldon E. Ferguson (303) 497-3218, FTS 320-3218

MISSION DESCRIPTION: The chemical and physical processes of the Earth's atmosphere are studied to advance the capability of monitoring, predicting, and controlling the quality of the atmosphere. The research concentrates on the stratospheric and tropospheric regions of the atmosphere but also involves the ionosphere as well as the atmospheres of other planets. Research methods involve both in situ and remote measurement of critical atmospheric parameters, including chemical composition and dynamic properties such as wind velocities, turbulence, and wave motions. Theoretical programs in atmospheric photochemical modeling and in atmospheric dynamics and transport support the observation programs. An experimental laboratory chemical kinetics program supports the theoretical photochemical modeling program and also supplies input for the development of new atmospheric monitoring and measurement technology. The research of the laboratory is accomplished by six programs that have substantial interaction: atmospheric chemical kinetics, atmospheric dynamics, atmospheric sampling, atmospheric wave and turbulence theory, optical aeronomy, and theoretical aeronomy.

AIR RESOURCES LABORATORY
8060 13th St., Room 927, Silver Spring, MD 20910
Director, Dr. Lester Machta (301) 427-7684, FTS 427-7684

MISSION DESCRIPTION: The laboratory includes a headquarters group in Rockville, MD, the Field Research Division in Idaho Falls, ID; the Atmospheric Turbulence and Diffusion Division in Oak Ridge, TN; the Meteorology Division in Research Triangle Park, NC; and the Solar Radiation Facility, the Sun-Climate Staff, the Air Quality Division, and the Geophysical Monitoring for Climatic Change Division (GMCC) in Boulder, CO, with GMCC observatories at Manua Loa (Hawaii), Barrow (Alaska), the South Pole, and American Samoa. Most ARL research deals with the use of meteorology to understand and predict human influence on the environment, especially with regard to the atmospheric transport and diffusion of toxic effluents. General areas of study include turbulence and diffusion in the atmosphere, atmospheric trajectories from microscales to global scales, meteorology of air pollution, CO_2 and climate, acid rain, and monitoring of atmospheric constituents for climatic change.

ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORY
4301 Rickenbacker Causeway, Miami, FL 33149
Director, Dr. Hugo F. Bezdek (305) 361-4300, FTS 350-1300

MISSION DESCRIPTION: The laboratory is organized to pursue basic and applied research programs in oceanography and tropical meteorology. Oceanographic investigations center on fluxes of energy, momentum, and materials through

the air-sea interface: the transport and composition (thermal and chemical) of water in the ocean volume; and hydrothermal processes of mineralization at seafloor spreading centers. Meteorological research is carried out to improve the description, understanding, and prediction of hurricanes and to determine their potential for beneficial modification. Current research addresses processes related to climate, marine assessment, marine resources, ocean and lake services, and weather observations and predictions.

COOPERATIVE INSTITUTES OF THE ENVIRONMENTAL RESEARCH LABORATORIES

MISSION DESCRIPTION: Several Environmental Research Laboratories interact with the university community through NOAA/university cooperative institutes. These institutes provide a mechanism for research collaboration and training in areas of mutual interest to NOAA and the academic community. There are six of these institutes at universities in Colorado, Washington, Hawaii, Oklahoma, and Florida. Each institute is closely associated with one or more of NOAA's Environmental Research Laboratories.

1. **Cooperative Institute for Marine and Atmospheric Studies (CIMAS),** University of Miami, 4600 Rickenbacker Causeway Miami, FL 33149, Dr. William Fox (305) 350-7385

2. **Cooperative Institute for Mesoscale Meteorological Studies (CIMMS),** University of Oklahoma, School of Meteorology 200 Felgar Street, Room 219, Norman, OK 73019 Dr. Yoshi Sasaki (405) 325-3041

3. **Cooperative Institute for Research in the Atmosphere (CIRA),** Colorado State University, Fort Collins, CO 80523 Dr. T. Vonder Haar (303) 491-8566

4. **Cooperative Institute for Research in Environmental Sciences (CIRES),** University of Colorado, 39th & Marine Streets Boulder, CO 80303, Dr. Robert Sievers (303) 492-6531

5. **Joint Institute for Marine and Atmospheric Research (JIMAR),** University of Hawaii, 1000 Pope Road, Honolulu, HI 96822 Dr. Dennis Moore 808-546-8914

6. **Joint Institute for Study of the Atmosphere and Ocean (JISAO),** University of Washington, 608 Atmospheric Sciences Route Code 8K40, Seattle, WA 98105 Mr. John M. Wallace (206) 543-7390

ENVIRONMENTAL SCIENCES GROUP
3100 Marine Street, RE2, Boulder, CO 80303
Director, Dr. William H. Hooke (303) 497-6378, FTS 320-6378

MISSION DESCRIPTION: The group plans, develops, and conducts programs of research and technology transfer that cut across NOAA laboratory or program area missions. Its four components are the Climate Research Project, the Weather Research Program, the Program for Regional Observing and Forecasting Service, and the Weather Modification Program. The principal activities of the Climate Research Project are the construction of a global data set describing the fluctuations of climate over the oceans and the continents during the past 130 years; interpretive diagnostic studies of the climatic fluctuations during that period; and modeling studies of polar ice sheets to clarify their evolution and their responses to climatic change. The Weather Research Program conducts research to improve short-range weather predictions and warnings, and to provide a scientific basis for weather modification. Emphasis is on precipitation, with research interest extending from microphysical processes to structure and behavior of large mesoscale precipitation systems. The program actively transfers promising techniques and technologies to National Weather Service (NWS) and other user groups. The program for Regional Observing and Forecasting Services (PROFS) works to improve local weather services through the introduction of new technologies into weather service operations. Although PROFS is an Environmental Research Laboratories (ERL) program, it receives applications guidance and review from National Weather Service (NWS) and the National Environmental Satellite, Data, and Information Service (NESDIS). Through this liaison, PROFS maintains a balance between research and operations. The Weather Modification Program is developing, solely through the Federal-State Cooperative Program, criteria for the effective evolution of operational cloud seeding.

GEOPHYSICAL FLUID DYMANICS LABORATORY
NOAA, P.O. Box 308, Princeton, NJ 08540
Director, Dr. Jerry D. Mahlman (609) 452-6502

MISSION DESCRIPTION: The laboratory is engaged in comprehensive long-lead-time research in the primary areas of NOAA mission, such as the weather and climate prediction and ocean services. Its goal is to expand the scientific understanding of those physical processes that govern the behavior of the atmosphere and the oceans as complex fluid systems. These fluids can then be modeled mathematically, and their phenomenology can be studied by computer simulation methods. In particular, research is conducted toward understanding the following: predictability of weather, large and small scale; structure, variability, predictability, stability, and sensitivity of climate, global and regional; structure, variability, and dynamics of the ocean over its many space and time scales; and interaction of the atmosphere and oceans, and how they influence and are influenced by various trace constituents; and particular nature of the Earth's atmospheric general circulation within the context of the family of planetary atmospheric types.

The scientific work encompasses a variety of disciplines: meteorology, oceanography, hydrology, classical physics, fluid dynamics, chemistry, applied mathematics and experimental design and analysis, and utilizes a sixth generation computer system.

GREAT LAKES ENVIRONMENTAL RESEARCH LABORATORY
2300 Washtenaw Ave., Ann Arbor, MI 48104
Director, Dr. Eugene J. Aubert (313) 668-2244, FTS 378-2244

MISSION DESCRIPTION: The laboratory conducts integrated, interdisciplinary environmental research in support of resource management and environmental services in coastal and estuarine waters. Special emphasis is on the Great Lakes. It performs field, analytical, and laboratory investigations to improve understanding and prediction of coastal and estuarine processes and interdependencies with the atmosphere, land, and sediments; places special emphasis on a systems approach to problem-oriented environmental research to develop environmental service tools; and provides assistance to resource managers and others in obtaining and applying the information and services developed. The environmental information is provided to government and private organizations to facilitate planning and decision making in water resource management. The program includes both background and applied studies and combines experimental, theoretical, and empirical approaches. Research is carried out through four groups; synthetic organic and particle dynamics, ecosystem and nutrient dynamics, lake hydrology, and physical limnology and meteorology. Their disciplines and activities include meteorology, geology, hydrology, physical oceanography, aquatic chemistry, aquatic biology, applied mathematics, systems engineering, computer systems applications, instrument design and development, and experimental design and analysis.

NATIONAL SEVERE STORMS LABORATORY
1313 Halley Circle, Norman, OK 73069
Director, Dr. Edwin Kessler (405) 360-3620, FTS 736-4916

MISSION DESCRIPTION: The laboratory supports NOAA's weather observing and forecasting missions through studies of storm processes, numerical and conceptual modeling of storm phenomena, and development of improved means for observation. Recent emphasis has been toward Doppler radar applications and studies of storm electricity. The laboratory maintains a 50-station capability for digital recording of surface meteorological parameters, and maintains instrumentation on the tallest tower in the United States that is equipped for recording boundary layer parameters. Two 10-cm Doppler radars on a 41-km baseline provide unique capabilities for recording atmospheric circulations in both precipitating weather systems and the optically clear boundary layer. A comprehensive range of instrumentation for recording electrical parameters has been brought to a high peak of refinement so that distributions of wind, water, and lightning can be recorded contemporaneously,

and their interaction examined. The laboratory is working closely with the Joint System Program Office of the Next-generation Radar (NEXRAD) program to help develop an effective national weather radar network and meteorological airspace system for the late 1980's and beyond. Laboratory expertise resides in the following areas: fluid dynamics, numerical modeling, severe storms meteorology, aviation meteorology, radar engineering, microwave propagation and scattering, signal processing and digital logic.

PACIFIC MARINE ENVIRONMENTAL LABORATORY
NOAA, 7600 Sand Point Way, N.E., Seattle, WA 98115
Director, Dr. Eddie N. Bernard (206) 526-6239, FTS 392-6800

MISSION DESCRIPTION: As an interdisciplinary research laboratory, scientific investigations are carried out in oceanography, marine meteorology, and allied disciplines. Its mission is to assist NOAA and other Federal agencies by conducting research directed toward understanding processes in coastal and open-ocean systems. The current research programs focus on four general subjects; climate, marine environmental assessment, marine observation and prediction, and marine resources. Research results provide information necessary for effective management of marine assets and improved marine environmental forecasting. Two cooperative institutes, the Joint Institute for Study of the Atmosphere and Ocean (JISAO) and the Joint Institute for Marine and Atmospheric Research (JIMAR), established between NOAA and the Universities of Washington and Hawaii, respectively, provide a bridge between the academic community and laboratory scientists working in such areas as climate dynamics, estuarine processes, tsumamis, equatorial oceanography, and environmental chemistry.

SPACE ENVIRONMENT LABORATORY
325 Broadway, Boulder, CO 80303
Director, Dr. Harold Leinbach (303) 497-3311, FTS 320-3111

MISSION DESCRIPTION: The laboratory, through the Space Environment Services Center (SESC), provides Federal agencies and a wide range of public users with real-time space environment data, forecasts of the time of terrestrial impact of significant solar energy output, and warnings of solar events threatening to human life or to continued effective and/or economic operation of modern technological systems. In order to fulfill this role, the laboratory collects data in real-time from NOAA satellites, the Air Weather Service global network of optical and radio solar telescopes and from cooperating observatories. Additional data are acquired in near real-time through the International Ursigram and World Days Service (IUWDS). The SESC operates 24 hours per day, 7 days per week, in cooperation with the Air Weather Service to provide forecasts, and warnings of solar-terrestrial disturbances. The laboratory conducts supporting research to improve capabilities to forecast and issue warnings of solar disturbances, and to improve the operational data base. Efforts within SEL address improvements

in quantitative forecasts and warnings, testing the results of such research using available real-time data, and on transferring the resulting models and algorithms to operational status. Some of the current research projects are: produce and analyze synoptic maps of solar activity; investigate the problems of predicting erupting filaments; develop simple models for the origin of the structure of the solar wind close to the sun; develop empirical forecasting techniques of geomagnetic activity, based on use of real-time solar radio and optical data and abstractions from interplanetary propagation models; develop and test magnetohydrodynamic models for fully describing the spatial and temporal evolution of disturbances from their source at the sun and propagation to the Earth; assessment of geomagnetic activity using data from the real-time magnetometer network; improved evaluation of the magnitude; extent and duration of energetic solar particle events, using GOES and NOAA/TIROS data; and development of operational methods for characterizing the particle environment as information useful to customers for their evaluation of ionospheric disturbances, spacecraft charging and satellite electronics degradation, atmospheric heating, and radiation hazards.

WAVE PROPAGATION LABORATORY
R/E/WP, 325 Broadway, Boulder, CO 80303
Director, Dr. Gordon Little (303) 497-6261, FTS 320-6261

MISSION DESCRIPTION: Research is conducted to improve geophysical research and services, through the development and application of remote measurement systems. In general, the denser the observational data set in space and time, the more complete and accurate the research and services can be. Experience has shown that in situ measurement methods, which require that a sensor be located at each measurement location, are too expensive to be practical for anything but the largest scale phenomena. Therefore, the laboratory was established to explore the possibility that remote sensing might provide the several-orders-of-magnitude improvement in space/time density of observations required to predict or warn of events in all scales of atmospheric and oceanic phenomena, from micro and boundary layer to global scale. To achieve this goal it performs the following functions: theoretical and experimental studies of the interactions of acoustic and electromagnetic waves with the atmosphere or ocean, with particular reference to the use of such interactions for remote-sensing purposes; development and experimental evaluation of new geophysical remote-sensing concepts; application of the unique advantages of newly developed remote-sensing techniques to geophysical research; and improvement of the Nation's geophysical research, and operational forecasting and warning services, through transfer of the newly developed remote-sensing technology to others.

NESDIS

NATIONAL

ENVIRONMENTAL

SATELLITE

DATA AND

INFORMATION

SERVICE

NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

OFFICE OF RESEARCH AND APPLICATIONS
Room 801, WWB, Camp Springs, MD 20233
Acting Director, Mr. Harold W. Yates (301) 763-8127, FTS 763-8127

MISSION DESCRIPTION: Provides overall guidance and direction for all research and application activities of NESDIS. Coordinates the efforts of the Climate and Earth Sciences Laboratory, the Experimental Studies Laboratory, and the Satellite Applications Laboratory. Assesses the requirements and goals of the NESDIS research and applications programs and evaluates their progress. Provides expert service to other NESDIS offices relating to sensor development, instrument problems, or system hardware components. Coordinates with NESDIS, other appropriate NOAA units or U.S. Government agencies in the implementation and evaluation of operational satellite data and products that result from research activities. Coordinates research activities of mutual interest with foreign laboratories, particularly those in satellite-operating countries.

Provides advice to the Assistant Administrator concerning interfaces among the Centers and Offices of NESDIS and among the major NOAA elements in relation to broad scale scientific projects. Produces specialized programmatic studies and statistics. Provides support and coordination on NOAA's activities in the National Climate Program.

SATELLITE APPLICATIONS LABORATORY
Room 601, World Weather Building, Camp Springs, MD 20233
Chief, Dr. P. K. Rao (301) 763-8282, FTS 763-8282

MISSION DESCRIPTION: The laboratory provides an interface to the research community, internal and external, to insure that research results regarding applications in meteorology, oceanography and hydrology are carried smoothly into operational use. As part of this interface, it develops and specifies new products, services, and techniques; develops test and pilot operations for agriculture, marine and aviation applications, trains operational users of satellite products; and turns over systems or components to the NESDIS Office of Satellite Operations. In order to carry out these responsibilities, it maintains a staff of project managers and task leaders. The laboratory also conducts cooperative research in university institutes (at the University of Wisconsin and Colorado State University) which emphasizes the design and development of spaceborne measuring devices, formulation of reduction techniques, and program development for the application of data by operational and other research groups. To facilitate this, the laboratory conducts training and consultation in the application of environmental satellite data, provides consultation in data processing systems, and serves as a focal point to the research community for satellite data support.

SATELLITE RESEARCH LABORATORY
Suitland Professional Center, Suitland, MD 20233
Chief, Dr. George Ohring (301) 763-4248, FTS 763-4248

MISSION DESCRIPTION: Applies satellite observations to solving problems in the atmospheric, oceanic and land sciences and in climate research and monitoring. Develops methods for remote sensing of the Earth and its atmosphere. Performs research on the Earth and its atmosphere using satellite observations. Supports such research activities at universities and private research organizations, and participates with the university community in joint research projects. Plans and coordinates research and development activities and applications of research results with other parts of NESDIS, NOAA, and other U.S. Government agencies, universities, and international groups. Carries out experiments which are intended to either improve the products which NESDIS derives from operational satellite data, or are intended to demonstrate initiatives for new operational products. Laboratory investigations are concerned both with measurement of physical constants relevant to operational data reduction, and with the design, construction, and calibration of specialized equipment for laboratory and field use. Analysis of satellite data and other instrument data in a research mode is a necessary part of the laboratory effort, and this is accomplished with general purpose minicomputer systems. Field experiments are conducted to demonstrate the utility of new measurement techniques, new results, or new technology. They are carried out at appropriate sites and times throughout the world, and use a variety of platforms (aircraft, balloons, ships, fixed ground based sites, etc.). Data from field experiments may be reduced either with NESDIS minicomputers or through the facilities of the principal investigator if the investigation is initiated outside of the SRL. Areas of experimentation include atmospheric, oceanographic, hydrologic, and earth resources investigations.

ASSESSMENT AND INFORMATION SERVICES CENTER
Room 290, 3300 Whitehaven Street, Washington, DC 20235
Director, Dr. Joan Hock (202) 634-7324, FTS 634-7324

MISSION DESCRIPTION: The center studies the social and economic impacts on the nation of short-term climatic and oceanic anomalies and manages NOAA's libraries and their participation in the national network of scientific information centers and libraries. It develops techniques for integrating socio-economic data with current and historical environmental data to provide qualitative and quantitative assessments of the social and economic effect of extended episodes of unusual weather and oceanic anomalies. The studies focus primarily on the national economy and its major industrial sectors (agriculture, energy, transportation, construction, etc.) however, it also develops models and techniques for estimating weather impacts on agricultural production in developing countries and provides assessments to the Agency for International Development and the Department of Agriculture. The center also participates in research on the value of the use of climatological data in water management, energy use and conservation, and agricultural production.

NATIONAL CLIMATIC DATA CENTER
Federal Building, Asheville, NC 28801
Director, Dr. Kenneth D. Hadeen (704) 259-0682, FTS 672-0682

MISSION DESCRIPTION: The Center has the congressional mandate to acquire, manage, archive, and distribute meteorological and climatological data collected for operational purposes by the National Weather Service, the weather services of the Air Force and Navy, the Federal Aviation Administration, and the Coast Guard. It also serves as World Data Center-A for Meteorology. While the primary mission of NCDC is to document the climate of the United States, data holdings include the global surface and upper air meteorological observations collected by the National Meteorological Center through the Global Telecommunications System of the World Meteorological Organization. Climatic information available includes: hourly surface observations from land stations; three-hourly and six-hourly surface observations from land stations and moving ships; daily climatological observations from cooperative observing stations; upper air observations; radar observations; satellite data; hourly and daily solar radiation data; selected maps and charts; and derived and summary data. The Satellite Data Services Division is located in the World Weather Building in Camp Springs, Maryland. The satellite data base includes data collected by earlier TIROS, ITOS, ESSA, and NOAA series polar-orbiting satellites as well as the current TIROS-N/NOAA series, and earlier ATS and SMS geostationary satellites as well as the current GOES (Geostationary Operational Environmental Satellite) series. Also included are all SEASAT data and Nimbus-7 CZCS (Coastal Zone Color Scanner) data. Data and information are available on several media including subscription publications, paper copies, film loops, microfilm, microfiche, and magnetic tape. The 1983 publication "Selective Guide to Climatic Data Sources" lists most products and services available at the NCDC.

NATIONAL ENVIRONMENTAL DATA REFERRAL SERVICE (NEDRES)
3300 Whitehaven Street, N.W., Washington, DC 20235
Chief, Gerald Barton (202) 634-7722, FTS 634-7722

MISSION DESCRIPTION: The service is designed to provide convenient, economical, and efficient access to widely scattered environmental data. It is a publicly available service which identifies the existence, location, characteristics, and availability conditions of environmental data sets. The NEDRES database is a computer searchable catalog and index of environmental data. It contains descriptions of environmental data files, published data sources, data file documentation references, and organizations that make environmental data available. In development since 1980, the database consists of two files with more than 15,000 descriptions of data sources (as of mid-1985). The smaller file contains newly updated records, while the larger one contains records of data files extant between 1974 and 1980.

NATIONAL GEOPHYSICAL DATA CENTER
325 Broadway, Boulder, CO 80303
Director, Dr. Michael Chinnery (303) 497-6215, FTS 320-6215

MISSION DESCRIPTION: The center collects, manages, archives, and distributes data in the fields of solid earth geophysics, marine geology and geophysics, and solar-terrestrial physics. NGDC data sources include NOAA's observing programs and through cooperative arrangements, data from universities, other government agencies and foreign organizations. NGDC also serves as World Data Center-A for the above disciplines. Available data include Earthquake Seismology, more than 300,000 seismograms per year from about 150 earthquake monitoring stations worldwide are processed and archived; Solid Earth Geophysics, extensive files of common depth point seismic reflection, gravity, and topography data. Geothermics, holdings encompass data and maps on volcanoes, geothermal energy, and world heat flow. Marine Geology and Geophysics, gravimetric, magnetic, bathymetric, and seismic data, as well as geotechnical, textural, petrologic, and paleontologic analyses and descriptions of sediment and rock samples. Geomagnetic Data, archived at NGDC show both changes in direction and strength of Earth's magnetic field; Solar-Terrestrial Data, from domestic observatories and worldwide sources under international exchange agreements; Solar Activity Data, records of solar flares, solar radioemission events, sudden ionosopheric disturbances, and some satellite-monitored measurements of the solar wind and ultraviolet, X-ray, and particle emissions; Ionospheric Data, and Glaciology, the National Snow and Ice Data Center is an information-retrieval center for snow and ice research, glacier changes, and paleoglaciology.

NATIONAL OCEANOGRAPHIC DATA CENTER
2001 Wisconsin Avenue, Washington, DC 20235
Director, Mr. Greg Withee (202) 634-7510, FTS 634-7510

MISSION DESCRIPTION: NODC is the United States national facility established to acquire, process, archive, and disseminate global oceanographic data. NODC's digital data bases include data collected by Federal, State, and local government agencies; universities and research institutions; and private industry. It also acquires data from foreign sources and operates World Data Center-A for Oceanography, a part of the World Data Center systems that facilitates international exchange of scientific data. NODC holds physical, chemical, and biological oceanographic data. Global, deep-ocean data bases include: 1) oceanographic station data -- measurements of temperature, salinity, oxygen, phosphate, phosphorus, nitrite, nitrate, silicate, and pH at the surface and serial depths; 2) temperature-depth profiles from expendable and mechanical bathythermographs; and 3) surface current (ship drift) data. In addition, NODC holds environmental assessment data collected primarily on the U.S. outer continental shelf to support studies of the effects on marine ecosystems of offshore development. These data include: (1) winds, waves, and ocean surface data from automated buoys: (2) current meter

data; (3) measurements of hydrocarbons, metals, and other pollutants and toxic substances; and (4) data on marine organisms, including plankton, benthos, and marine birds and mammals. Services include: data inventory searches; data products tailored to user specifications, e.g., selective retrieval and formatted output and other computer-generated data summaries, analyses, and graphic displays; publications, including the NODC User's Guide, Mariners Weather Log, NODC annual report, marine atlases, the special data catalogs and inventories; data referral services; and general marine science information.

SATELLITE DATA SERVICES DIVISION
Room 100, WWB, Camp Springs, MD 20233
Chief, Mr. Gregory Hunolt (301) 763-8185, FTS 763-8185

MISSION DESCRIPTION: The division is a source of information gathered by a series of Earthwatching spacecraft that began in 1960. Images in a variety of forms (negatives, film loops, digital data on magnetic tape) received for quality control and archiving are available for retrospective use. Over 8 million separate images, 50,000 computer compatible tapes, and 800 mass storage tapes from 30 satellites are now archived. Satellite data files contain imagery from the early TIROS series of experimenting spacecraft and the operational ESSA and NOAA series of spacecraft. Imagery gathered by NASA's experimental geostationary Applications and Technology Satellites (ATS), Synchronous Meteorological Satellites (SMS), and the current NOAA operational Geostationary Operational Environmental Satellite (GOES) is also available. The division maintains magnetic tapes containing digital data from many of these satellites that can be used quantitatively in computerized research and analysis programs. The digital data from the newest satellites are the fastest growing portion of the division's holdings.

NMFS

NATIONAL

MARINE

FISHERIES

SERVICE

NORTHEAST FISHERIES CENTER AND WOODS HOLE LABORATORY
National Marine Fisheries Service, NOAA, Woods Hole, MA 02543
Director, Allen E. Peterson, Jr. (617) 548-5123, FTS 840-1101

MISSION DESCRIPTION: The work at the Northeast Fisheries Center and co-located Woods Hole Laboratory concentrates on two major areas: 1) monitoring and evaluation of the marine fisheries resources for international negotiations, regional Fisheries Management Councils, and state/federal programs; and 2) evaluation of the biological and environmental interactions of marine fisheries resources.

The laboratory conducts major research vessel surveys of the fish and shellfish resources from North Carolina to Canada. Extensive evaluations are made of biological parameters on single and multispecies bases.

The Manned Undersea Research and Technology Program, a unique research unit of the center, specializes in studies which require use of submersibles and advanced SCUBA technology. These studies provide information on areas such as oil drilling on Georges Bank, performance of fishing gear, and descriptions of critical small areas of the ocean floor.

ATLANTIC ENVIRONMENTAL GROUP
National Marine Fisheries Service, NOAA
R.R. 7A, Box 522A, Narragansett, RI 02882
Dr. Merton C. Ingham (401) 789-9326, FTS 838-7142

MISSION DESCRIPTION: The Atlantic Environmental Group has offices in Monterey and Cabrillo Point, Pacific Grove, California. Its mission is to provide environmental information in support of biological and fisheries programs at the National Marine Fisheries Service research centers. The work concerns ocean climatology, monitoring, modeling, and forecasting with emphasis on large scale events and ocean variability.

GLOUCESTER LABORATORY
National Marine Fisheries Service, NOAA
Emerson Avenue, Gloucester, MA 01930
Director, Robert J. Learson (617) 281-3600, Ext. 237, FTS 837-9276

MISSION DESCRIPTION: The Gloucester Laboratory, located in Gloucester, Massachusetts, comprises NEFC's Utilization Division. The facility houses laboratory and refrigerated storage space, food preparation and processing area for research and development, and Marine Products Development Irradiation, the only semicommercial irradiation facility in the East for preserving fish quality with the use of gamma radiation. The primary mission

of the laboratory is to optimize the use of the fishery resources of the Northeast. Basic research areas include development of underutilized species for domestic and foreign markets, improving the quality of seafoods, utilization of discarded species, and increasing the productivity and efficiency of harvesting and processing seafoods.

MILFORD LABORATORY
National Marine Fisheries Service, NOAA
Milford, CT 06460
Director, Dr. Anthony Calabrese (203) 878-2459, FTS 642-5240

MISSION DESCRIPTION: The two pronged mission of the Milford Laboratory, Milford, Connecticut, involves 1) aquaculture research and development of the bay scallop, surf clam, and American oyster; and 2) identification of environmental pollution affecting marine fisheries resources. The information gained is used in management planning to conserve marine habitats and maintain fishery resources for commercial and recreational use.

NARRAGANSETT LABORATORY
National Marine Fisheries Service, NOAA
South Ferry Road, Narragansett, RI 02882
Director, Dr. Kenneth Sherman (401) 789-9326, FTS 838-7142

MISSION DESCRIPTION: The Narragansett Laboratory, located on the Bay Campus of the University of Rhode Island, conducts research to improve forecasts of fish stock abundance by measuring the biological and environmental fluctuations that control the size of the northeast shelf fisheries biomass. Studies are focused on the factors controlling changes in the growth and survival of early life history stages of fish populations. In addition, Apex Predator Assessments are conducted in cooperation with recreational/commercial fisherman and state agencies to determine the variation in abundance of shark, swordfish, and tuna in the Northwest Atlantic. The Laboratory serves as the NOAA/NMFS Center for the application of pattern recognition systems to the identification of fish eggs, larval, and other plankton, and the ageing of fish through electronic means for measuring skeletal structures.

NATIONAL SYSTEMATICS LABORATORY
National Marine Fisheries Service, NOAA
Smithsonian Institution
Washington, DC 20560
Director, Dr. Bruce B. Collette (202) 357-2550, FTS 357-2550

MISSION DESCRIPTION: The National Systematics Laboratory is located in the National Museum of Natural History of the Smithsonian Institution in Washington, D.C. The programs of this laboratory lay the foundation for proper identification of living marine resources so that they can be managed and population assessments made.

OXFORD LABORATORY
National Marine Fisheries Service, NOAA
Oxford, MD 21654
Director, Dr. Aaron Rosenfield (301) 226-5193

MISSION DESCRIPTION: The Oxford, Maryland Laboratory is the only major NOAA facility on Chesapeake Bay. The following areas of research are conducted: the role disease plays on fishery population variability; comparative studies on marine animal diseases to determine the causes of massive fish kills and predict population "crashes;" prevention or control of the spread of infectious marine animal diseases, pests, and predators; monitoring marine and estuarine environmental pollution; monitoring marine ecosystem integrity, degredation, or rehabilitation; impact of pollution stress on living marine resources; study of contagious disease agents and parasites that affect marine fishery; and developing methods to minimize effects of disease, toxic chemicals, and metabolites on marine fish kept in confinement or under culture conditions.

SANDY HOOK LABORATORY
National Marine Fisheries Service, NOAA
Highlands, NJ 07732
Director, Carl J. Sindermann (201) 872-0200, FTS 342-8200

MISSION DESCRIPTION: Major programs at the Sandy Hook Laboratory, located on Sandy Hook Peninsula, Monmouth County, New Jersey, includes most of the Environmental Assessment Division which provides long-term monitoring and research of the effects of contaminants and physical degradation on living marine resources. Included are the Coastal Ecosystems Task and Biological Oceanography Task. The Fishery Statistics Collection headquarters, located here, gathers data from port interviewers/investigators and provides them to the Resource Assessment Division and other users. The lab also houses the Marine Recreational Fisheries Task and a subtask of the Pathobiology Division. The Editor for the Fishery Bulletin and other principal NMFS publications is located at Sandy Hook lab.

NORTHWEST AND ALASKA FISHERIES CENTER AND ASSOCIATED LABORATORIES
National Marine Fisheries Service, NOAA
7600 Sand Point Way, NE, Seattle, WA 98115-0070
Director, Dr. William Aron (206) 526-4000, FTS 392-4000

MISSION DESCRIPTION: The Center is composed of eight Divisions/Laboratories of which seven are located in Seattle, Washington and one in Auke Bay, Alaska. A ninth, the Newport Laboratory (Newport, Oregon) is operated jointly by the Oregon State University and the Center. Field facilities include six stations in Washington, three in Oregon, and two in Alaska. The

center plans, develops, and manages programs designed for better comprehension of the living marine resources of the sea, as well as the quality of their habitat. Recommendations are made for their utilization, conservation or protection, consistent with national needs and goals. A principal function of the Center is to serve as technical advisor to Fishery Management Councils and U.S. Commissions or groups involved in fisheries and marine mammal negotiations with foreign countries. Research is conducted on composition, distribution, abundance, productivity and interactions of marine fish and shellfish in waters of the northeastern Pacific Ocean; fishing and sampling gear performance, techniques on selective fishing; ecology, population dynamics, and economic aspects of fisheries; the nature and extent of pollution in marine environments and potential effects on the viability of marine organisms; distribution, abundance, migration, survival, and interactions of marine mammals; migration and survival of anadromous fish in the Columbia River Basin and in Alaska; handling and preservation of fish catches appropriate to a fishery, abroad ship and in shore processing plants; use of underutilized species and microbiology and safety of products. Technical support is provided for Center scientists in areas of mathematics, experimental design, editing/graphics, and library and computer services.

AUKE BAY LABORATORY
National Marine Fisheries Service, NOAA
P. O. Box 210155, Auke Bay, AK 99821
Director, Dr. George R. Snyder (907) 789-7231

MISSION DESCRIPTION: The Auke Bay Laboratory, north of Juneau, Alaska, and its associated field stations has responsibility for providing research and advisory support to U.S. negotiations in fishery treaty deliberations with Canada and Japan to reduce interceptions of our salmon resources in their commercial fisheries; for assessing groundfish resources in the eastern Gulf of Alaska; for habitat studies focusing on impacts of petroleum and logging on Alaska fishery resources; and for developing the biological basis for restoring and enhancing Southeast Alaska depressed chinook salmon stocks and enhancing coho salmon stocks.

SOUTHEAST FISHERIES CENTER AND MIAMI LABORATORY
National Marine Fisheries Service, NOAA
75 Virginia Beach Drive, Miami, FL 33149
Director, Dr. Bradford Brown (305) 361-4286, FTS 350-1284

MISSION DESCRIPTION: Located on Virginia Key in Miami, Florida, the Miami Facility consists of the Southeast Fisheries Center and the Miami Laboratory. Facility programs include: 1) monitoring of fishery management council programs and reviewing of management plans, regulations, regulatory impact reviews, and environmental impact statements; 2) study of ocean pelagics,

primarily bluefin tuna; 3) survey of reef resources; 4) monitoring of endangered species, Kemp's ridley sea turtle in particular; 5) Southeast Marine Mammal Stranding and Salvage Operation: and 6) data collection, entry, and management of regional fishery statistics.

BEAUFORT LABORATORY
National Marine Fisheries Service, NOAA
Beaufort, NC 28516-9722
Director, Dr. Ford Cross (919) 728-4595, FTS 670-2451

MISSION DESCRIPTION: The Beaufort Laboratory, located on Pivers Island in Beaufort, North Carolina, 1) conducts research on menhaden stocks to answer questions on size and distribution, effects of fishing effort, annual yield prediction, and economics of the fisheries; 2) conducts research on age structure, growth rates, and recruitment of menhaden and reef fish; and 3) conducts research on the dependence of fishery species on the estuarine and near shore oceanic environment and the effects of man-induced changes on fishery production.

CHARLESTON LABORATORY
National Marine Fisheries Service, NOAA
P.O. Box 12607, 217 Fort Johnson Road
James Island, Charleston, SC 29412
Director, Harry L. Seagran (803) 762-1200, FTS 677-4773

MISSION DESCRIPTION: The mission of the Charleston Laboratory is to resolve long-term technological impediments to the greater economic return from the use of U.S. living marine resources while enhancing consumer confidence and satisfaction in the quality and safety of seafoods derived therefrom. Provides scientific, technical, and economic information and services to a variety of constituents to aid in the economic and safe use of fishery resources of the southeast region and the Nation.

GALVESTON LABORATORY
National Marine Fisheries Service, NOAA
4700 Avenue U, Galveston, TX 77550
Director, Dr. Edward F. Klima (409) 766-3500, FTS 527-6501

MISSION DESCRIPTION: Three programs are carried on at the Galveston Laboratory, Galveston, Texas. Laboratory personnel perform research to fulfill the requirements of the Gulf Regional Management Fishery Council for information on the Gulf shrimp fishery in general and the areas of the Texas closure and the Tortugas sanctuary in particular. A second area of research is on the impact to the ecosystem of bottomfish bycatch discarded from the more than 5,000 shrimp vessels in the Gulf. The third program conducts headstart research to save the endangered sea turtle, Kemp's ridley, through rearing techniques. In addition, shrimp physiology studies are conducted.

MISSISSIPPI LABORATORY
National Marine Fisheries Service, NOAA
National Space Technology Labs
Pascagoula Facility, NSTL Station, MS 39529
3209 Frederick St., P.O. Drawer 1207, Pascagoula, MS 39567
Director, Dr. Andrew J. Kemmerer (601) 688-3650, FTS 499-3650

MISSION DESCRIPTION: The Mississippi Laboratories, located at Bay St. Louis and Pascagoula, Mississippi, are organized into three tasks: 1) resource surveys emphasizing data collection from the fishery stocks of the southeast; 2) harvesting systems and surveys with emphasis on efficient assessment techniques for a wide variety of fishery independent data; 3) survey technology development using satellite remote sensing for surveys, tracking of endangered species, and forecast models for commercial fisheries.

PANAMA CITY LABORATORY
National Marine Fisheries Service, NOAA
3500 Delwood Beach Road, Panama City, FL 32407-7499
Director, Eugene L. Nakamura (904) 234-6541, FTS 234-6541

MISSION DESCRIPTION: The Panama City Laboratory conducts research on the biology and ecology of those species important to the recreational and commercial fisheries of the southeast. The Fishery Ecology Division conducts research on distribution and abundance, movements and migrations, coastal ecology, and predator-prey relations. The Bioprofile Division conducts research on sea turtle biology, reproductive biology, age and growth, stock identification, and food studies.

SOUTHWEST FISHERIES CENTER AND LA JOLLA LABORATORY
National Marine Fisheries Service, NOAA
P.O. Box 271, La Jolla, CA 92038
Director, Dr. Izadore Barrett (619) 453-2820, FTS 893-6820

MISSION DESCRIPTION: Largest of the Center's laboratories and site of headquarters for the Southwest Fisheries Center, research efforts at the La Jolla Laboratory are concentrated in two principal divisions: Oceanic Fisheries Resources Division and Coastal Fisheries Resources Division. The Oceanic Division conducts research in six program areas: the 1) tuna/porpoise; 2) coastal marine mammals; 3) high seas ecosystem; and 4) Pacific tuna conservation and management programs provide information for assessment of coastal marine mammals and Pacific tunas. Program five provides information for conservation of Atlantic tunas and program six provides conservation and management research on North Pacific albacore. The chief functions of the Coastal Division are to: 1) provide biological assessment of marine fish stocks important to California fisheries; 2) provide management advice including economic analysis of regulatory schemes and fishery

models; 3) conduct research on recruitment mechanisms of coastal pelagic fishes of California; and 4) conduct studies on the distribution. availability and migratory pattern of albacore.

HONOLULU LABORATORY
National Marine Fisheries Service, NOAA
P.O. Box 3830, Honolulu, HI 96812
Director, Mr. Richard S. Shomura (808) 943-1221

MISSION DESCRIPTION: The Honolulu Laboratory, located on the campus of the University of Hawaii. has four research groups: 1) the Insular Resources Investigation, composed of the Insular Ecosystem Program and Resource Assessment Investigation of the Mariana Archipelago Program; 2) the Pelagic Resource Investigation. composed of the Experimental Ecology of Tunas Program, the Pelagic Ecosystem Program, and the Pelagic Stock Assessment Program; 3) the Fishery Management Research Program; and 4) the Marine Mammals and Endangered Species Program, responsible for research on the endangered Hawaiian monk seal and endangered and threatened marine turtles in the central and western Pacific.

PACIFIC ENVIRONMENTAL GROUP
National Marine Fisheries Service, NOAA
P.O. Box 831, Monterey, CA 93942
Director, Dr. Andrew Bakun (408) 646-3311

MISSION DESCRIPTION: Pacific Environmental Group (PEG) is a laboratory of the Southwest Fisheries Center, NMFS, located in Monterey, California. PEG has offices at Fleet Numerical Oceanography Center (FNOC) and at Hopkins Marine Station of Stanford University. Research at PEG is directed toward promoting effective use of environmental information in fishery research and management. PEG has no field program of its own, but collocation with FNOC provides an extraordinary resource for real-time and historical marine data. Research activities are oriented toward large time- and space-scale variability, and tend to be highly computer-oriented. Present research emphasis is on recruitment variation in eastern boundary current (particularly California Current) fishery stocks and on the factors regulating distribution and abundance of North Pacific albacore tuna.

TIBURON LABORATORY
National Marine Fisheries Service, NOAA
3150 Paradise Drive, Tiburon, CA 94920
Director, Norman J. Abramson (415) 435-3149, FTS 556-0565

MISSION DESCRIPTION: The Tiburon Laboratory, located on the Tiburon Peninsula near San Francisco Bay, California, conducts research in three program areas: 1) underutilized fisheries resources; 2) fish communities, and 3) physiological ecology. The research programs deal with recreational and commerical fishes and their fisheries and predator/prey studies.

NOS

NATIONAL

OCEAN

SERVICE

NATIONAL OCEAN SERVICE

ALASKA OCEAN SERVICE CENTER
701 C Street, Box 23, Anchorage, AK 99513
Director, Gary Hufford (907) 271-3454

MISSION DESCRIPTION: This is a new facility that provides the general marine community in Alaska with a single focal point for all NOAA marine products and services, including technology transfer, for the region. All NOAA components are represented at the center: the National Ocean Service, the National Weather Service, the National Marine Fisheries Service, the National Environmental Satellite, Data, and Information Service, and the Office of Oceanic and Atmospheric Research. The center is a place where members of the marine community can go to obtain detailed information about NOAA products and services, suggest new products and services, and recommend ways of improving existing NOAA products and services. The center has a marine forecast and warning unit that operates 24 hours a day and provides computer access to guidance products generated by the National Meteorological Center and the U.S. Navy's Fleet Numerical Oceanography Center. The center also provides access to NOAA scientific and technical reports, conducts inventory searches, offers advice on oceanic and atmospheric data management, provides regional climate information, and assists the private sector in developing, implementing, and evaluating regionally oriented oceanic and atmospheric research.

NATIONAL MARINE POLLUTION PROGRAM OFFICE
11400 Rockville Pike, Rockville, MD 20852
Director, Dr. Andrew Robertson (301) 443-8817, FTS 443-8817

MISSION DESCRIPTION: The Office, administered by the National Ocean Service, carries out the National Oceanic and Atmospheric Administration's responsibilities under the National Ocean Pollution Research and Development and Monitoring Planning Act (OPRDM) of 1978. The Office prepares biennially the 5-year Federal plan on ocean pollution research, development, and monitoring called for by the Act. The Office, in consultation with other Federal, State, and local agencies, conducts studies and analyses to determine national OPRDM activities, priority problem areas for action, and areas of overemphasis or underemphasis in the current Federal program, and to make recommendations for improving the efficiency and effectiveness of the Federal OPRDM program.

NOAA DIVING PROGRAM
6001 Executive Blvd., Rockville, MD 20852
Director, Dr. J. Morgan Wells (301) 443-8007, FTS 443-8007

MISSION DESCRIPTION: The Program, administered by the National Ocean Service's Office of Marine Operations, primarily provides training to in-house personnel, but does provide training to other Federal, State, and local agencies on a space-available basis. The program provides scientists with

diver training ranging from basic scuba and operational diving to specialized capabilities such as mixed gas diving and surface-supplied diving. The program also provides training to diving support personnel, including emergency medical technicians and recompression chamber operators. It plays a key role in a national program to provide physicians with training in diving and hyperbaric medicine and is researching the problems faced by divers working in contaminated waters.

NORTHWEST OCEAN SERVICE CENTER
7600 Sand Point Way, NE, Bin C15700, Seattle, WA 98115
Director, Capt. Phillip Johnson (206) 526-6622, FTS 392-6725

MISSION DESCRIPTION: This is a new facility that provides the general marine community in the Pacific Northwest with a single focal point for all NOAA marine products and services, including technology transfer, for the region. All NOAA components are represented at the center: the National Ocean Service, the National Weather Service, the National Marine Fisheries Service, the National Environmental Satellite, Data, and Information Service, and the Office of Oceanic and Atmospheric Research. The center is a place where members of the marine community can go to obtain detailed information about NOAA products and services, suggest new products and services, and recommend ways of improving existing NOAA products and services. The center has a marine forecast and warning unit that operates 24 hours a day and provides computer access to guidance products generated by the National Meteorological Center and the U.S. Navy's Fleet Numerical Oceanography Center. The center also provides access to NOAA scientific and technical reports, conducts inventory searches, offers advice on oceanic and atmospheric data management, provides regional climate information, and assists the private sector in developing, implementing, and evaluating regionally oriented oceanic and atmospheric research.

OFFICE OF CHARTING AND GEODETIC SERVICES
6001 Executive Blvd., Rockville, MD 20852
Director, RADMR John D. Bossler (301) 443-8204, FTS 443-8204

MISSION DESCRIPTION: The office provides a wide range of geodetic products and services, produces nautical charts of U.S. waters, and produces aeronautical charts for the National Airspace System. Geodesy: The office establishes and maintains the national networks of geodetic control and conducts field surveys and research and development activities to improve the methods of collecting and disseminating geodetic data. The office provides leadership at the Federal level to develop specifications, standards, and instrumentation for geodetic surveys and assists State, county, and municipal agencies with geodetic-related work through a variety of cooperative programs. The National Geodetic Information Center, maintained by the office, collects, maintains, and distributes a complete range of information pertaining to the National Geodetic Reference System, including data on

vertical and horizontal geodetic survey stations, geodetic control diagrams for the conterminous U.S., Alaska, and Hawaii, gravity values for over 1 million points, calibration base line data, astronomic and Doppler satellite data, computer programs for geodetic applications, and geodetic publications and historical records. Nautical charting: The office produces nautical charts for navigation on U.S. coastal and estuarine waters, navigable inland waterways, and the Great Lakes, as well as a number of special purpose maps and charts of the U.S. coastal zone. Aeronautical charting: The office produces instrument flight rule and visual flight rule charts for flights in the National Airspace System in the U.S. and U.S. possessions, as well as chart-related products for air traffic controllers, airport ground personnel, and the FAA.

OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT
3300 Whitehaven Street, NW, Washington, DC 20235
Director, Mr. Peter Tweedt (202) 634-4232, FTS 634-4232

MISSION DESCRIPTION: This office provides the coordination and expertise at the Federal level needed for the effective management of resources within the U.S. coastal zone. Working closely with coastal States, it administers the Coastal Zone Management Program, the National Estuarine Sanctuary Program, the National Marine Sanctuary Program, the Coastal Energy Impact Program, and the Ocean Minerals and Energy Impact Program. Coastal zone management: The office provides technical assistance to U.S. States and territories, emphasizing special area management planning, coastal hazards mitigation, cost-effective coastal management, and the simplification of permit processes for coastal activities. Estuarine sanctuaries: The office administers the National Estuarine Sanctuary Program, which provides funding to U.S. States and territories to acquire and manage estuarine areas for research and education. Marine sanctuaries: The office administers the National Marine Sanctuary Program, which designates and manages offshore marine areas to preserve or restore their natural resources. Coastal energy: The office administers the Coastal Energy Impact Program, which has provided grants, loans, and loan guarantees to U.S. States and territories to help alleviate the effects of outer continental shelf oil and natural gas development and other coastal energy activities. Although direct funding has ended, the office is continuing to provide technical assistance and to monitor the disbursement and collection of the remaining program grants and loans. Ocean minerals and energy: The office serves as the focal point within the National Oceanic and Atmospheric Administration to assist the private sector in establishing new industries to develop ocean minerals and ocean energy resources, including hard minerals on the ocean floor and ocean thermal energy conversion.

OFFICE OF OCEANOGRAPHY AND MARINE ASSESSMENT
6001 Executive Blvd., Rockville, MD 20852
Director, Dr. John G. Hayes (301) 443-8487, FTS 443-8487

MISSION DESCRIPTION: The office collects, analyzes, and disseminates a wide range of data and information that describe the physical properties of the oceans, U.S. coastal waters, estuarine waterways, and the Great Lakes. These data and information, in the form of observations, analyses, assessments, and predictions, are developed to describe the physical features of the natural environment and trends in environment processes due to human activities. It also coordinates ocean products and services available at the National Oceanic and Atmospheric Administration's Northwest Ocean Service Center in Seattle, Washington. Tide and current predictions: Much of the physical oceanographic information produced by the office, such as predictions of the times and heights of the tides and description of tidal currents, is absolutely vital to safe navigation by both recreational and commercial navigators. These data and information are also used for a variety of non-navigational purposes. They provide the scientific basis for offshore oil and natural gas exploration, dredging operations, coastal and offshore construction, seafloor mining, emergency planning by coastal communities waste disposal management, and in protecting the marine environment from the adverse effects of ocean and coastal pollution. Ocean assessments: The office conducts studies to assess the environmental effects of human activities in the U.S. coastal and estuarine waters, and provides the leadership and expertise at the Federal level that are required to identify compatible multiple uses of marine resources and potentially conflicting uses of these resources. A wide range of strategic assessments of ocean resources, coastal and estuarine assessments, and ocean use impact assessments, in the form of reports, atlases, data bases, and models, are available. Ocean thermal energy conversion: The office maintains a special projects staff to perform ocean engineering work in support of National Oceanic and Atmospheric Administration programs. Currently the staff is working on the development of ocean thermal energy conversion, commonly called OTEC. The staff is developing an information base to guide future development of OTEC conversion technology, including ultimately the construction of commercial ocean thermal energy conversion plants.

SYSTEMS PLANNING AND ENGINEERING STAFF
6010 Executive Blvd., Rockville, MD 20852
Director, Mr. John H. Cawley (301) 443-8385, FTS 443-8385

MISSION DESCRIPTION: The Staff conducts system planning and concept development for new and improved systems to acquire and process physical oceanographic data. Through contracts and grants to the private sector, the Staff conducts feasibility studies and development programs to assure that advanced technologies are considered for incorporation into these systems. The Staff develops alternative system concepts for improving the collection of environmental data and the delivery of information products associated with ocean services. The Staff monitors ongoing technology development in the ocean sciences within and outside the National Oceanic and Atmospheric Administration, and implements technology transfers to other Government agencies and the private sector.

NWS

NATIONAL

WEATHER

SERVICE

NATIONAL WEATHER SERVICE

OFFICE OF SYSTEMS DEVELOPMENT

ADVANCED SYSTEMS LABORATORY
Room 1220, Gramax Bldg., Silver Spring, MD 20910
Chief, Mr. Louis Boezi (301) 427-7468, FTS 427-7468

MISSION DESCRIPTION: The laboratory develops new and/or improved systems suitable for implementation three or more years in the future; provides comprehensive solutions to systems problems of NWS; considers the entire scope of NWS requirements and examines system interfaces with other elements of NOAA, other Federal agencies, corresponding agencies in other countries and the World Meteorological Organization; performs systems planning and development in support of all NWS functions, including observations and data acquisition; communications; data analysis and interpretation; preparation of forecasts, warnings and other weather-related information products; and dissemination to users; maintains a continual awareness of the current and anticipated state-of-the-art in relevant technologies; devises alternative solutions to satisfy NWS requirements and analyzes advantages, disadvantages and costs. Manages specific development programs to develop and acquire new systems, utilizing contractors whenever appropriate; and incorporates substantial involvement of the private sector, through specialized and multi-disciplinary contracts, in the analysis, definition, development and execution of advanced systems programs.

INTEGRATED SYSTEMS LABORATORY
Room 201, 8060 13th St., Silver Spring, MD 20910
Chief, Mr. Richard Waters (301) 427-7809, FTS 427-7809

MISSION DESCRIPTION: The analysis, design, development and test activities are conducted in support of the implementation, operation and improvement of NWS systems. Primary emphasis is on systematic solution of current problems and development of systems that can be implemented within three years. The laboratory develops detailed system specifications based on NWS functional requirements established by the Office of Meteorology and the Office of Hydrology and using available technologies. It also conducts evaluations of system performance, identifies critical problem areas and analyzes the impact of proposed changes on operational system integrity as well as performance; designs, develops, integrates and tests comprehensive hardware/software solutions in support of on-going meteorological, hydrological and oceanographic observing, data acquisition, processing, display, interpretation, communication and dissemination functions; considers interfaces with other government agencies and external users; and prepares supporting documentation and maintains a library of technical specifications and standards. Maintains supporting facilities and staff for design, drafting, fabrication, model development and experimental testing. It also supports prototype development and experimental testing requiremnets of the Advanced Systems Laboratory and the Techniques Development Laboratory as well as ISL.

TECHNIQUES DEVELOPMENT LABORATORY
Room 825, Gramax Bldg., 8060 13th St., Silver Spring, MD 20910
Chief, Dr. Harry Glahn (301) 427-7768, FTS 427-7768

MISSION DESCRIPTION: The Techniques Development Laboratory conducts or sponsors applied research and development aimed at improvement of diagnostic and prognostic weather information intended to be used as guidance in making official weather forecasts. It carries out studies for the general improvement of prediction methodology used by the National Weather Service. The laboratory directs effort to the improvement of prediction techniques in such areas as public weather, aviation weather, marine weather, and agricultural weather. The laboratory gives special emphasis to the development of improved methods for prediction of tornadoes and severe local storms. Techniques are implemented centrally and the resulting products transmitted to field offices or are implemented on local or regional computers. Emphasis is given to local techniques which update and augment centralized guidance through use of more recent data and local data sources. Projects involve use of modern physical, dynamical, and statistical prognostics techniques; large, high-speed electronic computers; and minicomputers.

OFFICE OF HYDROLOGY

HYDROLOGIC RESEARCH LABORATORY
Room 530, 8060 13th St., Silver Spring, MD 20910
Chief, Dr. Michael Hudlow (301) 427-7904, FTS 427-7904

MISSION DESCRIPTION: The Hydrologic Research Laboratory conducts studies, investigations and analyses into the application of new knowledge of hydrologic forecasting and related water resources problems. The laboratory sponsors and conducts research, as may be required, for a better understanding of the physical processes and phenomena involved in the evaluation and prediction of water movement in all phases of the hydrologic cycle. It recommends the type and extent of extramural research, and reviews and evaluates the results.

OFFICE OF TECHNICAL SERVICES

TEST AND EVALUATION DIVISION
R.D.1, Box 105, Sterling, VA 22170
Chief, Mr. Robert C. Strickler (703) 471-5302, FTS 471-5302

MISSION DESCRIPTION: The Test and Evaluation Division develops and manages National Weather Service test and evaluation programs. Carries out final laboratory tests and limited field tests of instruments and equipment developed by the Office of Systems Development, or by other groups. Assesses the

ability of instruments or equipment to meet stated specifications, and their suitability for operational or research use. Tests instruments and equipment in a laboratory environment. Prepares working data concerning the accuracy, precision and other characteristics of the equipment. Conducts limited field tests and coordinates extensive field tests of such equipment. Advises concerning the operational use of products which have successfully passed the required tests. (Such advice is required for the preparation of installation, operation and maintenance manuals by other organizational components). In conjunction with other components of the National Weather Service, tests and evaluates current observational methods and procedures, and develops new methods for observing and measuring environmental parameters. Establishes and operates special purpose facilities for development programs. Designs and conducts experiments on equipment, techniques and procedures to develop quantitative performance as required to aid management, systems design, and development decisions concerning their potential role in the meteorological service system.

NATIONAL METEOROLOGICAL CENTER

CLIMATE ANALYSIS CENTER

Room 606, World Weather Building, Camp Springs, MD 20233
Director, Dr. David Rodenhuis (301) 763-8167, FTS 763-8167

MISSION DESCRIPTION: The Climate Analysis Center, as a major element of the NOAA Climate Program, applies new technology and new approaches to the analysis, diagnosis, and projection of short-term climate fluctuations on a regional and global basis. Maintains awareness of current climate anomalies and provides information on these anomalies and their projected changes to users within and external to Government who are responsible for coping with problems caused by short-term fluctuations, such as those of energy, food supply, water resources, and health. Cooperates and coordinates its activities with other elements of the National Meteorological Center and other parts of NOAA; with other Government agencies (e.g. Department of Agriculture); with interests in the private sector; with research and academic institutions; and with climate agencies in other nations and in the World Meteorological Organization. Supports research studies in climate diagnosis and prediction at universities, private research organizations, and other Government agencies.

DEVELOPMENT DIVISION

Room 204, World Weather Building, Camp Springs, MD 20233
Chief, Dr. John A. Brown, Jr. (301) 763-8005, FTS 763-8005

MISSION DESCRIPTION: The division conducts research and development in numerical weather and oceanic prediction which is directed towards the improvement of the products of the National Meteorological Center (NMC). It

adapts research results to oceanic and numerical weather prediction techniques which are suitable for operational forecasting. It develops, tests, and evaluates (1) methods of analysis for extracting maximum information from the various meteorological and oceanographic observing systems and (2) oceanic and numerical weather prediction models for improving the accuracy, extending the range, and enlarging the geographical domains of forecasts. In its R and D processes, the division analyzes and evaluates physical methods and numerical procedures which are appropriate to operational forecasting. The division also performs diagnostic studies of the earth's fluid environment in order to obtain a better understanding of its physical structure and motion. The division advises the Director of the NMC as to the suitability of new products for operational implementation and publishes research results in various media for widespread dissemination to the world meteorological community.

NATIONAL DATA BUOY CENTER
NSTL Station, MS 39529
Director, Dr. Robert Erickson (601) 688-2800, FTS 494-2800

MISSION DESCRIPTION: The National Data Buoy Center serves as the national center for environmental data buoy technology. Provides for systematic research, development, test and evaluation of data buoys and associated sensors, power supplies, hulls, mooring, data processing and communications systems tailored to meet specific needs of NOAA programs and other national programs in which NOAA has an interest. Develops, demonstrates, implements, and operates other automated environmental monitoring systems in response to NWS requirements and requirements of other agencies' programs in which NOAA has an interest. Provides the capability to support data buoy systems and other automated environmental monitoring systems required to meet measurement needs for research programs and NOAA's long-term operational needs in marine and weather areas. Provides a technical advisory capability in buoy technology to meet national needs.

OFFICE OF THE ADMINISTRATOR

OFFICE OF AIRCRAFT OPERATIONS

3401 NW 59th Ave., Miami, FL 33122
Director, Capt. F.D. Moran (305) 526-2936, FTS 350-2936

MISSION DESCRIPTION: The Office of Aircraft Operations (OAO) has the mission of procuring, maintaining, instrumenting, calibrating, and operating aircraft (both fixed wing and rotor) in support of a broad spectrum of environmentally related research programs of NOAA and other government agencies. The mission of the OAO is carried out through several interelated groups. They are:

1. Aircraft Operations (fixed wing) - maintains and operates the aircraft, and provides technical advice on the utilization of these aircraft for research activities.

2. Engineering and Research Systems Group - is responsible for the technical development, operation, management, and control of the scientific equipment on two airborne platforms; data processing and calibration, and for providing engineering and technical support services to all OAO elements.

3. Research Applications Group - provides total program development and management of national and international research efforts. Conducts feasibility studies for the optional configuration and utilization of the aircraft for NOAA approved programs.

4. Rotorcraft Group - is responsible for the operational support of a variety of programs in remote areas.

5. Quality Control Assurance Group - formulates and administers an aircraft operations standardization program for all NOAA aircraft.

SECTION III

Government Patents -

Information for NOAA Scientists and Engineers

SOME THINGS YOU SHOULD KNOW
ABOUT GOVERNMENT PATENTS

NOAA Scientists and Engineers are Inventors

R&D in NOAA is conducted to improve our understanding of the atmosphere and the ocean and its living resources and to improve our products and services to the nation. In general NOAA scientists and engineers do not think of themselves as inventors, but rather as researchers serving science and the NOAA mission. However, the product of their work often leads to the development of new and useful processes or devices which are indeed patentable inventions and occasionally inventions that have commercial value. The purpose of this section is to inform NOAA scientists and engineers of the advantages and potential benefits of applying for Government patents on their inventions. It is a relatively simple process for Government employees seeking a patent for which the Government will retain rights.

What are the benefits of a Government patent?

The most tangible benefit to the inventor is the possibility of financial rewards. In 1977, the Department of Commerce established a program for Incentive Awards for Federal Inventors. The program was established to: (1) compensate equitably and recognize Government inventors, and (2) encourage Government inventors to disclose commercially promising inventions and facilitate public use of Federally developed technology.

A government patent on your invention provides the best opportunity to ensure it's availability to the public. Under new regulations, exclusive licensing of government inventions can be offered to industry as an incentive to encourage venture capital investment in the development and marketing of Government inventions and to transfer Federal technology.

Obtaining a Government patent is also in the public interest. A Government owned patent protects the Government and the public from paying royalties to a second inventor for use of an invention that was first made by a Federal employee.

How do NOAA inventors obtain Government patents and participate in the NTIS incentive awards program?

The first step in obtaining a Government patent must be taken by the inventor(s) by preparing a Disclosure Document. A Disclosure Document is a description of the invention and what it will do which is sufficiently full and clear to teach a person of ordinary skill in the field of the invention to make and use it. It should also include drawings if the invention can be illustrated. There is no prescribed format for the Disclosure Document. It should simply be identified as such and sent to:

Mr. Eugene J. Pawlikowski
DOC Patent Counsel
Room 4610
Herbert C. Hoover Building
Washington, D.C. 20230

Upon receiving the disclosure, the DOC Patent Counsel will conduct a Preliminary Search to determine if the the invention is new. If it is determined to be new and, in the judgment of the Patent Counsel, a patent is likely to be granted, then he will collaborate with the inventor and prepare and prosecute a formal patent application with the Patent and Trademark Office (PTO). The average time between submission of a Disclosure Document and the filing of a Patent Application is 3 to 4 months. At the time of filing, rights to the invention are assigned to the United States of America as represented by the Secretary of Commerce, and custody of the Patent Application is transferred to the National Technical Information Service (NTIS).

In almost all cases, when the Patent Counsel recommends filing for a Patent Application, a patent is ultimately granted by the PTO. The entire process takes an average of 2 years from the filing date. However, at the time NTIS receives custody of the Patent Application (3 to 4 months after disclosure) they will advertize its availability for licensing through their many publications. Upon receiving an application for license, NTIS will negotiate the terms (effective period of the license and royalties to be paid). When a royalty-bearing license agreement is successfully negotiated the inventor, or inventors in the case of a jointly made invention, will receive a minimum of $300, or up to a maximum of 15% of the royalties for each year the license is in effect. The maximum cumulative award for a single invention is $35,000, unless, based upon the exceptional value and benefit of the inventors' contribution, the President authorizes more. If you have questions concerning this program or the potential commercial value of your invention call or write:

Office of Federal Patent Licensing
National Technical Information Service
P. O. Box 2423
Springfield, Virginia 22152

Telephone: (703) 487-4732

What about commercial value?

There are not many of us in NOAA skilled in recognizing the potential commercial value of an invention. While most NOAA R&D leads to technologies or inventions with little commercial value, you should not let this stop you from submitting a Disclosure Document if you think there may be commercial value. This is especially true if, through some modification or adaptation, a process or device made for NOAA use could also be used for other purposes. If in doubt submit the disclosure and let the Patent Counsel or NTIS help evaluate the commercial potential of your invention.

How does a NOAA scientist or engineer know if he or she has made a patentable invention?

In general, an art, manufacture, composition of material, or process, which has utility, is novel and is not obvious to one skilled in the field of the invention, is patentable. This description is so broad that it really takes a skilled practioner to make a decision in each case. That practioner

is available to NOAA inventors in the person of the DOC Patent Counsel. When in doubt prepare a Disclosure Document and let him evaluate it for you.

Publish or Patent?

You can do both. There is no doubt that scientific careers are better served by articles published in scientific and professional journals. However, there is no reason why you shouldn't submit a Disclosure Document at the same time you submit a manuscript for publication. In fact, the manuscript is likely to contain more information than that required for a Disclosure Document, so it should be a fairly simple task to extract the required information. A word of caution however, a patent cannot be granted if the invention was described in a publication more than one year prior to the patent application date. In other words, you have one year after publication to file a patent application. To obtain foreign protection the application must be filled in the U.S. Patent Office prior to publication or public disclosure.

Where can we obtain additional information?

The above information was provided by the DOC Patent Counsel and the NTIS Office of Federal Patent Licensing and both would be happy to answer any questions you may have. If we in the NOAA ORTA can be of any assistance or if you have any comments or questions concerning this section that may be of general interest to others in NOAA please write or call us at:

NOAA/NESDIS/ORTA
FB#4, Room 3316
Suitland, Maryland 20233

Telephone: FTS/Commercial (301) 763-2418

SECTION IV

Index of Keywords

KEYWORD INDEX