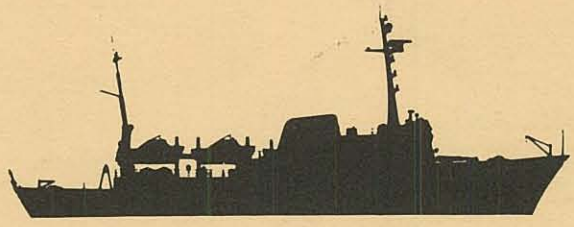
ANNUAL REPORT

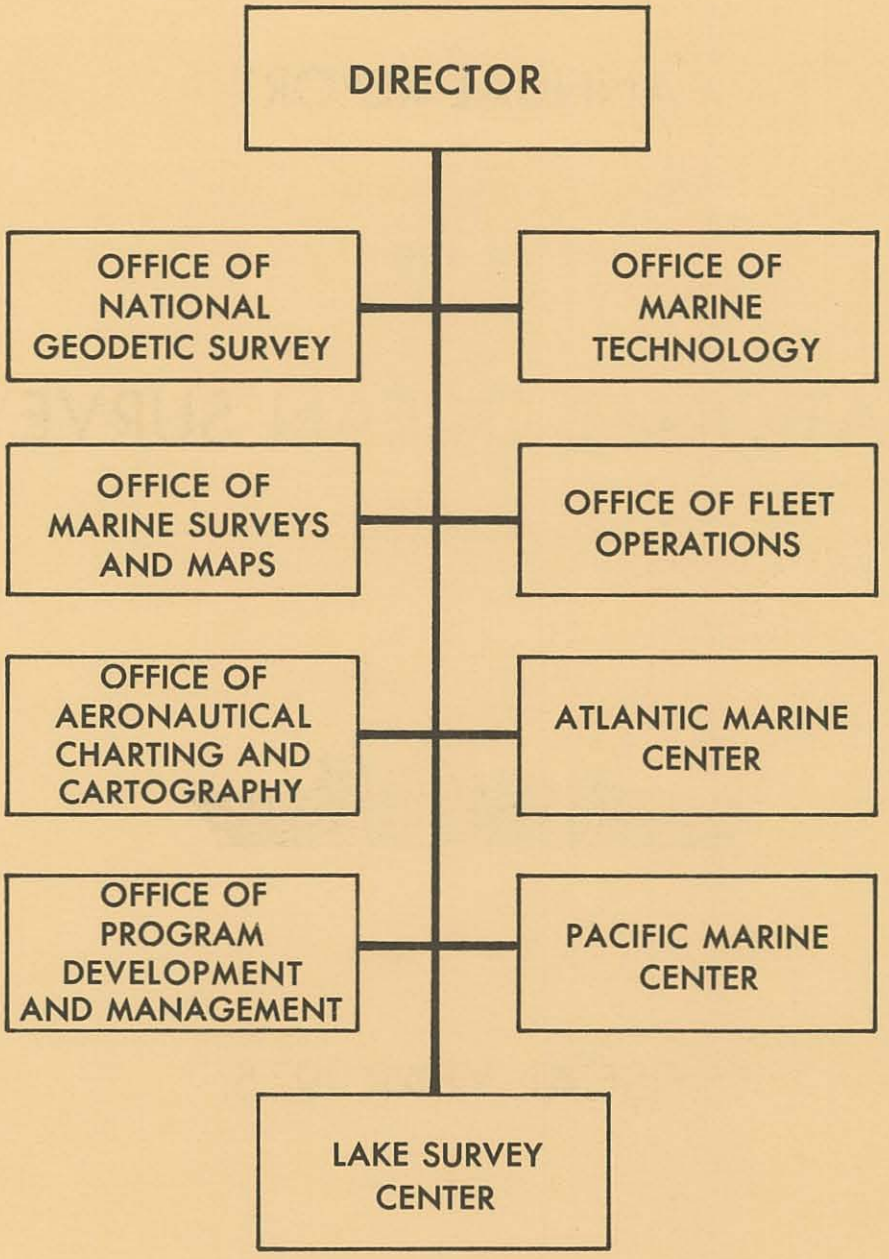
of the

NATIONAL OCEAN SURVEY



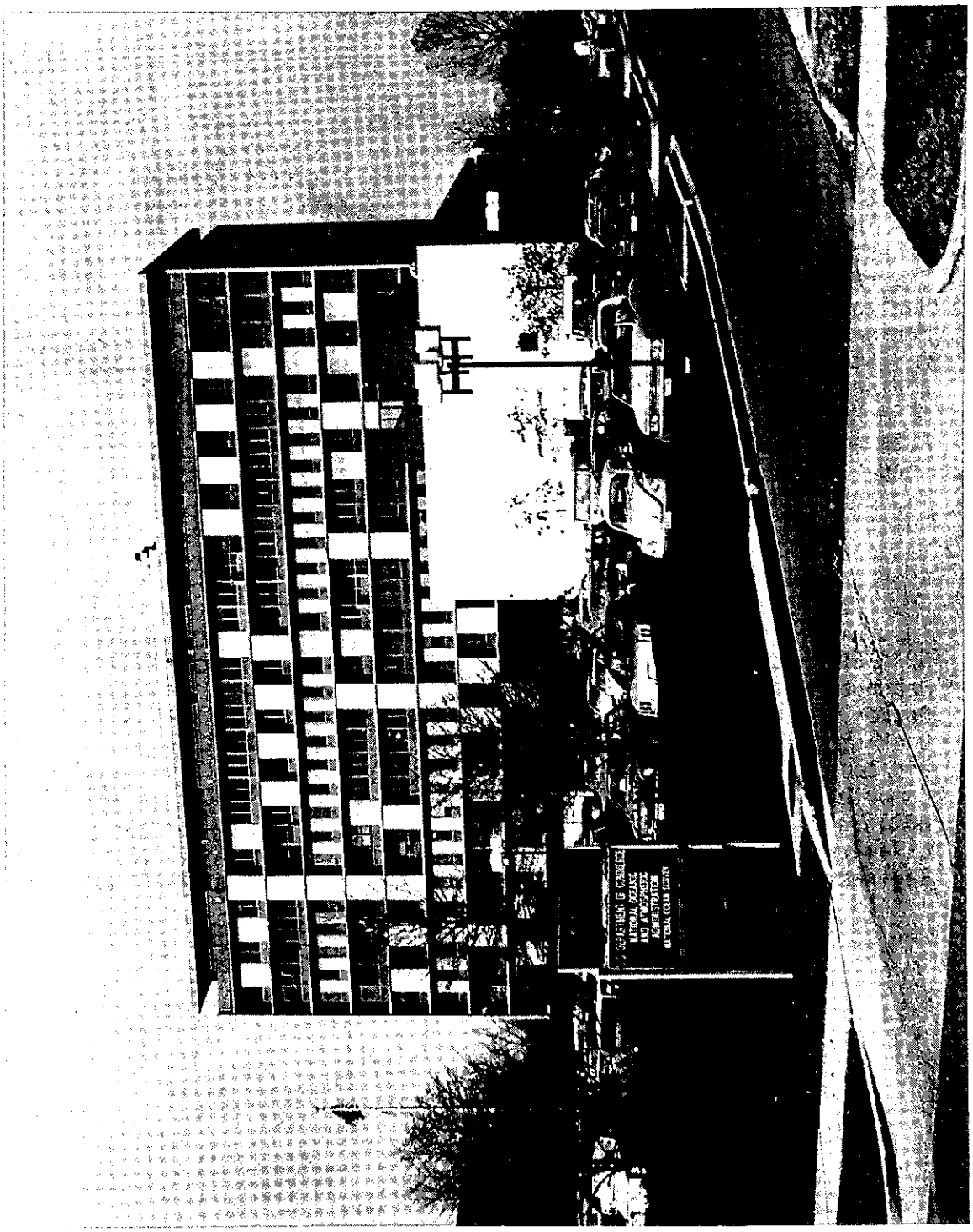
FISCAL YEAR 1975

NATIONAL OCEAN SURVEY



C O N T E N T S

List of Illustrations



1. NOS Headquarters, Rockville, Maryland

A MESSAGE FROM THE DIRECTOR

****

During the past year, I have had occasion to visit many parts of the country and talk with people working in a variety of activities related to our missions in charting, mapping, geodesy, and ocean survey. I am particularly impressed with the observations and opinions of professionals regarding a number of our ongoing and proposed programs.

The highest impact on NOS comes from the growing activity in the coastal zone and on the outer continental shelf - offshore oil and gas development, offshore nuclear power plants, onshore related facilities, deep-water ports, expanded coastal shipping, pollution control, coastal zone management policy, marine research, fisheries development, law-of-the-sea negotiations, marine recreation, ocean mining, near-shore construction, port development, etc.

In the area of ocean/marine activities, three points seem clear to me:

* the growing population of our earth will have an accelerating dependence on resources of the oceans

* we are only on the threshold of knowing how to intelligently develop, manage, and use these vital resources

* our pace of acquiring knowledge of the oceans is far too slow to meet man's inevitable need

The conclusions seem obvious:

* to avert the disastrous consequences of man not being able to utilize the ocean's resources, we must increase our efforts to explore and measure the world oceans and develop more efficient ways of working in the marine environment.

These observations and conclusions may seem too futuristic and too academic, yet they are basic facts. The question is time. How long can we wait? When do we seriously start to consider that earth resource depletion is not academic? When do we seriously start to establish and implement a total effort to survey and understand the oceans? Now is the time. Because the task is long, complex, and costly, our nation must start now to again look at our total effort in the oceans. For each day we delay, the task becomes more difficult and more expensive. The challenge is to bridge the gap between our present efforts and a realistic coordinated plan.

Ocean/marine affairs involve scores of government groups, academic institutions, and the private sector of the ocean/marine community. The National Ocean Survey is an important member of this community. For nearly 170 years we have contributed basic data and knowledge of the oceans and the coastal

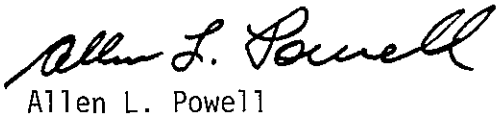
zone through our programs in hydrography, charting, mapping, and geodesy. More significant, however, are our opportunities to provide both leadership and basic data in the future. Our very existence demands that we be an active participant in any effort required to make the oceans serve mankind.

In the field of geodesy, there is high anticipation for early completion of our readjustment of the North American Horizontal Geodetic Datum. The enormous data processing task required is pushing the state-of-the-art near its present limit - the simultaneous solution of 2.3 million linear equations with 500,000 unknowns. During the past year, we began work on this 8-year program which will culminate in the publication of new horizontal control data for the entire U.S. control network, as well as for nets in Canada, Mexico, the Republics of Central America, and Greenland. To store and retrieve the enormous volume of computer-readable data involved and to accommodate geodetic control data now held by other government agencies, we are designing a new national geodetic data base.

Many eyes are focused on our chart automation program. Last year we established a separate Chart Automation Projects Office to plan for and direct programs for automation of both aeronautical and nautical charts. The first phase of the nautical chart automation program has been completed with the installation of computer-assisted data acquisitions systems on all hydrographic survey vessels. Shortly, we expect to award a contract for development of a data storage and retrieval system for nautical chart production.

With tradition goes responsibility. We cannot rest on our laurels. As a pioneering explorer and surveyor, NOS has the experience and the obligation to be a major force in the formation of national ocean policy and a national mapping policy. How much we contribute and accomplish will, in large part, depend on our own motivations and actions.

Your accomplishments during the past year are to be commended. As we strive to make greater contributions, I look forward to even greater accomplishments. It is well to remind ourselves that NOS missions are basic to national and world affairs. What we do is important.



Allen L. Powell
Rear Admiral, NOAA
Director
National Ocean Survey

OFFICE OF THE DIRECTOR

Research and Development

A Research and Development Council has been formed to satisfy the need for critical analyses of scientific and engineering research and development efforts of the National Ocean Survey. The Council will be made up of the NOS Chief Scientist and NOS scientists and engineers who have demonstrated research and development capabilities. Members of the Council will be responsible for the periodic review of all R&D projects, and for generating projects which will enhance NOS and NOAA programs. Reports on NOS R&D efforts will be made, on a periodic basis, to a Board of Directors. The Board will determine relative priorities of those projects favorably recommended by the R&D Council.

Scientific Publications

In a continuing effort to provide visibility for NOS Research and Development, the Collected Reprints 1974 was published in June 1975. In an effort to conserve paper, those articles which appeared in recognized journals and are easily accessible are presented in abstract. Appropriate references to the published article, and to those articles of limited interest, are given by title only with appropriate reference to the author or other source. A similar publication is under consideration for CY 1975.

Work continued toward the completion of a NOAA professional paper, "The Strategic Role of Perigean Spring Tides in Nautical History and North American Coastal Flooding, 1635-1975," now scheduled for publication in 1976. The content of this manuscript has been expanded to include examples of the impact of such tides upon important events in American history appropriate to the U.S. Bicentennial, an analysis of more than 100 cases of major tidal flooding on the North American coastline in the past 340 years associated with such tides, and numerous practical aspects of these tides in relation to the economy--all introductory to a basic technical treatise on the origin and nature of these tides and their potential for major coastal flooding.

Chart Automation

Chart Automation Projects Office. The Chart Automation Projects Office (CAPO) was recently established to manage the transition throughout NOS to computer-assisted production systems for marine data and nautical charting, automated interface with the FAA National Flight Data Center and aeronautical charting. Mr. Donald H. Hunt was designated as Director of CAPO and, in that capacity, coordinates and directs the activities of the Marine Data Systems Project (MDSP) and the Aeronautical Chart Automation Project (ACAP). CAPO provides centralized administrative support to the

two chart automation projects. In addition, CAPO facilitates the integration of the two system plans to achieve maximum utilization of key resources, maximum compatibility, and essential back-up support while avoiding unnecessary redundancy. The goal of the chart automation project is to develop, implement and complete the NOS transition to computer-assisted cartographic systems capable of increased productivity over the manual systems in providing accurate and timely charts and related products for safety in air and sea navigation.

Marine Data Systems Project (MDSP). A ten-year program to design, develop and implement computer-assisted systems for the acquisition, processing, compilation, and production of nautical chart data and products has been completed. At this point, the primary emphasis of MDSP is on transitioning those data acquisition and processing systems already developed to the appropriate line organizations of NOS, on an interim basis, and on completing the development of the Data Storage, Retrieval, Update compilation and production subsystems. The major activities of MDSP are summarized as follows:

1. Data Acquisition

a. Automated Shipboard Data Acquisition Systems. With the installation of a HYDROPLOT System on the NOAA Ship DAVIDSON in January 1975, all NOAA hydrographic survey ships are equipped with automated Data Acquisition Systems (DAS). In addition, 12 auxiliary launches are equipped with automated DAS. MDSP initiated action to transition the maintenance, replacement and management of these automated hydrographic DAS's (including the HYDROPLOT/HYDROLOG Manual) to the Office of Fleet Operations (OFO) beginning in FY 1976. In order to facilitate this transition, MDSP will transfer one position and $20K to OFO in FY 1976. Additional funding to support replacement will be transferred beginning in FY 1978.

b. Digital Sextants. Two production prototype digital sextants delivered to MDSP were successfully tested onboard the NOAA Ship RAINIER and at the Naval Eastern Standards Laboratory. Although the tests were successful, several minor modifications will be made to the prototype units and to the remaining six production models to be delivered in January 1976.

c. GYRO Compass. Digital gyro compass repeaters were installed on the Class II Ships MT. MITCHELL, FAIRWEATHER and RAINIER to reduce errors resulting from eccentricities of location of the navigation antenna and the echo sounder transducer.

d. Offshore Telemetering Tide System (OTTS). MDSP funded the design and development of this system by the Engineering Development Laboratory (EDL). The system, if successful, will provide accurate, real-time tide input for offshore hydrographic surveys. Operational tests for the prototype system began in June 1975, and will be completed during FY 1976.

e. Ship Motion (Heave) Sensor. EDL, with MDSP support, is procuring a heave sensor for test and evaluation to determine feasibility and applicability to hydrographic survey data acquisition.

2. Data Processing and Evaluation Subsystem

a. Digital Logging. The digital logging of unverified hydrographic survey data at the National Climatic Center (NCC) resulted in 15 surveys being logged and 30 remaining surveys to be completed. MDSP initiated a program to utilize high school students, working part time in cooperation with the Montgomery County Board of Education Work-Study Program, to transcribe this data onto log sheets to facilitate the digital logging by NCC personnel. This effort has been very successful and will be continued during FY 1976.

b. Pacific Marine Center (PMC) Automatic Data Processing (ADP). The replacement ADP System was accepted in July 1974. MDSP is continuing to support the development of software and automated graphics for this system.

c. Atlantic Marine Center (AMC) ADP System. A feasibility study has been completed relative to the upgrading of the AMC ADP system to achieve compatibility with PMC. Funding to support this effort will not be available until FY 1978.

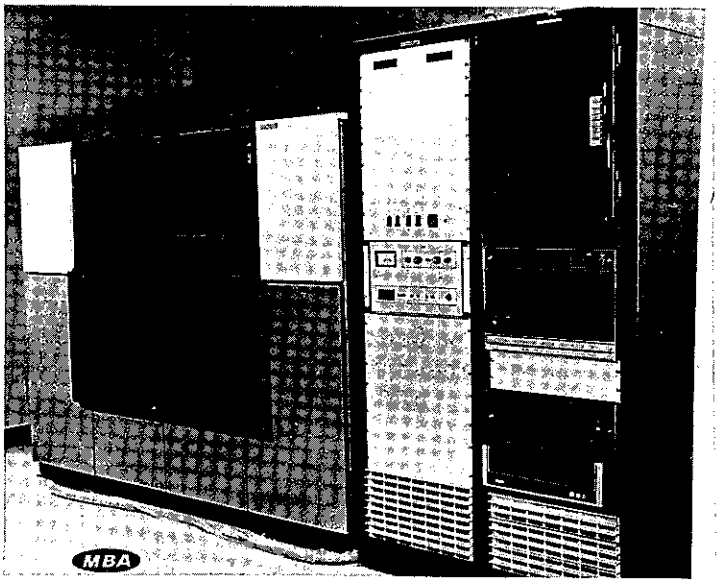
d. Hydrographic Survey Processing Conference. The second annual conference was held at Rockville, Maryland, during September 23-25, 1974, with participation by AMC, PMC and Lake Survey Center (LSC). The conference was again chaired by Mr. Dale Westbrook of MDSP, and was highlighted by workshops designed to focus attention on technical advances and ways to improve the quality and productivity of hydrographic survey processing.

3. Chart Production Subsystem

a. Graphic Digitizing System. The Calma digitizing system was accepted in September 1974, after all contract discrepancies and hardware deficiencies had been corrected by the contractor.

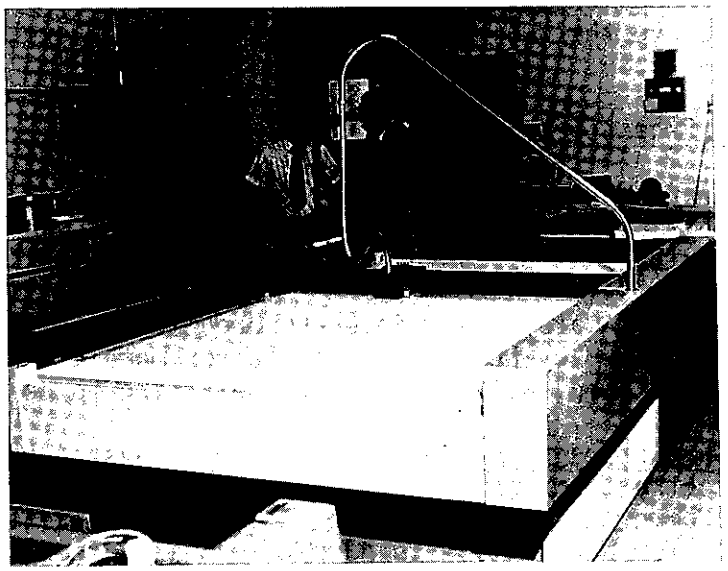
b. Digital Data Base. Seven-hundred-seven active hydrographic surveys were digitized by NCC. To date, approximately two-thirds of this task has been completed, with 900 surveys remaining to be digitized.

c. Data Storage and Retrieval System. System specifications were completed by contract and a procurement package has been forwarded to the Department of Commerce (DOC). Present plans have the Request for Proposal (RFP) scheduled for publication in August 1975 and a contract award projected for December 1975. The site for the proposed system has been selected and site preparation will begin in late 1975, as soon as the facility is vacated by its present occupants. Completion of site preparation and delivery of hardware is scheduled for June 1976.



2. Laser-raster Plotter

d. Production Capacity Plotter. The site preparation for the laser-raster plotter was completed in October 1974, and the plotter was delivered in January 1975. Some delays were initially encountered due to electro-mechanical failures and software deficiencies. These have been corrected, and acceptance testing and debugging has now commenced.



3. Flatbed Plotter

e. Flatbed Plotter. The Calcomp 748 plotter was delivered in August 1974, but had not been accepted by the end of the fiscal year due to deficiencies in the Vacuum holddown mechanism. The manufacturer was initially unable to correct the problem and requested arbitration by the General Services Administration (GSA). As a result the plotter underwent a 20-day evaluation test according to GSA standards, during which time the holddown deficiencies were corrected to permit successful completion of the test.

f. Contouring Program. A commercial contour program was delivered, installed on the NOAA IBM 360/195 computer, and successfully tested. This software program is now in use by MDSP personnel on a developmental basis.

4. Management

a. Personnel. On November 25, 1974, Commander Ray E. Moses relieved Captain Clinton D. Upham as Manager, Marine Data Systems Project.

A cooperative program was initiated with the Montgomery County Board of Education in October 1974, whereby 12 high school students were hired on a part-time basis. These students worked an average of 20 hours per week and were assigned tasks of data transcribing, data logging, etc., as necessary to support the development of the digital data base. MDSP plans to continue this program for several more years.

In January 1975, 26 cartographic personnel were transferred from MDSP to the Marine Chart Division. The transfer of positions and corresponding funding is part of the planned transition of the "automated" system to the line organizations of NOS. As part of this overall transition effort, the Marine Chart Division will initiate a major reorganization in FY 1976 in order to facilitate the adaptation of computer-assisted technology and the changing pattern of personnel duties and workloads.

b. Training. MDSP continued to support HYDROPLOT training programs at AMC, PMC and LSC. Although this effort will be transitioned to OFO during FY 1976, MDSP will provide video tape facilities on a cooperative basis until OFO can procure the necessary equipment.

MDSP provided funding for the Marine Chart Division to rejuvenate its after-hours education program. MDSP will provide continuing support of this effort in order to encourage existing cartographic personnel to acquire the additional skills in computer technology, cartography and management essential to the successful implementation of the computer-supported nautical charting system.

c. Liaison. A series of monthly seminars was initiated by MDSP in January 1975, to facilitate communication and liaison with the line elements of NOS. Each office within NOS has been represented at these seminars and, in most cases, has made a presentation of its own efforts or problems in implementing automated technology. The objective of these

seminars is to establish an open exchange of ideas at the working level to enhance developmental efforts and avoid redundancy.

Aeronautical Chart Automation Project (ACAP). In December 1973, a Task Group for Automated Production of Aeronautical Charts was established by the Director, NOS, under the authorization and approval of the Associate Administrator of the National Oceanic and Atmospheric Administration, to review and evaluate the current status of aeronautical charting automation planning and prepare a Program Development Plan for automated production of aeronautical charts. The resulting report, "Aeronautical Charting Automation: A Program Development Plan," June 1974, recommended the establishment of the Aeronautical Chart Automation Project (ACAP) under CAPO.

The recommendations of the Task Group were approved, and ACAP was established in July 1974, to design, develop, and implement a system for automating the production of aeronautical charts. Mr. Friason G. Travis was selected as the manager of this project.

The Program Development Plan, through extensive review and analysis, has been subdivided into four subordinate tasks as follows:

1. Implementing of an integrated NOS operational system for aeronautical chart data acquisition, processing, and publication, December 1978.

2. Implementing an operational system for automated aeronautical chart compilation and reviewing, December 1978.

3. Implementing an operational system for automated production of separation overlays ready for printing, December 1978.

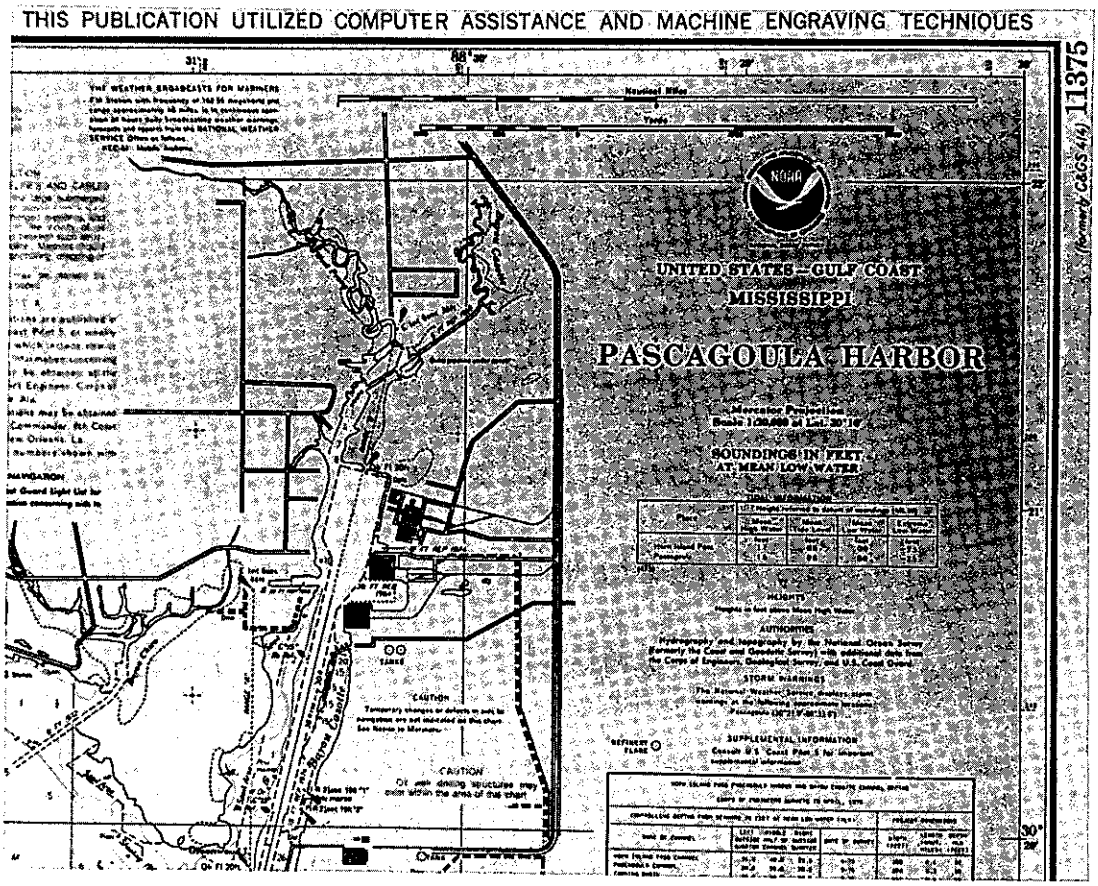
4. Implementing an integrated NOS Aeronautical Chart Automated Production System and Management Techniques by September 1979.

ACAP proposes to utilize contractual computer services as the major resource. However, to insure that each subsystem evolving from contractual agreements is developed as an integral part of the total system concept, ACAP will utilize its limited in-house resources to develop and test prototype designs in support of the Program Plan.

1. Contractual Services. Under the NOAA procurement procedures, an RFP for a "Two-Phased Contract to Develop System Design and Implementation Specifications for an Automated Aeronautical Charting Production System," was advertised in the Commerce Business Daily on April 25, 1975. ADL Systems, Inc., was the successful bidder and the contract was awarded on June 25, 1975. ADL Systems is a subsidiary company of Arthur D. Little, Inc.

2. Prototype Development. The ACAP automation team, comprising cartographers, physical scientists, computer specialists, and system analysts, has been exposed to an extensive orientation/training program since April 1975. The program was designed to establish a common threshold of understanding the National Aviation System, the aeronautical charting

processes, the missions of various federal offices that contribute to the safety of air commerce, and those many processes for supplying aeronautical information to the controllers and users of the National Airspace System. In the process ACAP has visited many government facilities, attended briefings and seminars, reviewed charting requirements and specifications, and investigated existing NOAA hardware and software applicable to ACAP needs. To extend ACAP's understanding, the airspace of the State of Hawaii and adjacent water areas has been isolated and selected as a self-contained model for the development of various prototypes. Aeronautical data files with the associated data elements are being identified and developed. An in-house data management system is being developed for processing the data to support experimentation. The technical and statistical data derived from the models will be used to assess and manage the overall program plan.



4. First Automated Nautical Chart

OFFICE OF THE NATIONAL GEODETIC SURVEY

The Office of the National Geodetic Survey (NGS) is responsible for the mathematical study of the size and figure of the earth, and for the development of geodetic control surveys. Its activities include the determination of extremely precise geographic positions, known as longitude and latitude, the establishment of accurate elevations of marked points, gravity and geodetic astronomic determinations, crustal movement studies, and geodetic marker maintenance.

The average personnel of NGS was 336, including 11 commissioned officers; an average of 159 were in the office and 177 in the field, including the Instrument Support Unit and the Observatories. The Control Network Division moved from the Washington Science Center to the Rockwall Building near the end of the fiscal year.

Vertical Network

Leveling by NGS totaled 3,345 kilometers of first-order and 125 kilometers of second-order, on which 1,757 new bench marks were set.

Leveling by other organizations (state highway departments, state geodetic surveys, local governmental units, etc.) computed and adjusted into the National Geodetic Vertical Control Network totaled 1,966 kilometers of second-order.

Major conventional projects included first-order releveling as follows:

1. 364 kilometers along the Hudson River from Saratoga Springs to New York City.

2. 135 kilometers from Sandy Hook, New Jersey, to Philadelphia, Pennsylvania.

3. 592 kilometers from Charleston, South Carolina, via Savannah, Georgia, to St. Augustine, Florida.

4. 568 kilometers in the northwest portion of the State of Washington.

5. 307 kilometers in California, from San Francisco to Oakland, thence following the California Aqueduct to San Luis Dam.

Special survey projects included a survey of Oregon Inlet and the adjacent waters of Pamlico Sound, North Carolina, made in support of a coastal mapping project. The Zeiss valley-crossing instrumentation was used to form a network of height differences extending out several kilometers over water. The longest water crossing was 1.81 kilometers. Four circuits were formed; the largest misclosure was 7.6 mm.

Special investigations were accomplished as follows:

1. Plans for the creation of the vertical portion of the NGS Data Base were finalized. The plan, which defines content and formats, is documented in a report entitled, "Input Formats and Specifications, National Geodetic Survey Data Base."

2. Two new mathematical models were developed for the purpose of generalizing the adjustment of leveling data. The new methods allow combination of old and new measurements in areas affected by crustal movements, and for each junction point yield a height which corresponds to a particular point in time as well as a velocity of height change.

3. Cornell University engaged in a cooperative effort with the Vertical Network Branch to process a crustal movement profile library. Approximately 133 new profiles have been processed by Cornell and added to the library.

Horizontal Network

After more than a decade of continuous effort, the High Precision Traverses are nearing completion. The remaining segment of about 700 kilometers in northern Michigan will be observed in Fiscal Year 1976. This survey, undoubtedly the most accurate attempted to date, is approximately 22,000 kilometers in length. It will serve as the base for the National Horizontal Control Network and as a fundamental standard to which other surveying systems will be calibrated. Future reobservations of this framework are certain to provide a myriad of information far beyond the expectations of the original project. A spur line along the United States-Mexico boundary in southern California, established to High Precision Traverse specifications, will be completed in the next fiscal year.

In support of the New Adjustment, the New Datum Sections processed data for about 45,000 stations comprising 530 surveys. To test the consistency of the procedures, as practiced in the New Datum Sections, a block of 18 projects containing about 1,400 stations was adjusted in simultaneous computation with no difficulties experienced.

A second evaluation of a network scaled and oriented by Doppler-derived data was made for a multi-project system in North Carolina, South Carolina, and Georgia. The results were similar to those obtained earlier and again indicate that the framework of Doppler-determined positions will significantly strengthen the overall network.

Data for 4,382 stations determined from the adjustments of 48 projects were added to the published files. Among the major surveys completed were urban networks for the metropolitan Washington, D.C. area, and for Pinellas County, Florida. A very large multi-network system in southwestern Kansas and northwestern Oklahoma was adjusted in a single computation. Several first-order traverses in South Carolina were processed.

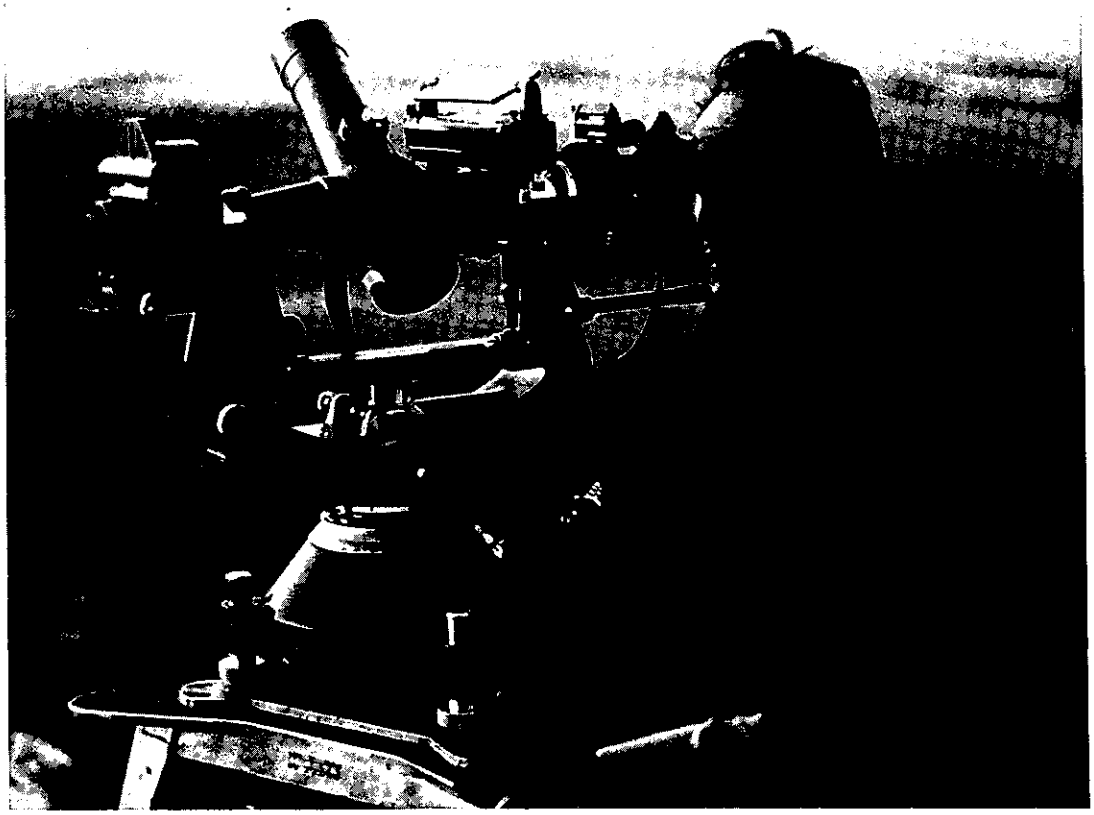
A program to observe arcs of triangulation, traverse, and trilateration in those parts of the network requiring framework strengthening has been instituted. This program also includes provisions for astronomic observations and the measurement of base lines where evaluations indicate additional scale and orientation are required. To this end, several first-order traverses in New Mexico and Texas have been completed, and a first-order, north-south arc of triangulation extending from Pennsylvania through Maryland to West Virginia (complemented with east-west, first-order traverses) is underway.

First-order cooperative surveys are continuing in Connecticut and Georgia. Surveys are in progress in Maine under an arrangement calling for a limited number of NGS field personnel complemented by a much larger group of Maine Department of Transportation employees. Surveys to replace missing or displaced monuments on the north-south section of the Mason-Dixon Line dividing Delaware and Maryland have been completed, and plans are being instituted to locate monuments at one-mile intervals along the Delaware-Maryland east-west boundary. Resurveys to study crustal movement at TEJON RANCH and MEADE sites straddling the San Andreas Fault were completed. Trilateration, with horizontal directions observed only at stations where astronomic azimuth observations were made, was utilized for the first time.

Special surveys were carried out for the Department of Defense (DOD) at Holloman Air Force Base, New Mexico; Dahlgren, Virginia; and Charleston, South Carolina. The survey at Holloman Air Force Base is of particular interest because accuracy requirements specified that the lengths of individual sections of the High Speed Track were not to be in error by more than one millimeter. Cooperative surveys are underway in support of the Bureau of Land Management (BLM) program in Alaska. New microwave distance measuring equipment and pole signals specifically designed to elevate the antennae of the instruments are being employed.

The cooperative program to establish base lines for calibrating electronic distance measuring equipment continued. Base lines were measured in Florida, Kentucky, Louisiana, Maine, Michigan, New York, North Carolina, Utah, and Guam.

The policy to adjust accomplished surveys to National Network standards remained unchanged. Surveys which met these standards and have been accepted were accomplished by: U.S. Geological Survey, the Transportation Departments of the States of Arizona, California, Florida, Georgia, Louisiana, Minnesota, and New Mexico; North Carolina Geodetic Survey; Erie, Monroe and Saratoga Counties, New York; several counties in the Willamette Valley of Oregon; Salt Lake County, Utah; and King County, Washington.



5. T-4 Theodolite

Gravity and Astronomy

Gravity Observations. From July 1, 1974, to March 1975, the gravity party observed over level lines in southern California. Most of this work involved reobservations providing information on gravity changes associated with land subsidence. In March 1975, special gravity observations were conducted at the Jet Propulsion Laboratory in Pasadena, California, in conjunction with Very Long Base Line Interferometry (VLBI) measurements. In April 1975, the party began reobserving the U.S. Gravity Base Network. By June 30, 1975, the eastern portion of this network, consisting of lines from Washington, D.C., to Miami, Florida; Washington, D.C., to Bangor, Maine; Washington, D.C., to Atlanta, Georgia, continuing to Detroit, Michigan; and Syracuse, New York, to Duluth, Minnesota, had been completed.

Gravity Reductions and Geoid Studies. With the addition of 400 new astrogeodetic deflection stations, a new geoid for the United States has been produced. For the total of 3,000 stations added, a map is being drafted with a contour interval of one meter.

Approximately 43,000 stations were added to the automated U.S. Land Gravity Data Bank, making a total of about 350,000 stations. The entire data bank, or any portion of it, is supplied upon request to the public at a nominal fee.

Geodetic Astronomy. Two units have been in the field throughout the year. Two new digital printers, purchased as replacements for the chronographic systems now in use, are currently undergoing field tests by the astronomic field parties.

Astronomic positions for Laplace control, covering approximately 1,300 kilometers of the high precision traverse, were observed during the year. In addition, positions for Laplace control of cooperative projects in New York, Louisiana, Kansas, and Connecticut were completed. A total of 99 positions and 69 azimuths were determined.

Astronomic Computations. Astronomic data processing has remained current with field work during the year. Modifications continue for maintaining optimum flexibility in data processing for CDC 6600 latitude and longitude programs. An investigation into reductions required for placing all NGS longitudes on a common reference system has been completed.

Variation of Latitude. The variation-of-latitude observatories at Ukiah, California, and Gaithersburg, Maryland, continued throughout the year. At Ukiah, 3,148 star pairs were observed, with 2,991 star pairs observed at Gaithersburg. Latitude observing records were transmitted weekly to the Central Bureau of the International Polar Motion Service in Misuzawa, Japan.

Satellite & Marine Applications

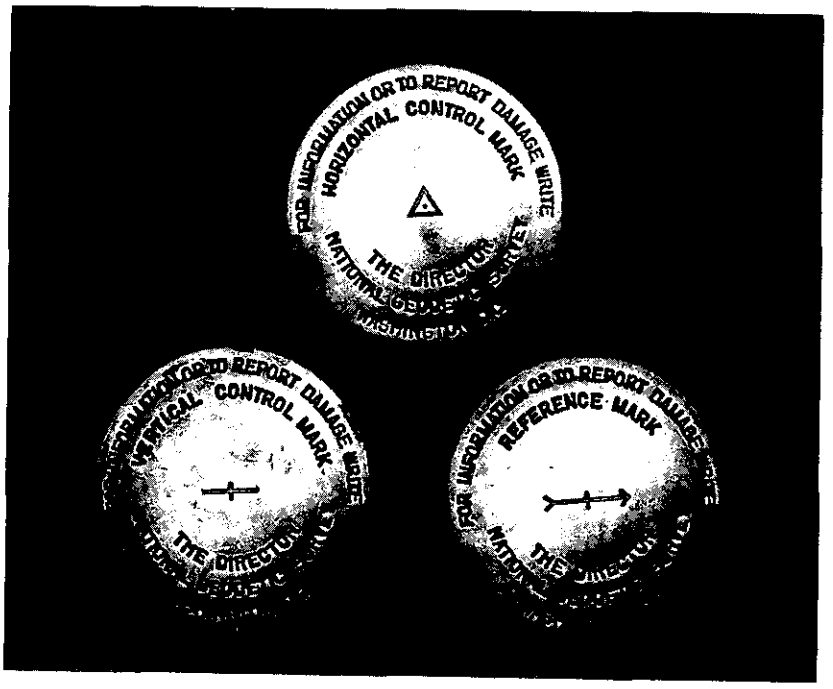
Doppler satellite observations were obtained at 71 stations throughout the United States, including 33 stations along the Transcontinental Traverse. Six stations were located near the Alaskan Cook Inlet in support of the pre- and post-earthquake horizontal control adjustment. Ten stations were located in the offshore oil platforms in the Gulf of Mexico for the purpose of extending the offshore horizontal control network.

Observations for 23 Doppler stations in Alaska, established by the Bureau of Land Management, were reduced and transformed to NAD 1927 positions.

Extensive evaluations of the Doppler point positioning accuracy and error sources associated with Doppler positioning were conducted.

Network Maintenance

The maintenance of the horizontal and vertical control network is presently being done by 15 full-time field engineers and three state geodetic advisors. This maintenance team regularly recovers or resets markers in danger of being disturbed, and promotes assistance from private surveyors and state and local governments through personal contact and attending surveyors' state conventions. Maintenance personnel participate in special tasks such as selecting sites, and assist in establishing calibration base lines for Electronic Distance Measuring Instruments, establishing control points at colleges, inspecting control being established by states, and training state personnel on geodetic procedures.



6. Newest Geodetic Markers

There were 1,006 vertical control marks and 1,295 horizontal control stations visited and found in good condition by maintenance personnel. A total of 759 were preserved or relocated. This total includes 406 vertical control marks and 353 horizontal control stations. In addition, 116 vertical control marks were reset by private, state and county engineers.

The National Geodetic Survey received and processed 13,000 "Report on Condition of Survey Mark" cards. This total includes 9,000 vertical control markers requiring 5 percent maintenance, and 4,000 horizontal control markers requiring 25 percent maintenance.

During the period, 6,402 witness signs and 3,847 posts were issued to private surveyors to be set near our horizontal and vertical control points.

Adjustment of the North American Horizontal Datum

The New Adjustment of the North American Horizontal Datum has begun and the adjustment will place every country from Denmark (Greenland) to Panama on the same datum.

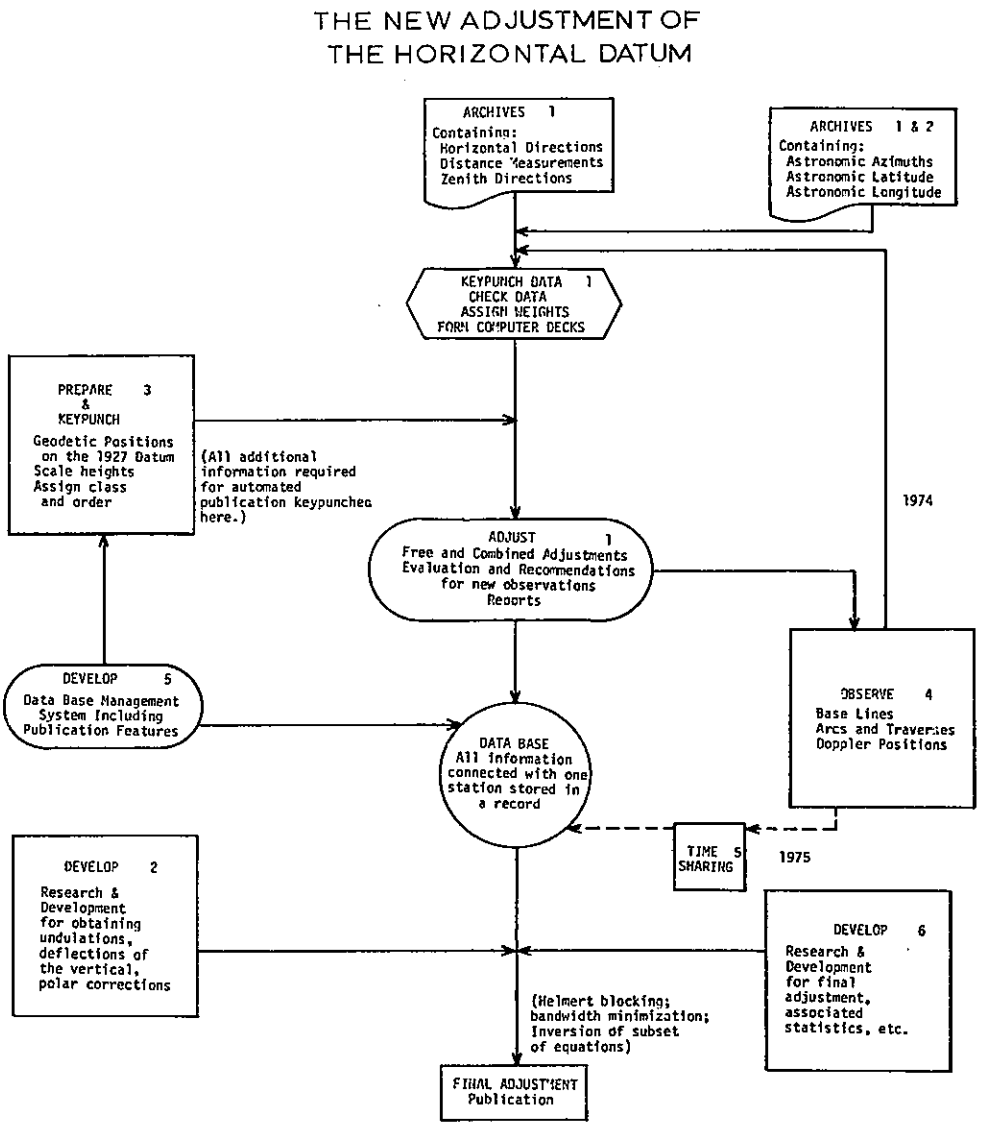
The bulk of the effort is in converting historical data into computer-readable form. The NGS has keypunched to date all information necessary for automated publication of the horizontal control (except the information describing the stations) for about 185,000 points, representing all published points in the NGS data base. A subset of this data file includes the geodetic position, elevation and approximate accuracy of these control points used in preliminary adjustments. The NGS astronomic data file, including astronomic latitude, longitude, and azimuth, have been completely keypunched, and an associated absolute error budget for these parameters is completed. Free and combined adjustments of 45,000 points have been evaluated by making "free" and combined adjustments of each field project. Additional base lines and azimuths have been recommended and are being observed for the purpose of strengthening the network.

The first version of the data base management system necessary to support the tremendous data manipulation associated with the adjustment is scheduled for completion in December 1975. The data base file is station-oriented, meaning that all the associated information (observations, descriptions, recovery notes, etc.) is filed with the station name and position. The data base management system has been written for the IBM 360/195 and will, eventually, serve the needs of all of the National Geodetic Survey.

The method of adjusting the data has been selected, and plans are to solve for the 500,000 unknowns by partitioning the equations into blocks of approximately 1,000 stations (2,000 unknowns). The Canadian and Danish Governments have agreed to this approach.

In addition to placing existing classic (triangulation) observational data in computer-readable form, Denmark is charged with the task of extending the geoid from Canada to Greenland. Denmark is also evaluating the HIRAN control tying Canada to Denmark. Mexico and the Central American countries have their data in computer-readable form and have agreed to join in the adjustment. The "NAD 1983" will undoubtedly be earth centered and on a new reference ellipsoid which will, hopefully, be adopted by the International Association of Geodesy in 1979.

Since the beginning of the project in July 1974, the Defense Mapping Agency (DMA), Department of Defense, has been represented in the New Adjustment of the North American Datum. This representation is made possible with one member of the DMA assigned to the National Geodetic Survey for a six-month period continuously throughout the adjustment. This liaison has resulted in several decisions on the part of NGS (for instance, to compute certain accuracies) which would not have resulted otherwise. In addition, DMA personnel have contributed to the overall quality and usefulness of the new adjustment.



Performed by:

1. The New Datum Section of the Horizontal Branch
2. Gravity, Astronomy and Satellite Branch
3. The National Geodetic Survey Information Center
4. Operations Division
5. Systems Development Division
6. Geodetic Research and Development Laboratory

FIGURE 1

7. Diagram of New Adjustment of Horizontal Datum

Systems Development

The Systems Development Division (SDD) expended most of its resources to the development of the Geodetic Data Base Management System (GDBMS). Major components of the subsystems have been completed and loaded into the GDBMS library. A test area was designated, and horizontal position data were loaded into the geodetic data base for 1,166 stations. The system testing of this preliminary version of the GDBMS has been initiated. Members of the SDD presented the design characteristics of the GDBMS at the joint session of the Photogrammetric Survey Division and Cartography Division of the American Society of Photogrammetry - American Congress on Surveying and Mapping Convention.

The SDD actively supported the North American Datum adjustment project. A Horizontal Adjustment Program was designed, coded, tested and submitted for production.

Members of the SDD have written numerous application programs for the editing and preprocessing of geodetic position information, for the formatting of vertical observations, and for the calculation of the geoid from terrestrial gravity anomalies. The content of vertical data base records was defined, and specifications accepted by the Vertical Network Branch.

Significant effort was devoted to the automation of geodetic field operations. The devised system employs remote computer terminals for data transmission at field sites. The system, when operational, will provide quality control for observations prior to entry into the data base.

SDD assumed responsibility for the establishment and maintenance of program libraries, and provides technical consultations and operational assistance in computer utilization matters to all NGS components.

Geodetic Instrumentation and Equipment

Twelve technicians were utilized to test, evaluate, repair, calibrate, and perform preventive maintenance on all types of geodetic equipment.

The following equipment has been designed and fabricated at Corbin, Virginia:

1. Truck-mounted portable observing tower.

2. 10 milliwatt long-range laser distant measuring instrument.

3. Calibration cap for the Hewlett-Packward distant measuring instrument to increase accuracy and dependability.

4. Portable, lightweight telescopic pole tower.

5. Modernization of the MRA5 tellurometer to be used on the pole tower.

6. Aluminum carrying cases for level rods.

7. Short-range Electronics Distant Measuring Instrument (EDMI) offset bar.
8. Azimuth timing modules.

9. Pek towers.

Research & Development Laboratory

Work on the Selenocentric Reference System project under contract with the NASA Johnson Space Center was completed. A simultaneous adjustment was carried out of all useable photography from the Apollo 15, 16, and 17 missions, consisting of 1,244 photographs. The positions of 5,325 lunar surface features were determined to within an error or less than 45 meters in both horizontal position and elevation for more than 90 percent of the points.

Utilizing 419 satellite events, totalling 966 BC-4 plates, the reduction of the 23 stations of the North American densification network was completed. The average standard deviation per station coordinate was less than three meters.

Work continued on the preparation of computer programs for the analysis of altimetry data from the GEOS-3 satellite. For this purpose, a new comprehensive orbital program and accompanying orbital error analysis program were installed on the IBM 360/195 computer. A formula was designed for the determination of a simple density layer from geoid heights, enabling the program to convert altimetry into the parametric form utilized in previous solutions for the gravitational field. Work was begun on analyzing the problems involved in obtaining sufficiently accurate orbits for the forthcoming (1978) SEASAT satellite, which is expected to carry an altimeter with a ten cm precision.

Altimeter data obtained in 1973 from the Skylab satellite have been used to evaluate global geoids, and have shown that current satellite-based geoids are reliable only to the eighth degree and below.

M2 ocean tide effects of 0".05 on the inclination of GEOS-2 have been observed. The accuracy of this determination is adequate to verify the location of important amphidromes.

In connection with the adjustment of the North American Datum, progress was made in optimizing the program for reduction, solution, and inversion of the large, sparse matrices involved, and in the associated error propagation.

Studies were initiated in the consideration of new observational methods for more accurate determination of geodetic control, and for temporal variations in horizontal and vertical positions, pole location, and earth rotation. These methods include radio interferometry, lunar laser ranging, and laser ranging to satellites (in particular, the LAGEOS satellite, planned for launch in early 1976).

Theoretical research was carried out in a number of fields. A method of modified arithmetic has been developed which expedites various mathematical operations, with particular application to computer programs. The statistical techniques of Model II analysis of variance were applied to the evaluation of accuracy of astronomic observations. A method of generation of exact equal-area blocks on both a sphere and spheriod was developed and programmed.

Geodetic Information

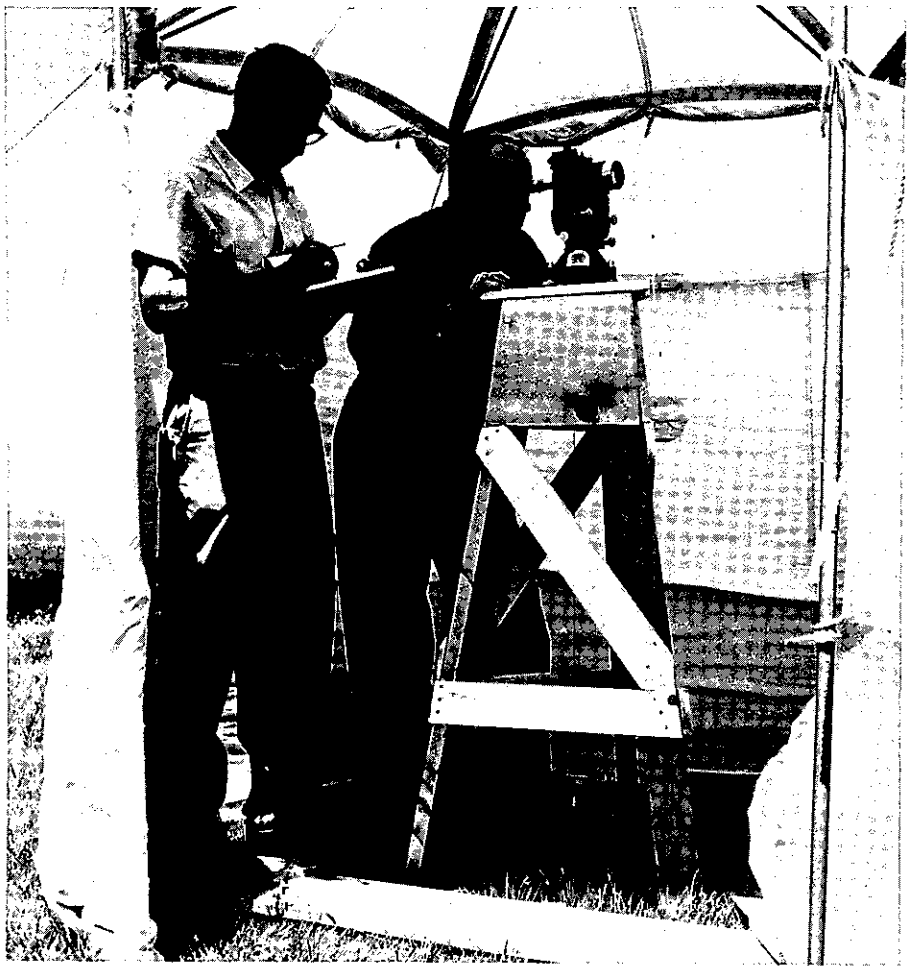
The National Geodetic Survey Information Center (NGSIC) is responsible for the preparation, publication, and dissemination of horizontal and vertical control data of the National Ocean Survey, and that of other federal agencies, and state and local governments which have been incorporated into the national networks. To provide pictorial and working references to these networks, various series of control diagrams are also prepared, maintained, and disseminated. During the fiscal year, approximately 15,000 units (1.5 million sheets) of data were mailed in response to requests. As part of the ongoing project to educate and inform the user community of the availability and types of data, a project was completed involving the mailing of questionnaires and information packets to all registered land surveyors in the United States. This involved approximately 37,000 mailings. As a result of this and similar programs within NGS, subscribers to the automatic mailing list for data continue to grow, with an increase of seven percent during the reporting period. Approximately 13,000 reports on the condition of control points were received from other than NGS sources, providing significant information to the mark preservation program and all other programs related to the maintenance of the national networks.

Major advancements in applying data processing techniques and procedures were accomplished. Foremost of these was the placing of positional data for all horizontal control stations in the national network in machine-readable form. This achievement met the original five-year milestone for the New Horizontal Adjustment and greatly enhanced the value of these data. It is now suitable for use as input to various automated programs used throughout the surveying and mapping community, enabling computer reordering of the data to meet specific requirements and enabling ongoing products to be produced in a more efficient and cost-effective manner. Work began on placing in machine-readable form the descriptive data associated with these positions.

Chapters involving horizontal and vertical observational, positional and descriptive data were prepared for a publication entitled "Input Formats and Specifications: National Geodetic Survey Data Base." To provide the fullest possible service to the surveying and mapping community, it is desirable that geodetic holdings of other organizations be furnished to NGS in an automated form suitable for inclusion in the NGS Data Base. The purpose of this publication is to provide the required formats and keying instructions for standardizing the data from various organizations into the format acceptable as direct input to the NGS system. As this publication is the first step toward a National Geodetic Data Center, the benefits to the user are immeasurable. All available data for areas of

interest may be obtained, and contacting of numerous organizations can be eliminated. The first agreement utilizing this publication is with the U.S. Geological Survey, and will result in the submission of their data to the present holdings of this organization.

Efforts continued in the Vertical Branch throughout the reporting period to automate positional and descriptive data. Such data were placed in digital form for approximately 18,000 bench marks. Working in conjunction with the Vertical Branch, the Cartographic Branch assisted in a study for obtaining the most efficient and accurate method of determining latitudes and longitudes for all vertical control points in the United States. The Cartographic Branch determined elevations from various map sources for horizontal control stations being placed in a digital form. In addition to performing manual revisions and preparing various diagrams for reprint, 30-minute vertical diagrams required for publication with such data were prepared using totally automated techniques. This approach will be pursued in the future and will hopefully lead to a totally cartographic operation.



8. Horizontal Observations Over MEADE'S RANCH

TABULATION OF GEODETIC FIELD WORK

Vertical Control

	Kilometers 1st-Order	Kilometers 2nd-Order	New Bench Marks
NGS	3,345	125	1,757
Other Organizations	0	1,966	7,649
Total	3,345	2,091	9,406

Horizontal Control

State	Marked Stations FY 75	Intersection Stations	Total Stations to June 30, 1975
Alaska	129	18	22,031
Hawaii	17		2,057
Puerto Rico			1,489
Guam			133
Conterminous U.S.	3,360	458	180,627
Samoa			121
Wake Island			1
Total	3,776	476	206,459

Summary of Geodetic Field Operations

	FY 75	Total Stations to June 30, 1975
Horizontal Control Stations	4,252	206,459
Bench Marks	9,406	447,131
Precise Traverse (kilometers)	2,124	20,524
Latitude Stations	99	3,600
Longitude Stations	99	3,402
Azimuth Stations	69	2,964

OFFICE OF MARINE SURVEYS AND MAPS

The Office of Marine Surveys and Maps serves as the focal point for planning, management and development of the land, estuarine and shelf resources of the nation's coastal zone, through the construction, updated maintenance and availability of accurate surveys, maps and nautical charts. It is responsible for the analysis and dissemination of data collected within the two-and-one-half million square miles of NOS charting responsibility. This area covers the coastal marine environments of the conterminous United States, including the Great Lakes, Alaska, Hawaii, U.S. Virgin Islands, Puerto Rico, and islands in the Pacific Ocean.

The Southern Coastal Plains Expedition (SCOPE) project, a multifaceted two-year investigation of the waters extending from Cape Hatteras to Cape Canaveral and offshore to the 100-fathom depth curve, was successfully completed during the year.

Commander Donald R. Tibbit, Deputy Associate Director, was presented with a Department of Commerce Silver Medal in recognition of his outstanding leadership in the development and coordination of the SCOPE project.

The tide and tidal current survey in Cook Inlet has proceeded at a tremendously successful rate. It is anticipated now that the proposed five-year project will be completed in three years. This reduction has been attributed to the outstanding performance of the Aanderaa Current Survey System and the capability and organization of the NOAA Ship McARTHUR. In recognition of the McARTHUR's achievements, the ship was presented the KARO AWARD for 1975.

The Environmental Project Office was established within the Office of Marine Surveys and Maps to coordinate all environmental assessment and monitoring activities within NOS.

A new edition of the "Boston Harbor Tidal Current Charts" was published based on data from 1971 tidal current surveys.

The Chart Adequacy Survey (CAS) concept was implemented during the year. The surveys on the California coast and in the Florida Keys indicate that this concept furnishes an excellent opportunity to contact the maritime public and is an effective means of establishing and justifying the NOS plan for survey and chart production.

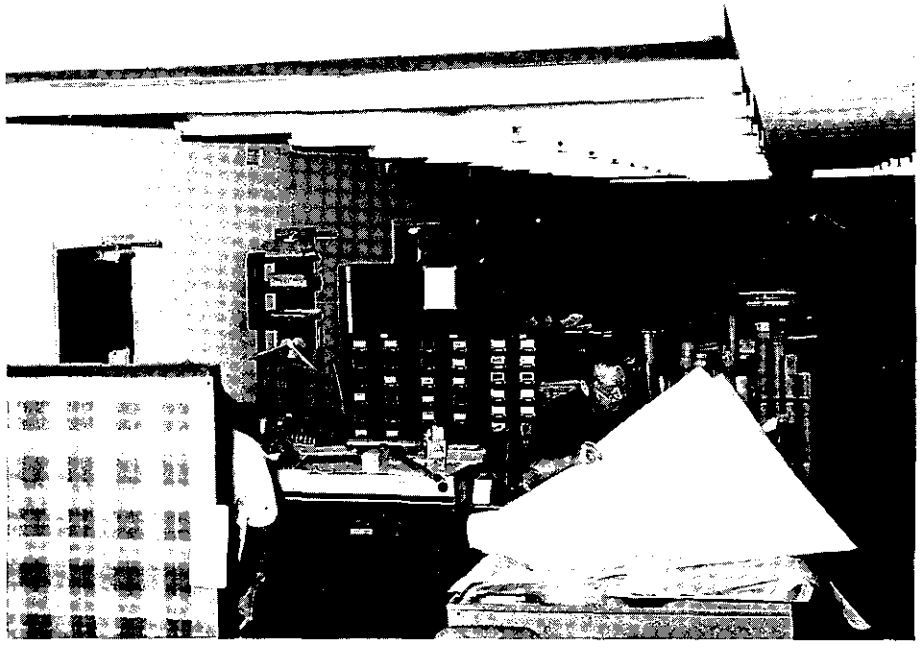
The new chart numbering system, developed in cooperation with the Defense Mapping Agency Hydrographic Center (DMAHC), was initiated to bring all United States nautical charts (DMAHC and NOS produced) under a unified national system. The new numbers have been applied to more than half of the NOS charts.

New traffic separation schemes were added to charts in Prince William Sound, Alaska, and the Strait of Juan de Fuca, Washington.

LORAN-C lattices were added to six charts and LORAN-A lattices were added to 18 coast charts in response to Coast Guard recommendations.

Marine Charting Accomplishments

Nautical Charting. An analysis of chart coverage and revision schedules was continued. This study has led to the cancellation of seven charts through the addition of three insets, and modification of the limits of one chart to provide adequate coverage. Further results of the study have been an extension of the revision schedules for a number of charts having a low rate of corrections. The study will continue in FY 1976.



9. Marine Chart Compilation Section

The compilation of the first two of the NOS commitment for international charts was completed, with printing and issue scheduled for early FY 1976.

The Cooperative Charting Program showed continued growth. In addition to individual reporting, special volunteer investigations were conducted by 16 U.S. Power Squadrons (USPS) districts and seven U.S. Coast Guard

Auxiliary (USCGAUX) districts. Overall, 31 USPS districts and 12 USCGAUX districts participated in the program, with a total of 21,794 corrective units credited to the voluntary observers. In addition to monitoring NOS nautical charts, the cooperative charting participants form a knowledgeable and readily accessible group for testing user reaction to proposed changes in chart format or content.

Computer-Assisted Charting. The joint Marine Chart Division/Marine Data Systems Project (MCD/MDSP) effort for the development of computer-assisted chart production continued to gain momentum. Twenty-three additional employees were hired by MDSP, and subsequently transferred to the MCD for this activity.

1. Geographic Area Team 4, Gulf Coast, began the implementation of computer-assisted techniques as operational tools in continual chart maintenance.

2. Geographic Area Team 3 achieved continual maintenance status, in the manual mode, for 66 percent of the 108 charts in its area.

3. The base plates (landmarks, fixed aids, etc.) were completed for the Gulf coast and are being maintained by Team 4.

4. Digital subject files for oil wells, pipelines, mineral leasing, and channel tabulations in Area 4 are being maintained by Team 4 and utilized for chart maintenance.

5. Team 8 took over the automated plotting of all channel tabulations in support of notice to mariners action and chart maintenance.

Hydrographic Survey Processing. Hydrographic survey review output increased by 32 (more than 50 percent) over FY 1974 and by 43 (almost 90 percent) over FY 1973, reflecting the growing competence of the reviewers in training, as well as a net gain of two reviewers during this year.

Modified review procedures to decrease the time required for some review operations while maintaining the basic quality control standards were adopted in April. These procedures, with the continuing development of the review capability, are expected to result in further growth of review output during FY 1976.

Coast Pilots. Arrangements have been made with NOS flight missions to obtain suitable photographs to supplement the Coast Pilots.

Field inspection for the revision of Coast Pilot 4, Cape Henry to Key West, was begun.

Technical assistance was furnished to Lake Survey Center (LSC) in connection with plans for automated photocomposition of the Great Lakes Pilot.

Bathymetric Mapping. Ten bathymetric maps were produced under a reimbursable program with Bureau of Land Management (BLM).

Bathymetric compilations, including NOS shoreline, were completed for two prototype Coastal Zone Management maps. One map, scale 1:10,000, combines the Florida boundary mapping output with NOS bathymetry. The other is joint NOS-Geological Survey (GS) effort to combine 1:24,000 GS topography with NOS shoreline and bathymetry.

Arrangements are also underway for NOS-GS cooperation for combining the 1:250,000 NOS bathymetric mapping being done for BLM with the GS 1:250,000 topographic series. An example of this product is the 1:250,000 experimental bathymetric/topographic map, Beaufort, North Carolina, printed in FY 1975.

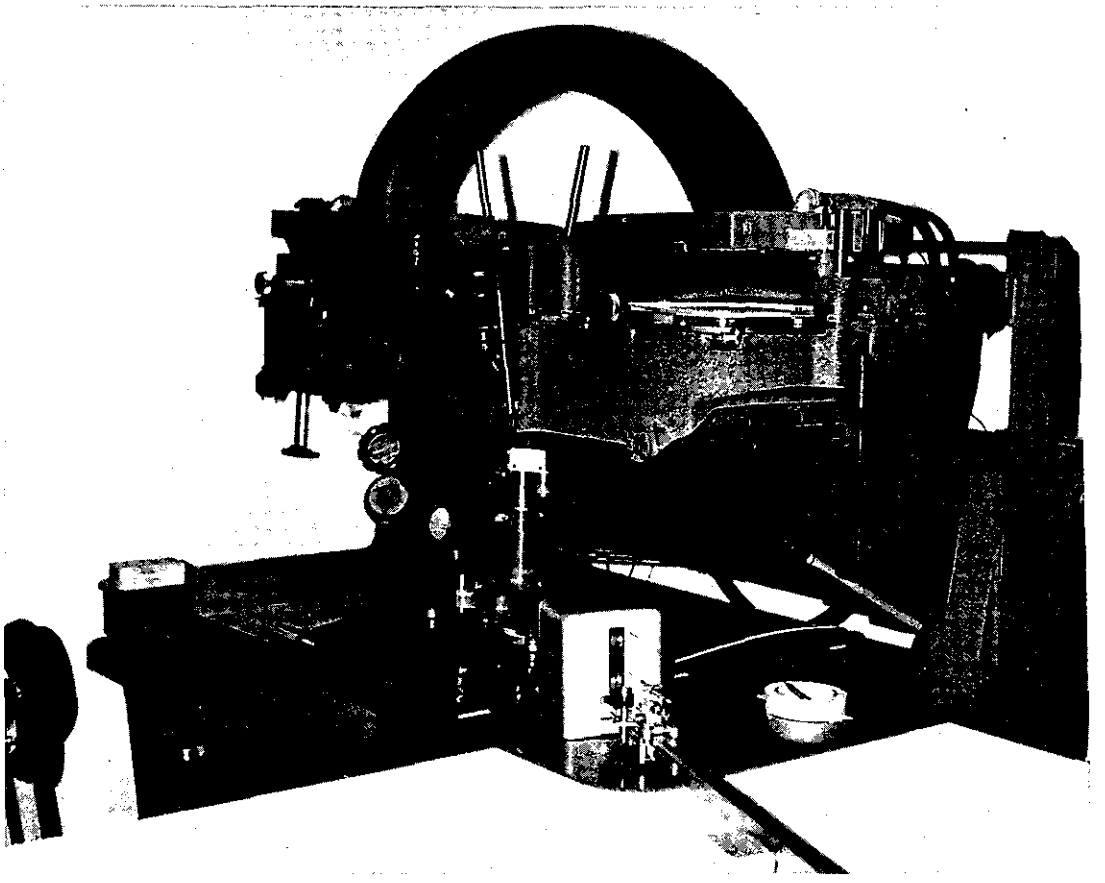
Statistics

New Special-purpose Nautical Charts	2
Reconstructed Conventional Nautical Charts	3*
Maintained Conventional Nautical Charts	439
Reconstructed Small-craft Nautical Charts	1**
Maintained Small-craft Nautical Charts	83
Articles Published in Notices to Mariners	2,227
Chartlets Published in Notices to Mariners	72
Surveys from non-NOS Processed	3,003
Hydrographic Survey Verified	20***
Hydrographic Survey Reviewed	92
Hydrographic Survey Registered	105
Copies, Hydrographic/Topographic Surveys Disseminated	1,962
Coast Pilots-New Editions	6
Coast Pilots-Supplements	2
Bathymetric Maps	10

* Two with orthophoto topography
** Utilized computer-assisted techniques
*** Rockville only (57 by AMC, 55 by PMC)

Coastal Mapping Accomplishments

About 9,000 linear miles of metric aerial photography were flown by the two NOAA photographic missions. A newly leased Turbo-Commander 690A was operated by Mission 2 during this fiscal year. Field survey units were assigned to various coastal mapping jobs and approximately 125 maps were compiled for the marine charting program and in support of hydrographic operations. Aproximately 3,400 corrections were applied to 148 nautical charts.

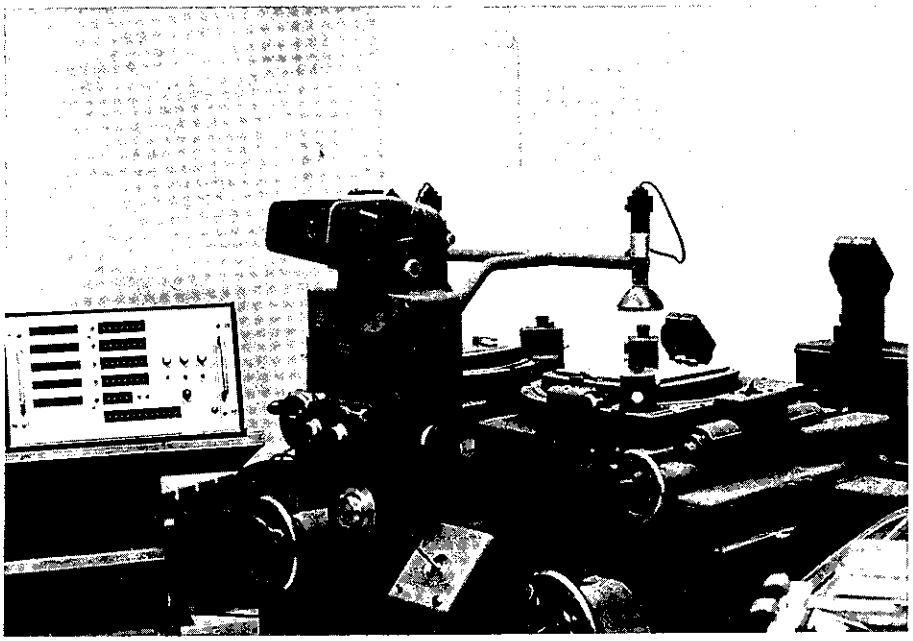


10. B-8 Stereo Plotter

Photographic Research and Development. Research and development activities were mainly concentrated in the areas of precision numerical photogrammetry and automation of the photogrammetric processes. Emphasis was placed on the development of computer software in support of a total program development to produce ground positions having conventional geodetic accuracies. In addition, the mensuration capability of the Coastal Mapping Division was updated with the procurement of state-of-the-art hardware. Development continued in the area of sensor calibration by stellar and airborne techniques, and new efforts have been initiated for the partial automation of photogrammetric bathymetry.

Coastal Boundary Mapping Program. Operations continued on a cooperative program with the State of Florida to map the mean high- and mean low-water lines along the Florida coast. Twenty new maps were issued during the fiscal year; 54 maps in the series are now available. Tide-coordinated aerial photography was completed through the Keys, and the tidal datums to control proposed photography on the west coast of Florida are in the process of being determined.

Airport Obstruction Program. Field surveys for 145 airports were completed for the Federal Aviation Administration (FAA), and obstruction charts were compiled and published for 140 airports. Additional efforts were required to accurately locate 125 instrument landing facilities and 37 radar navigational facilities. An investigative study for automating and digitizing obstruction data was made for the FAA Flight Facility in Oklahoma City. This will result in a much expanded area for the airport site.



11. STK and Data Logger

Photogrammetric Bathymetry. Photogrammetric bathymetry was completed on seven maps at Beaufort Inlet, North Carolina, and compilation of six photobathymetric maps at Oregon Inlet, North Carolina, was begun. Photogrammetric contouring, utilizing photography taken just prior to flooding of the Lower Granite Pool of the Snake River, Washington/Idaho, was started on ten maps. These contours will be mapped as depth curves, obviating the need for hydrography after the pool is filled.

Storm Evacuation Mapping. Nine new National Ocean Survey/National Weather Service storm evacuation maps in the areas of Long Island, New York, New Orleans, Louisiana, and the Mississippi River Delta were issued; 42 maps are now available. Second editions of six maps in the Galveston-Houston, Texas, area reflecting land subsidence to 1973 were also published.

Flood Insurance Mapping. Special flood study reports and 300 map plates for 18 communities were delivered to Housing and Urban Development's (HUD) Federal Insurance Administration as part of the reimbursable Coastal

Inundation Mapping Program. NOS participation in this program is in the process of being phased out. No new studies were undertaken, but efforts have been accelerated to complete the studies now in production with new, more stringent guidelines.

Oceanographic Accomplishments

The tide and tidal current survey of Cook Inlet, Alaska, continued with the anticipated completion of the data acquisition phase by September 1975. Data processing and analysis are proceeding on schedule, and the first Cook Inlet Data Products Report for Phase I-1973 was prepared. The report for Phase II-1974 will be completed in September 1975. Public interest in the tides and currents of Lower Cook Inlet has intensified due to the proposed oil tract lease sales in that area. The NOS is recognized as having collected and disseminated the most up-to-date and, in many cases, the only information on the circulation of Lower Cook Inlet.

Due to the projected early completion of the survey of Cook Inlet, the NOAA Ship McARTHUR can now be more firmly scheduled to commence a tide and tidal current survey of Prince William Sound, Alaska, in mid-1976. The navigational requirements for tide and tidal current information have greatly increased due to maritime commerce in the Sound.

The tide and tidal current survey of Puget Sound and approaches continued, with the past year's efforts focused on Rosario Strait and the channels throughout the San Juan Islands. The NOS also recommended tide and tidal current surveys of east coast estuaries with a one-month test of the Tidal Current Survey (TICUS) System at the mouth of the Chesapeake Bay. In addition, a tide, tidal current, and hydrographic survey of Oregon Inlet, North Carolina, was conducted in cooperation with the U.S. Army Corps of Engineers. The TICUS System was modified and refurbished prior to re-installation aboard the NOAA Ship FERREL. A new computer system has also been installed as part of the TICUS System. This will enable ship's personnel to monitor the data acquisition, provide quality control, and perform preliminary data processing.

The Deep Sea Tides Program continued with a multigage deployment along a line extending seaward southeast from Savannah, Georgia. This information will be used to test a tidal model which has been developed to provide offshore tide corrections to hydrography. The model was used to provide offshore zoning referenced to predictions at Sandy Hook, New Jersey, for hydrography being conducted in the New York Bight by the NOAA Ships MT. MITCHELL, PEIRCE, and WHITING. A Deep-Sea Tide Gage is also being prepared for deployment during this project in conjunction with a field test of the Offshore Tide Telemetering System (OTTS), being developed by the Engineering Development Laboratory (EDL) to provide real time tide information to the hydrographer.

Requests for tidal datum information continued to increase. In addition to fulfilling numerous individual requests, NOS is now providing limited assistance to California, Florida, New Jersey, and South Carolina to implement state-wide tidal datum projects.

Two agreements were entered into by NOS to install tide gages for marine boundary determination along the east coast. A private engineering firm from New Jersey requested one tide gage and the U.S. Army Corps of Engineers District, Norfolk, Virginia, purchased three tide gages with the understanding NOS would inspect installation and process data.

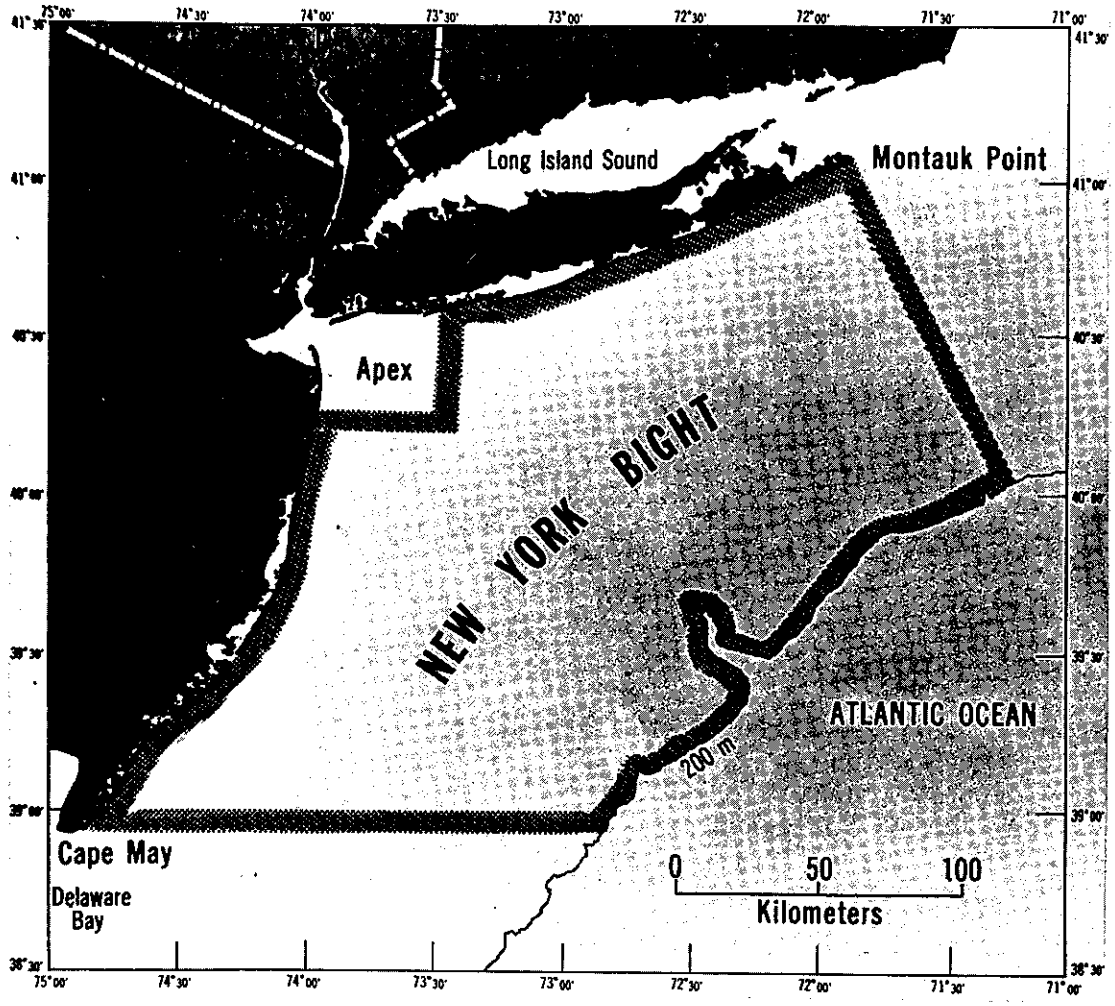
Two agreements were completed for tidal measurements on the west coast. In the Tijuana Estuary in southern California, five gages were installed for the Justice Department. In the Suislaw River, Oregon, five gages were operated for three months for the U.S. Army Corps of Engineers, Portland District, model study.

A major impact on the Tides Branch has been the numerous cases of litigation in Federal and state courts, requiring expert testimony by NOS personnel. An estimated four man-years of effort have been required to support these cases. The outlook is for this effort to double in FY 1976.

On July 1, 1974, the Tides Branch ceased processing tide data collected under the Inter-American Geodetic Survey (IAGS) Program. All tide marigrams were returned to the IAGS and, in turn, to the countries which owned them, at their request. The contract to NOS for processing this data was terminated in 1970. However, NOS recognized the need to complete the 19-year series at each station, where possible, and therefore continued to receive the records for processing on a "time-available-only" basis without reimbursement. At the end of FY 1974, the minimum 19-year requirement was satisfied in most cases, and the Tides Branch ceased to receive and process IAGS data. Tidal datums, based on one complete epoch, are now computed for most IAGS long-term stations.

During the past year the Oceanographic Division has continued to implement new technology and procedures to improve data quality and increase efficiency of processing and analysis. A "quality control-information feedback" system, instituted two years ago, has significantly improved the quality of tide and tidal current data and has given direction to plans to improve the overall system. Digital recording units are being added to the remaining analog recording tide gages of the Tide Observation Network, primarily on the west coast, in Alaska, and the Pacific Islands. New equipment is being used to translate tide and tidal current data directly onto computer-compatible magnetic tape at higher rates of speed. Existing computer programs are being revised to process this data more efficiently and improve "turnaround" time with the computer centers. A comparison of the annual statistics for FY 1974 and FY 1975 indicates a significant increase in production.

The Division provided support for the Marine Ecosystems Analysis (MESA) New York Bight Project by processing the Aanderaa current meter data acquired during the past year. Preliminary statistics indicate more Aanderaa data were received in FY 1975 than originally anticipated (see following tables). However, most of this data has been processed, per the NOS-MESA agreement. Extensive analyses have been performed by the Division to describe astronomic and nonastronomic effects on the New York Bight currents. The results of these analyses will be published in a cooperative NOS-MESA report in the fall of 1975.



12. MESA New York Bight Project

Oceanographic Division Statistics - FY 1975

Publications

Tide Tables	4
Tidal Current Tables	2
Supplemental Tide Tables	1
Supplemental Tidal Current Tables	1
New Edition, Tidal Current Charts	1
Tidal Current Diagrams	2

Stations

New Stations in Tide Tables	(US)	6	(Foreign)	95
New Stations in Tidal Current Tables				137

Stations Months

Tide Records Received	3,711
Tide Records Processed	3,841
Reduction of Backlog	130
Backlog-End of FY 1974	876
Backlog-End of FY 1975	746

Books

Level Books Received	833
Level Books Processed	586
Backlog-End of FY 1975	247

Hydro Sheets

Tidal Datum Zoning and Reducers	160

Station Datums

Tidal Datums Established	
New Stations	230
Redetermined	160
Tidal Datums Published	170

Analyses

Harmonic Analysis of Tide Data	
365-Day Time Series	62
29-Day Time Series	134
15-Day Time Series	3
Subtotal Analyses	199

Meter-Months

Current Meter Data Received		
NOS Projects		142
MESA N.Y. Bight Project		262
	Subtotal	404
Current Meter Data Processed		
NOS Projects		128
MESA N.Y. Bight Projects		242
	Subtotal	370
Increase in Backlog		
NOS Projects		14
MESA		20
	Subtotal	34
Backlog		
End of FY 1974		159
End of FY 1975		193
Archival of Current Meter Data at NODC		226

Analyses

Harmonic Analysis of Current Meter Data		
NOS Projects		52
MESA N.Y. Bight Project		60
	Subtotal	112
Non-Harmonic Reduction of Current Meter Data		
NOS Projects		50
MESA N.Y. Bight Project		73
	Subtotal	123

Station Months

Surface Water Temperature-Density Data	
Received	1,125
Processed	1,125
Backlog-End of FY 1975	0

Stations

Serial STD Observations	
Received	666
Processed	486
Backlog-End of FY 1975	180

OFFICE OF AERONAUTICAL CHARTING AND CARTOGRAPHY

The Office of Aeronautical Charting and Cartography (AC&C) continued its primary mission of producing and distributing aeronautical charts required for the management of and operation in the National Aviation System. Reproduction and distribution support for other NOAA programs was also provided.

Training

AC&C personnel attended 181 training courses, of which 54 percent were in science and technology, 23 percent in management and supervision, 13 percent in automatic data processing and 10 percent in general education for high school diplomas.

Management

This was a year of significant achievements in the development of new products and the modification and reformatting of others currently on issue. It was also a year of exceptional progress in the development of new processes, techniques and systems designed to improve the quality of NOS products and services. Planned program objectives were satisfactorily accomplished in spite of the unprecedented down-time on both of the five-color printing presses.

The airspace amendment of cycle was changed from 28 days to 56 days, effective April 24, 1975. Cyclic Instrument Charts produced and issued on a 28-day cycle will now be issued on a 56-day cycle. This will reduce the amount of reproduction material consumed by $150,000, and the assessment for postage charges by $244,000.

The firm of Howard, Needles, Tammen and Bergendoff (HNTB) completed their study and furnished a report outlining a plan for collocating the dispersed chart production facilities into one location. This plan was subsequently disapproved by the General Services Administration. However, a vast amount of the data contained in the HNTB report can be effectively utilized in future planning for collocation.

To augment the inhouse chart production capability, contracts were awarded to commercial sources for the negative engraving of Airport Obstruction Charts, and for the reproduction and distribution of both Airport Obstruction Charts and Standard Instrument Departure Chart Booklets. Commercial contracts were also awarded for the bindery work on the Alaska Terminal Publication and the Airport Directory. Involvement with commercial contracting afforded an opportunity to evaluate contractor responsiveness in meeting prescribed time schedules, evaluate product quality and cost effectiveness. The experience gained through this effort can be used most advantageously in future commercial contracting for the production of chart products.

The volume of weekly issues of the Instrument Approach Procedure Charts, coupled with the impact on workload in the Distribution Division as a result of the change to the 56-day amendment cycle, prompted a study to determine the feasibility of converting existing manual/machine systems for issuing NOS products to a complete mechanized system. An RFP was issued and contract awarded to Dynatech Research and Development Corporation for a mechanized system-design for packaging and distribution of subscription charts. The system design is scheduled to be completed and delivered for evaluation by December 1975.

To provide ADP support for the clerical, administrative, financial and statistical functions of the Distribution Division, an analysis of the work and its related processes was made by an inhouse study group. The study recommended the development of a multi-phase system by which these processes could be automated. An RFP was issued and contract awarded to Creative Consultants of America to design the system and implement the first phase.

The control and coordination of chart production was elevated to the staff level. This in no way downgrades the day-to-day production scheduling performed in the operating division. This staff function was established to coordinate chart production among the three divisions of this Office and the Marine Chart Division. It will also provide management with a daily overview on the status of chart production and an insight to the problem areas involved.

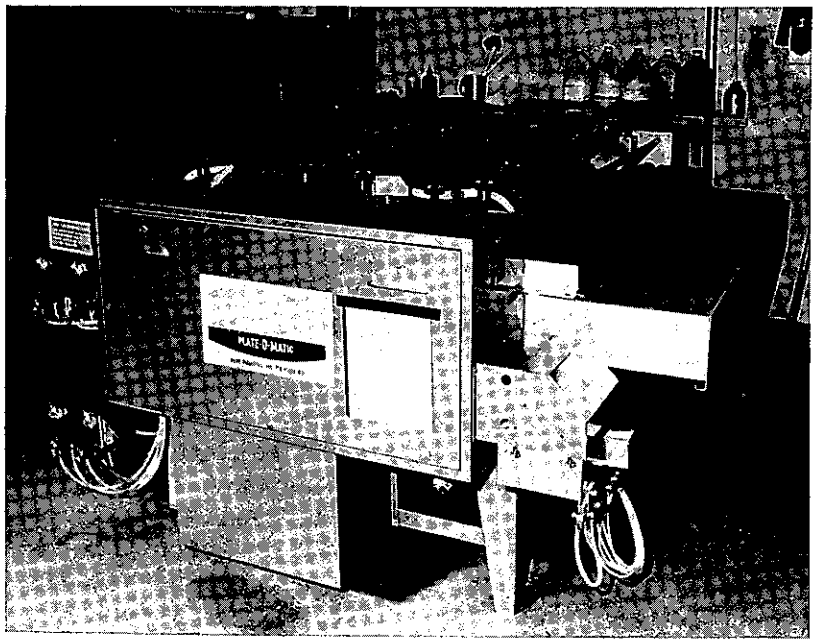
A plan for the reorganization of the staff of the Associate Director, Aeronautical Charting and Cartography, was developed and processed for review and approval. This proposed reorganization is designed to provide additional manpower and expertise necessary to expand and upgrade the technological development effort, and for effective management of production programs and resources of AC&C.

On Friday, February 8, Mr. Walter Chappas, Office of the Associate Director, AC&C, provided NOS testimony to the National Transportation Safety Board inquiry into the TWA crash on approach to runway 12, Dulles International Airport, December 1, 1974. The testimony was provided without difficulty, questions being primarily directed towards determining what the Interagency Air Cartographic Committee (IACC) is, its authority, function and membership, and how IACC chart specifications are derived, implemented and maintained. A few questions were directed at specific detail portrayed on the NOS VOR/DME 12 approach plate. All were explainable as required under the agreement and as spelled out in the specifications.

A new automated personnel roster system providing personnel management with information for the organizational components of AC&C was developed and implemented. Updated roster listings are routinely produced each month or as required. The listings include information such as employee position, location, employment summary, and salary. The system also has a multi-level search capability for use in compiling personnel data for special reports.

An informational advisory bulletin, "NOS-NEWS," was developed to serve as a vehicle for announcing items of interest to chart users, and to provide a means of issuing questionnaires for product development and determination of potential markets for NOS products. The first bulletin was issued on March 20, 1975, as a questionnaire with self mailer.

Authorized chart agents and FAA facilities are being visited by the Flight Edit Team while on flight edit missions. Through this personal contact, lines of communication are being established with the aviation community which will help to promote the NOAA/NOS image, products and services. This effort has also resulted in expanding the chart agent system through the recruitment of potential sales agents. The public response to the program has been very enthusiastic. The Flight Edit Team flew a total of 224 hours, covering approximately 208,500 square nautical miles in support of the Visual Chart Program. Missions were also flown in support of NOAA's MESA New York Bight Project, and the National Ocean Survey's Marine Chart Program.

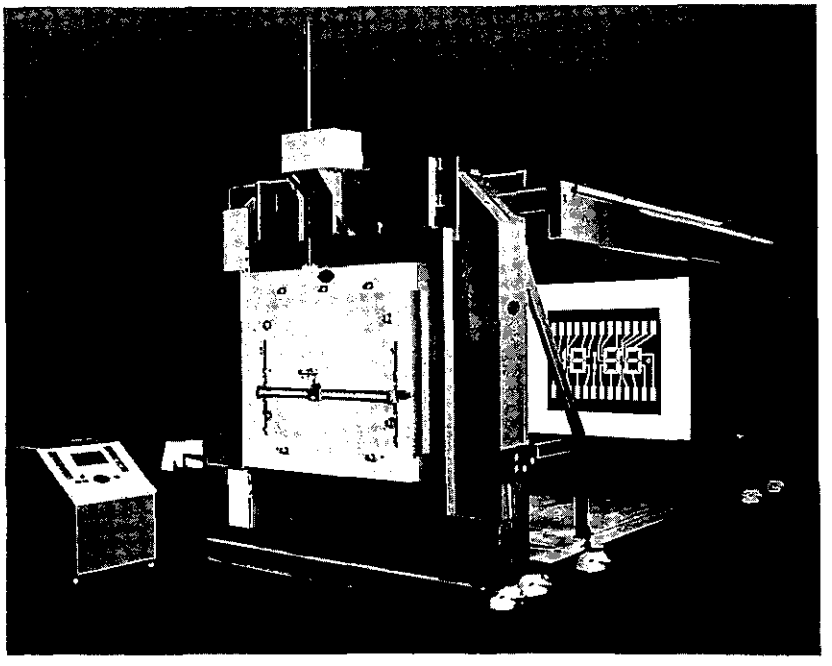


13. Automatic Plate Processor

Reproduction

The Reproduction Division purchased an Automatic Plate Processor for the image development of lithographic plates after exposure. The machine automatically dispenses a metered quantity of developing lacquer, and oscillating sponges uniformly apply the lacquer to the entire surface of the plate providing complete image development. The rinsing, gumming and drying processes automatically follow this operation, furnishing a

complete printing plate ready for use on the printing press. This automated operation will increase the speed of plate processing by approximately 20 percent, thereby expanding the plate-making capacity commensurate with requirements being generated by the increased number of chart products.



14. Reduction Blow Back Camera

The Reproduction Division also purchased a reduction-blow-back-camera for the topographic and hydrographic survey sheet copy program. The camera is designed to make precise fixed reductions of source data, and for making enlargements of the data with the degree of accuracy required in cartographic operations. The camera design provides the most precise size duplicating control that can be set in a minimum amount of time, while virtually eliminating operator error. The conversion of the old negative file of survey data will also be processed on this camera, providing distortion free imagery and top quality prints.

A Magnacraft Model 602 address labeler was installed in the Distribution Division. This labeler applies computer produced mailer labels to a variety of mailing media at a possible cycling rate of 25,000 per hour. Special labeling head sections handle 1, 3, 4 & 5 up labels. Zip code separator attachments provide for positive zip code stacking. The labeler will be used to apply computer produced labels from subscriber lists for products such as Radio Facility Charts, Instrument Approach Procedure Charts and Visual Charts. Other applications include lists such as chart catalogs, agents lists and dates of latest editions.

Aeronautical Products

A Helicopter Chart was designed, developed and issued for operational use in the Los Angeles area. This is the only chart in the series at this time. The expansion of the Helicopter Chart series to other areas has not as yet been decided by the FAA.

The San Juan Local Chart was redesigned and reformatted. The obverse side now includes coverage of Puerto Rico and The Virgin Islands, with the reverse side providing a Planning Chart of the Gulf of Mexico and Caribbean area with related text and tabular data. The first edition of the modified chart was published in December of 1974. This chart is now titled the San Juan - Virgin Island Local Aeronautical Chart.

With the approval of DOC and FAA and in collaboration with the DOD, eight of the DOD operational Navigational Charts (scale 1:1,000,000) are being reformatted to provide civil World Aeronautical Chart (WAC) coverage of Mexico, Central America and the Caribbean area. Five of these charts have been published, with the other three scheduled to be issued early in FY 1976. These eight charts will become a part of the WAC series and will be updated and issued on a prescribed schedule.

The Instrument Approach Procedure (IAP) Charts of the Southwest Region of the United States are currently being issued to subscribers in bound book format along with loose-leaf versions. The experimental book contains IAP Charts of Texas and New Mexico, and will be issued monthly for a six-month period for operational evaluation. Current plans provide for issuing all IAP Charts in bound book on a 28-day or possibly 56-day cycle.

A mock-up booklet prototype has been prepared, combining in one document the information now contained in four separate publications. The five-inch by ten-inch publication provides, in a single source document, all the information required for the purchase of aeronautical charts. Included are dates of latest edition brochures, chart agent listings, chart catalogs and a self-mailer chart order form. The single booklet uses seventeen-square-feet less paper than the four individual publications. The reduced paper usage is the result of reformatting and miniaturization of information.

Requirements for a series of VFR Radio Navigation Charts were defined, design concepts developed and a prototype issued for evaluation. This chart is designed to satisfy the need of present day operations in a Visual Flight Rule (VFR) environment, where VFR flight utilizes radio navigation aids and Area Navigation (RNAV) equipment as the primary navigational system. Additional mock-ups are planned, and when fully operational the chart may replace the existing WAC series.

A prototype of the Small Craft Nautical Chart has been designed to combine all data shown on the existing format of the Small Craft Chart and accompanying cover on 60" x 20" stock folded into five-inch fan folds. The

finished product is 5" x 10" in size, the same as the Sectional Aeronautical Chart. In January 1975, 5,000 copies of the prototype were printed and issued at boat shows and to power squadrons. The public response to the accompanying questionnaires was highly favorable. Plans are to eventually convert all Small Craft Charts to the 5" x 10" folded format.

Earth Resources Technology Satellite (ERTS) imagery has been evaluated as a source data for updating the base features on aeronautical charts. The evaluation determined that hydrographic features, such as lakes, rivers and reservoirs, can be readily identified and delineated on ERTS imagery sensed by the infra-ray band. The direct application of ERTS was used to update a portion of the San Francisco Sectional Chart produced and issued in November 1974. Current plans provide for utilizing ERTS as the prime source data for updating all significant hydrographic features on visual aeronautical charts.

A Photon Type Specimen Catalog was completed and distributed to users of type composition throughout NOS. This 66-page publication displays all styles of lettering used in production of NOS products with complete size range, and clearly labels the disc and grid number of each style depicted.

Computational routines and procedures for the determination of bearings, distances and geographic positions by the Aeronautical Chart Division were evaluated, resulting in the implementation of a single system employing subroutines of the National Geodetic Survey (NGS). The system and routines were reviewed by NGS, were certified accurate within the limits required for aeronautical charts, and the computational routines have been installed on the Page IBM 360/65 computer. The Aeronautical Chart Division (ACD) is now using this system operationally to supply the Division and the FAA with computations. User manuals are being written to allow Remote Batch and Time-shared use of the routines by the ACD.

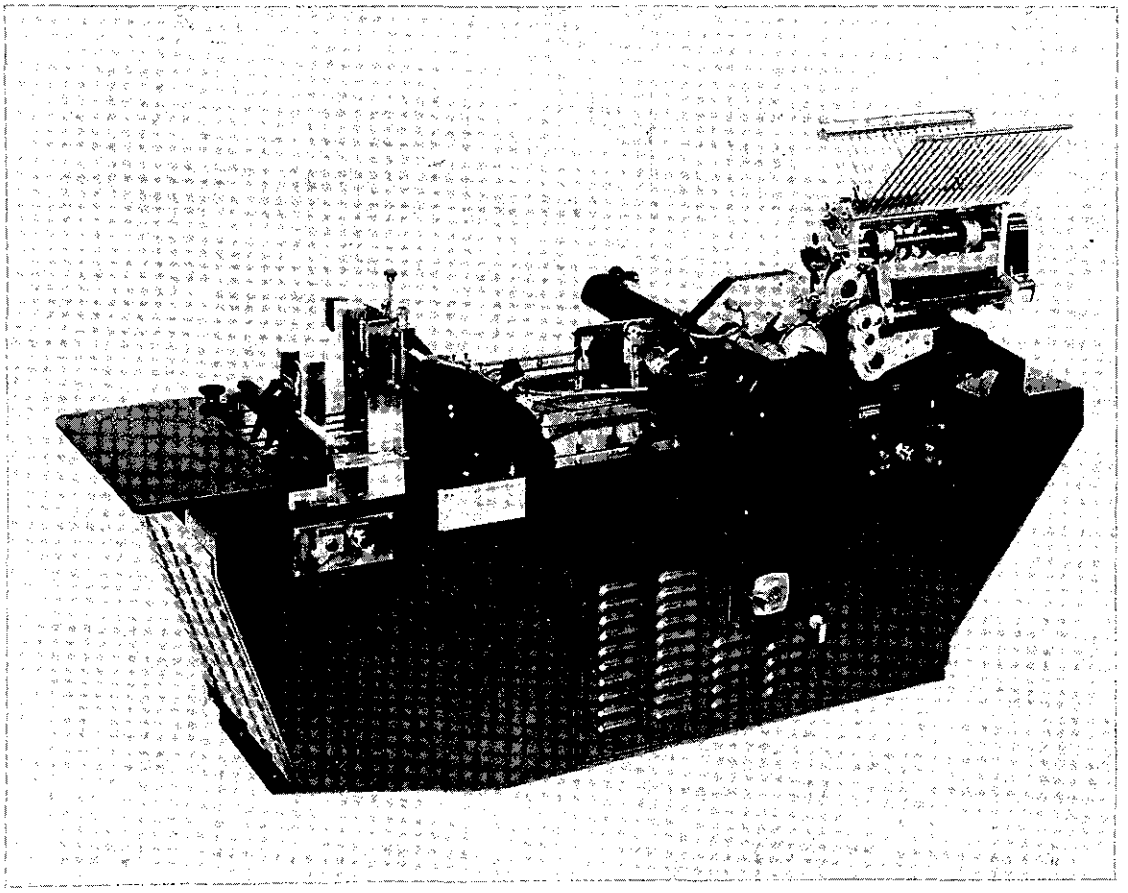
A contract for three portable time-sharing terminals was awarded to Texas Instruments with delivery expected in September or October 1975. In the interim, Boeing Computer Services terminals are being utilized in the Airspace and Instrument Approach Procedure Chart Sections for the new computational system. Final user manuals describing details and procedures on the operation of the system are in preparation.

Omega Lines of Position (LOP's) will replace Loran LOP's on two Aircraft Position Charts (APC's) used for flight evaluation by the FAA and Air Transportation Association in long navigation.

The obstacle file was completely automated for the Aeronautical Division. Elements of the file can be accessed via a CRT terminal, affording the user the capability to perform search and retrieve, circle search, polygon search, and slope penetration functions.

Special Products for the FAA

AC&C continued to furnish the Federal Aviation Administration with special products and services required for management of the National Aviation System. This included 46 Controller Charts and four Controller Chart Supplements, revised and issued on a 56-day cycle, and four Controller Chart Supplements revised and issued once during the year. Two hundred and sixty-five Aeronautical Video Maps were constructed and furnished to the FAA, along with 413 revisions, other products and services included Central Altitude Reservation Plotting Charts, Defense Readiness and Facility Overlap and Airport and Airspace Diagrams. Special products and services were furnished on an as requested basis.



15. Magnacraft Address Labeler

STATISTICAL DATA

Fiscal Year 1974

	Charts On Issue	Total Copies of Charts Produced	Total Copies of Charts Issued
		(Amounts in Thousands)	
PRODUCTS			
Aeronautical			
Visual	92	2,890	2,460
Instrument	2,830	37,236	22,248
Related Data	N/A	14,919	14,919
Nautical			
Charts	909	2,848	2,208
Publications	16	70	110
Related Data	N/A	1,019	1,019

Fiscal Year 1975

PRODUCTS			
Aeronautical			
Visual	100	2,920	2,278
Instrument	2,834	27,244	20,047
Related Data	N/A	13,249	13,208
Nautical			
Charts	953	2,750	2,072
Publications	17	195	131
Related Data	N/A	2,162	1,820

PUBLIC CHART SALES

	FY 74		FY 75	
	Copies Issued	$ Issue Value	Copies Issued	$ Issue Value
Aeronautical				
Visual	1,507,488	1,069,167	1,548,113	1,252,797
Instrument	17,359,073	1,254,719	15,420,412	1,148,526
Nautical				
Charts	1,252,416	1,336,870	1,284,872	1,652,190
Publications	97,994	117,144	103,786	163,716

SUBSCRIPTION SERVICE

	1974	1975
Paid Public Subscriptions	63,495	67,924*
Paid Public Subscribers	33,434	34,392*

PROCEEDS FROM CHART SALES

1974	1975
$3,937,081	$4,272,831

AUTHORIZED CHART AGENTS

	1974	1975
Aeronautical	1,553	1,788
Nautical	1,096	1,590

* Increases result primarily from Taxi Charts being sold as a separate subscription. In FY 74 Taxi Charts were part of the Instrument Approach Procedure subscription package.

OFFICE OF PROGRAM DEVELOPMENT AND MANAGEMENT

The Office of Program Development and Management (OPD&M) continued to provide executive management services for the Director, serving as the focal point for NOS planning, budget formulation, financial management, technical information, electronic data processing services, personnel and organizational control, emergency preparedness and security, and for the distribution and reprogramming of resources.

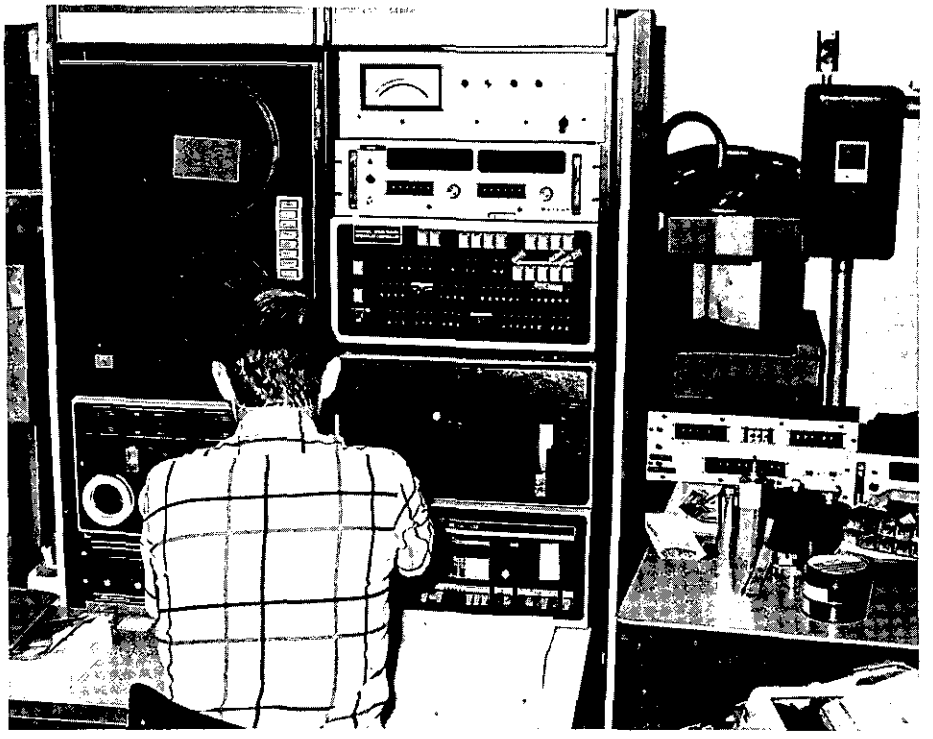
A Director's Conference for all key NOS managers was held at the National Bureau of Standards in Gaithersburg, Maryland, on October 1-3, 1974. The aim of this annual conference is to provide the opportunity for first-hand exchange of information and ideas, as well as a forum for open discussions on ways and means to improve NOS programs, operations, and communications. The successful conference included: (1) brief progress and status reports, and informal round-table discussions of special topics; (2) program manager examination of future requirements and projected plans toward meeting NOAA/NOS goals and objectives; (3) discussion of important recent programs and major accomplishments; (4) keynoting of substantial reprogramming of manpower, funding or program direction; and (5) opportunity for all managers to raise problems and issues of mutual interest or concern in an informal atmosphere and benefit from a full, open exchange of ideas.

The National Ocean Survey Conference Room was enlarged, remodeled, and equipped with a remote-operated, rear projection audio-visual system for 16mm movies and dual 35mm slide and viewgraph projection.

Monthly and quarterly in-depth management reviews were conducted for the Director. These reviews included: (1) complete resources evaluation of financial and personnel status for all NOS programs and (2) management-by-objective program status report system for examining objective attainment within prescribed constraints of time, manpower, and cost.

Scientific Services

The Scientific Services Division's IBM 1620 computer, in continuous use in NOS for the past 13 years, has been retired and transferred to the Federal Communications Commission (FCC). Work was started, in conjunction with NOAA's Office of Management and Computer Systems (OMCS), on a centralized training concept for NOAA in the ADP training field. The NOS Scientific Subroutine System was prepared and published, and a new cartographic system called Reproduction Data Collection was placed in operation. NOS programs and documentation were assembled and forwarded to the National Oceanographic Data Center (NODC) for inclusion in the NODC publication "Computer Programs in Oceanography." Program ALRTEX was converted from the CDC 6600 to S360/195 for Gravity Astronomy and Satellite Branch (NGS).



16. PDP-8/E Computer

Other programming projects included 23 programs supporting cartography (administrative), oceanography, HYDROPLOT/HYDROLOG, and coastal mapping; thirty programs and/or systems dealing with cartography (administrative), oceanography, HYDROPLOT/HYDROLOG, coastal mapping and MDSP; and four programs converted to the 360 from the 6600 in coastal mapping and MDSP. A new cartography system called "Reproduction Data Collection" system was placed in operation. The following hardware and software was acquired and installed: DECTAPE and OS/8 Software, ODEC highspeed printer, XEBEC mag tape drive, REMEX hi-speed paper tape reader, cabinets to house EDC related equipment and used PDP-8/E from NOAA Ship WHITING.

In addition, the following studies and documents were reviewed:

1. Feasibility Study for Acquiring an Automated Information System for Nautical Chart Compilation.

2. Feasibility Study for Acquiring a System Design to Automate the Production of Aeronautical Charts and Supplementary Materials.

3. Software Specifications for MDSP's Interim-Data Storage and Retrieval System.

4. Feasibility Study for an Integrated ADP System to Support AC&C's Distribution Division.

5. Lake Survey Center's Justification for Acquisition of an Inhouse ADP System.

6. NGS Feasibility Study for Automation of Geodetic Control Descriptive Data.

Members of the ADP Planning Branch served on Source Evaluation Boards to select vendors to develop software for the AC&C Distribution Division's Integrated ADP System and to develop a System Design to Automate the Production of Aeronautical Charts and Supplementary Materials. Members served on special task groups to study and recommend improvements for NOS charting financial management activities, to study NOS ADP requirements for NOAA central computer facilities, to study NOS space requirements, and to study Lake Survey Center's data processing requirements and make recommendations for satisfying these requirements.

Over 12,000 public requests were processed as part of a continuing effort to provide a specialized user information service. Across-the-counter sales at the Rockville Sales Office totalled $9,756.48. Over 85,000 maps, charts and photographs were received from state and federal agencies. Over 50,000 of these items were distributed within NOS and NOAA, including 3,600 nautical charts and 5,100 topographic quadrangle maps. Over 28,000 cartographic items were superseded. One hundred-twenty-five charts were furnished for court cases as a result of litigation actions.

The NOS Publications Program was prepared and coordinated with an operating budget of $92,000.00. A new contracting arrangement was agreed upon which will greatly reduce delivery time for publications in the navigation series. Lists of those papers published and/or presented at meetings appear in the appendices.

Ninety-two accident reports were processed, as were ten incidents of loss or theft. Three fires and one bomb threat were reported, and two fire drills were held. Under the direction of the NOS Safety Management Officer, a new set of safety guidelines were published with the aim of drawing attention to the individual employee's obligation in self protection.

Lists of approved names were prepared for 106 hydrographic survey sheets and ten coastal mapping projects. Just under 800 new Geographic Name Standards were made for nautical and aeronautical charts. Meetings of the U.S. Board on Geographic Names' Domestic Names Committee resulted in alteration of 1,144 names on NOS charts.

On March 2, 1975, the Support Services Branch functions and resources were transferred to the Physical Science Services Branch, as were those of the Technical Services Branch on June 30, 1975. As part of a planned relocation of the Marine and Earth Sciences Library by EDS, a complete review and inventory of the NOS Record Set of historical materials was prepared. As a result of the study NGS transferred all geodetic records from the record set to their custody.

The NOS Bicentennial Chart Program entered its final stage of planning. A total of 48 selected 19th century charts will be offered beginning July 7, 1975. The Chief, Physical Science Services Branch, was appointed by the Director as Chairman of the NOS Bicentennial Advisory Committee. A national mapping exhibit was proposed by the U.S. Geological Survey for the Bicentennial. The committee prepared an NOS presentation for inclusion in the exhibit.

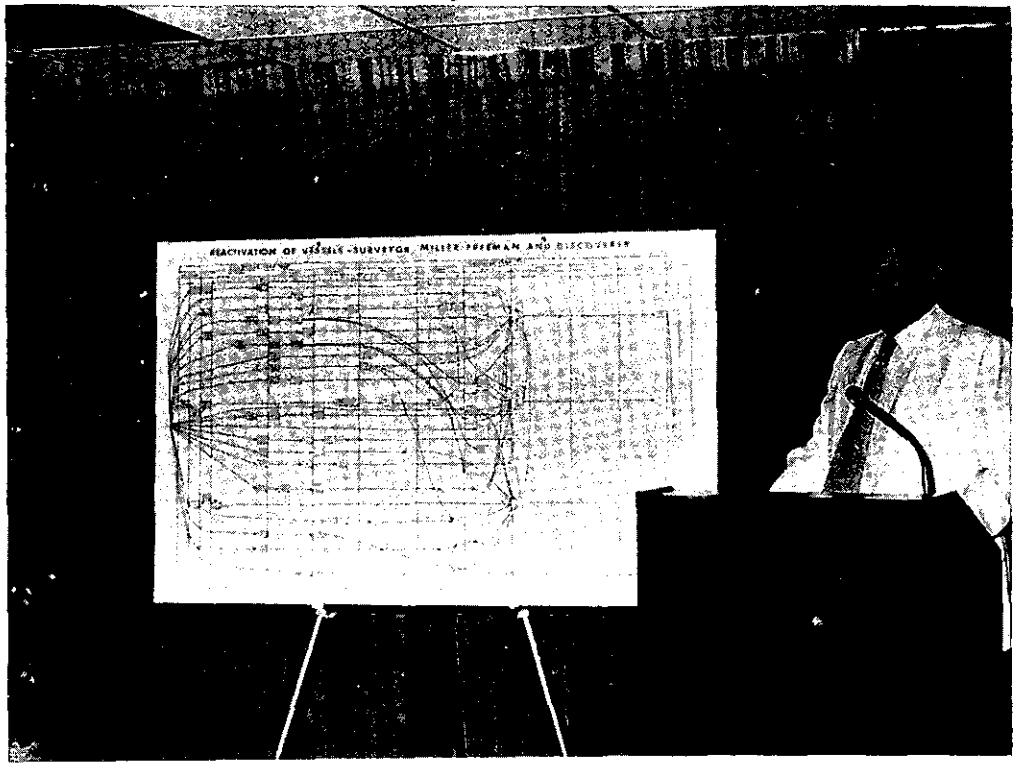
NOS Research and Technology Resumes were reviewed, approved and forwarded to the Smithsonian Science Information Exchange, and revisions were made to the NOS portion of the NOAA Reports Catalog. In April, all current geodetic records were relocated to NGS offices in the Rockwall Building. Over 4,700 NOS field and office reports were registered and processed, including 231 Ship and Field operations reports, 230 ship log books and 69 engineer logs. More than 3,000 loans and information were furnished from current records. Approximately 407 cubic feet of inactive records were transferred to the NOAA records staging area, Washington National Records Center.

Program Development

The Program Development Division continued its efforts to develop and coordinate the short-term and long-range program plans for NOS. In the formulation of advance plans and program policies this Division provides essential guidance to program managers, and evaluates the results of NOS efforts in terms of user needs and resources expended. The Division is a focal point within NOS for coordination and assistance in the preparation of documents in reponse to requests from NOAA, the Department of Commerce, Congress, and various interagency groups. In response to an increased number of requests, and to provide in-depth program development services, the capability of the Division has been increased.

A major portion of the new capability was devoted to implementation of an expanded NOS Management-By-Objective (MBO) program. Developed and organized to provide the Director and NOAA with the status of all basic programs and significant projects, MBO is a results-oriented management process by which work is organized in terms of achieving specific objectives within related time frames and resources costs. The Program Development Division maintains the reporting documents.

The basic MBO program consists of 34 verbal and graphics descriptions covering all basic NOS programs for a 5-year period, with specific milestones for each according to date of completion and resources budgeted each year. Every three months, briefings are conducted to report on the progress (or delay) in completing the milestones previously estimated for each of the 34 NOS program objectives. Five of these programs are reviewed each month, and written reports submitted to NOAA for resources review and the Presidential energy report using MBO format.



17. Management-By-Objective (MBO) Review

Monthly MBO reports are now being issued for 25 on-going projects for use by the Director in determining status. As they become operational, an additional 11 significant NOS projects will be monitored and reported using the MBO format. Modified PERT-type Gantt Charts are used to describe the programs, to show objectives, and to show progress in meeting these objectives.

As the coordination center for preparation of program documentation and program justification, the Program Development Division produced final material for the "NOS Program Plan for FY 1977," which was presented by the Director at the Administrator's Annual Review. Following this first step in developing plans and budget increase requests for FY 1977, the Program Development Division coordinated and assisted in the preparation of twelve issue papers and three supplementary papers in support of FY 1977 increase items as listed below:

1. Issue Papers Supporting FY 1977 Increase Items

   a. Geodetic Control Data Bank
   b. Releveling of the Vertical Network
   c. Large-Scale and Intermediate-Scale Mapping to Meet Management Requirements in the Coastal Zone

d. Water Movement Studies
e. Advanced Technology
f. NOAA Data Buoy Program
g. Pollution Abatement
h. Vessel Construction
i. Fleet Maximum Use
j. Fleet Electronic Support
k. AMC Base Expansion
l. Equipment Replacement

2. Supplementary Issue Papers

a. FY 1977 Manpower Increases
b. FY 1977 Capital Outlay for Equipment
c. Bases for Cost Derivation
Releveling of the Vertical Network
Vessel Construction

In support of the FY 1976 increase request for Coastal Mapping and Marine Boundary Surveys and as a basic planning document, the Program Development Division researched and prepared the paper "Marine Boundary and Tidal Datum Surveys."

As a result of questions from Congressional committees, and as requested by NOAA, documents were prepared in support of NOS FY 1976 increase items.

The Division also drafted the document "Coordination of the Office of Coastal Zone Management and the National Ocean Survey."

In the area of program economic evaluation, a number of plans are being developed to secure basic quantitative data for program planning. Proposals have been made for improving the reporting of resources usage within NOS, based on the Financial Management System (FIMA) and changes in the Management-By-Objective System (MBO). A suggestion has been accepted for alignment of FIMA task numbers with the objectives of the MBO system. A task team, comprised of personnel from the Program Management Division and the Program Development Division, is analyzing each NOS program area and making appropriate adjustments to both systems. Additional proposals are being investigated for improving the use of existing FIMA reports by providing additional task and organization summaries.

During FY 1975, the Program Development Division reviewed 223 Draft Environmental Impact Statements and prepared NOS comments for transmittal to the NOAA Office of Ecology and Environmental Conservation.

The Division participated in the research and preparation of three major Task Group Studies: (1) The South Texas Offshore Environmental Assessment Plan, (2) Missions and Procedures of the Oceanographic Division, and (3) NOS Cartographic Research.

The Program Development Division provides a representative to the Interagency Committee for Marine Environmental Prediction (ICMAREP), working through the Department of Commerce Coordinating Group, and serves as the focal point for NOS contact with the Interagency Committee on Marine Science and Engineering (ICMSE) and the international activities represented by these groups. During the year responses were prepared for 17 requests from ICMAREP and ICMSE, including program activities, special projects, annual reports and budget summaries. Subjects of these documents included: (1) The Chesapeake Bay Area Research and Survey, (2) The National Atmospheric Sciences Program (ICAS), (3) Federal Great Lakes Program, (4) Senate Ocean Policy Study, (5) Outer Continental Shelf Baseline Study, (6) Environmental Quality Standards, (7) Oceanic Research and Development, (8) Arctic Offshore Research, (9) Instrumentation Development, and (10) The Federal Plan for Marine Environmental Prediction.

Program Management

As in past years, the Program Management Division continued to monitor and control all funding in NOS. To keep pace with the Financial Management System (FIMA), fund controls were updated and revised continuously during the year. There were changes during the year affecting such things as program structure, sub-object classes and reprogramming authority.

A significant change was the elimination of the use of replacement COP's, except for reimbursables and trust funds. Beginning July 1, 1975, only adjustment COP's will be submitted for program changes related to direct funds or management funds.

The Division initiated and completed a study concerning the pricing policy for the sale of NOS products. The study included such items as identification of all products sold or distributed gratis, elements included in the cost of products, rationale for sale price and free issues, authority for sales prices, and frequency of price revisions.

The Director's Resource Reviews were conducted on a monthly basis. A viewgraph presentation was made showing the current financial status of all NOS programs. The format for the review was usually dictated by current problems or areas of particular interest. Each month the detailed Program Management Report was compiled and distributed to all Financial Management Centers. As a result of the Resource Reviews and fund controls exercised throughout the bureau, the fiscal year was concluded in solid condition. The following table shows the June 30, 1975, (Preliminary) status of all accounts (in thousands of dollars):

Appropriation/Fund	Annual Plan	Actual Obligations	Balance (+) Deficit (-)
Operations, Research & Facilities	62,540.3	61,805.5	+ 734.8
Management Fund	7,459.7	7,471.9	- 12.2
Reimbursables	8,751.5	9,219.4	- 467.9
PL 91-412	4,883.8	4,521.9	+ 361.9
TOTAL	83,635.3	83,018.7	+ 616.6

A task study was undertaken to relate resources planned and expended to the Management-By-Objective (MBO) system objectives and milestones. The first phase, to develop the means to relate FIMA tasks to MBO Objectives, is scheduled to be operative by the end of the first quarter in FY 1976.

Numerous congressional inquiries were answered regarding expenditures made or planned in various states, counties, and congressional districts. In many cases, this data was also furnished by activity.

The following is a summation of actual total costs incurred by fund and subactivity:

Actual FY 1975 Total Cost by Subactivity
($ in thousands)

Subactivity		OR&F	Reimbursable	PL91-412	Mgmt Fund	Total
31	Aeronautical Chart Services	5,422.6	5,054.6	2,929.1	-	13,406.3
32	Nautical Chart Services	20,608.6	1,030.2	1,418.6	-	23,057.4
33	Ocean Mapping & Services	9,434.2	57.6	-	-	9,491.8
34	Coastal Mapping & Services	5,462.3	1,038.1	35.6	-	6,536.0
35	Ship Bases & Program Support	3,496.3	-	-	-	3,496.3
36	Geodetic Surveys & Services	7,372.0	1,313.4	-	-	8,685.4
62	Oceanographic Instrumentation, Development & Calibration	3,057.8	116.1	-	-	3,173.9
81	Resources Research & Assessment	6,710.3	35.9	-	-	6,746.2
AA	National Data Buoy Project	8,529.2	48.0	-	-	8,577.2
9D	General Support	-	-	-	(7,467.7)	(7,467.7)
9X	EXAD	-	-	-	(452.0)	(452.0)
--	All Other (GATE, MESA, etc.)	1,284.1	12.1	-	-	1,296.2
	Total	71,377.4	8,706.0	4,383.3	(7,919.7)	84,466.7

NOTE: Numbers in ( ) have been distributed and therefore are non-add.

A number of significant NOS organizational changes were accomplished during the year. The more significant included: (1) the establishment of a Chart Automation Projects Office (CAPO) reporting to the Director and the transfer of the Marine Data Systems Project from the Office of Marine Technology to CAPO; (2) the abolishment of the Aeronautical Charting and Cartography Research Group and the establishment of a Program, Production, and Resource Management Staff; (3) elimination of the Support Services Branch and Technical Services Branch in the Office of Program Development and Management (4) the reassignment of the Limnology and Computer Services Divisions of Lake Survey Center from the National Ocean Survey to the Great Lakes Environmental Research Laboratory, (ERL) (5) the transfer of the compilation, reproduction, and distribution functions of the Lake Survey Center from Detroit to the Washington, D.C. area; and (6) the establishment of a Northeast Marine Support Facility at Woods Hole, Massachusetts.

Initial procedures were established to implement the Privacy Act of 1974 and the Freedom of Information Act. These Acts will require greater definition and controlled procedures during FY 1976.

During the year, the National Ocean Survey initiated 1832 new requests for personnel actions and processed 1988 actions, including holdovers from FY 1974. The FY 1975 ceiling for full-time permanent personnel was 2150; and at the close of the fiscal year, NOS had 2177 full-time employees on board.

Thirty-two NOS employees were nominated for DOC and NOAA medal awards and special citations, 262 employees received Outstanding ratings, and 13 employees were selected to participate in NOAA Scientific Upward Mobility Training Programs.

The Assessment Section of the NOS EEO Affirmative Action Plan was completed and effort initiated on the development of action items for 1976. A Management-by-Objectives system was implemented to monitor NOS progress in achieving EEO Affirmative Action Plan objectives. Statistics showing the status of women, minorities, and non-minorities by organizational segment are compiled and reported to the Director on a quarterly basis. Forty-eight NOS supervisors attended a three-day EEO course entitled "Focus on Understanding," and 171 employees attended a similar one-day course. Twelve NOS managers attended a five-day NOAA Counseling Workshop to improve basic communication skills in dealing with personnel problems.

OFFICE OF MARINE TECHNOLOGY

Engineering Development

The Engineering Development Laboratory continued to provide engineering system design and development to support Hydrographic and Circulatory Surveys, the Marine Ecosystems Analysis Project (MESA) and the Undulating Oceaographic Recorder (UOR) System for the National Marine Fisheries.

The design and development of two subsystems to correct depth soundings for vertical motion of the vessel and offshore tide anomalies are underway. A contract for a vertical motion correction sensing system was initiated with scheduled completion in FY 76. The Offshore Tide Telemetering System (OTTS) design and development was completed and is presently undergoing field test. This system provides for the telemetry of real time-tidal data from offshore buoys to a survey vessel.

Test and evaluation of radio positioning subsystems was initiated. Two line-of-sight subsystems presently in use for hydrographic surveys are being evaluated to determine operating characteristics and ability to meet hydrographic survey requirements. The Microwave Propagation Study by the Office of Telecommunications, Boulder, Colorado, to support this test and evaluation has been completed.

Engineering support was provided for the Cook Inlet and Puget Sound Circulatory Surveys. The level of return of the field data continues to be greater than 80 percent. Operating currents in upper Cook Inlet are less than anticipated, and therefore the present current meter mooring system will be utilized in this area. Preliminary laboratory tests on the bottom resting Acoustic Doppler Current measuring system transducer and processing subsystems were completed.

The Marine Ecosystems Analysis Project (MESA) engineering support was divided into four principal areas: design and development of data acquisition subsystems; analysis, testing and modification to improve the quality of the present data acquisition subsystems; design and development of a prototype shipboard instrumentation container; and development of the system specification package for the conversion of the NOAA Ship GEORGE B. KELEZ.

Laboratory modification and testing to increase the overall reliability of the Undulating Oceanographic Recorder (UOR) System has continued for National Marine Fisheries. The design and development of a translator to convert and process data tapes on the surveying vessel was completed.

The development and testing of the on-board processing and software for the Sea Scan System was completed by Draper Laboratory. The Sea Scan System will be incorporated into an expanded Underway Water Sampling Program development that will measure the impact of energy-related operations on the marine environment. In addition to water quality parameters, the systems

will measure currents, optical properties and petroleum hydrocarbons while the surveying vessel is underway.

Data Buoy Program

The delivery and predeployment test of the Prototype Environment Buoy (PEB) was the culmination of 5 years of work in the development of deep ocean moored buoys which will automatically supply environmental data for improved weather forecasting. An additional five PEB's are under contract for delivery in Fiscal 1976. These are the first in a series of operational buoys to be deployed off the coasts of the United States and Canada in support of National Weather Service requirements.

Development continued on ultrahigh frequency equipment to integrate data buoys into the GOES and NIMBUS-6 Satellite communications system. This hardware is expected to significantly improve communications reliability over the HF equipment currently in use.

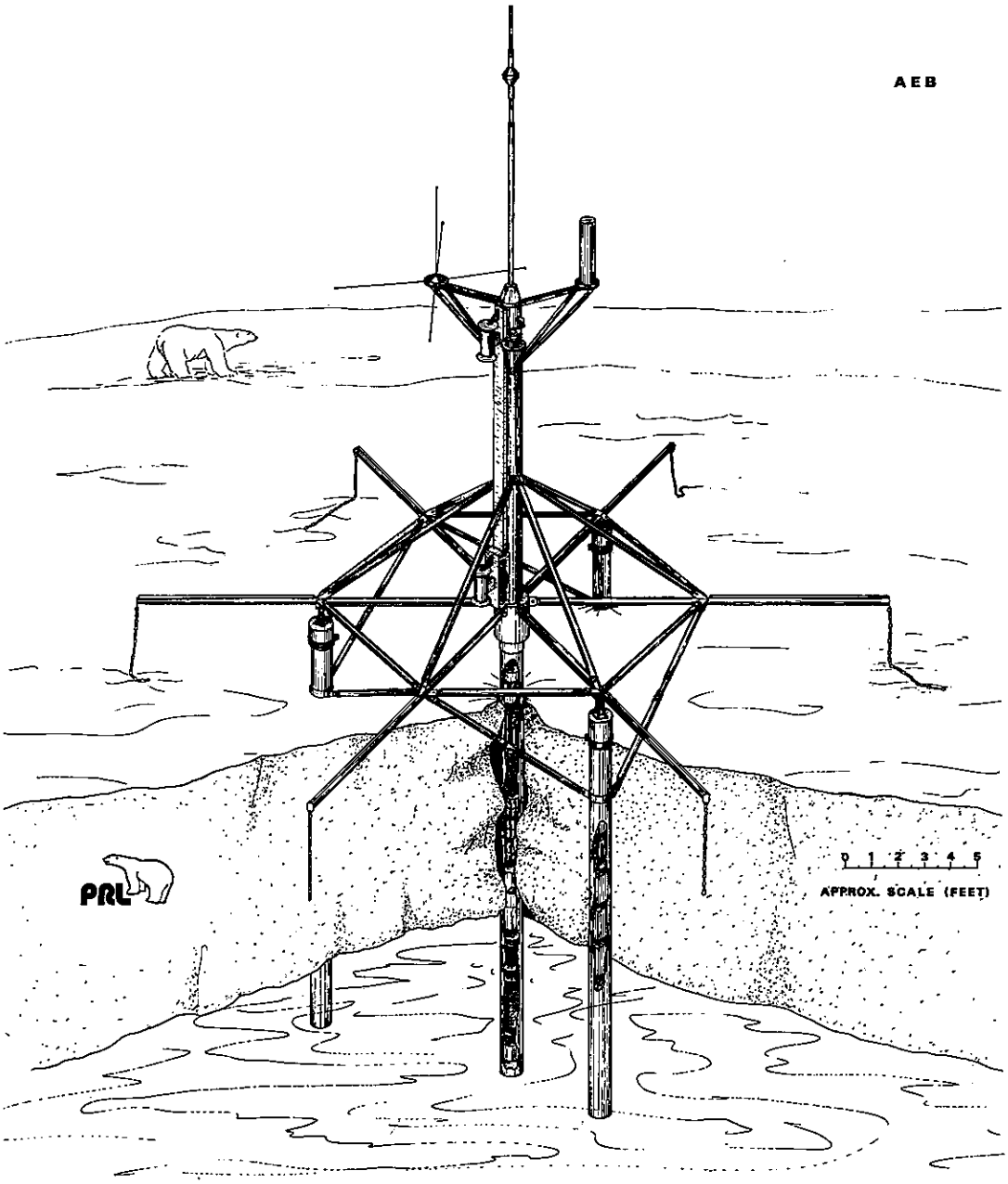
A project was instituted to provide integrated temperature profiles of the atmosphere from the surface to an altitude of 5000 to 6000 meters by use of remote sensors located on the deck of the buoy. Proven satellite technology is being utilized to adapt satellite-type sensors to buoy use. Considerable progress was made to enhance wave data, and the possibility of providing directional spectra appears to be good. In addition, an effort was initiated to develop an ocean temperature sensor to obtain sea water temperature profiles from the surface to a least 500 or 600 meters. Plans are to retrofit existing buoys with these added capabilities as they are tested and proven.

Several buoy developments directed towards specific continental shelf applications were initiated including support of baseline studies for offshore oil exploration, NOAA survey missions in areas such as Cook Inlet, environmental design studies for offshore structures, coastal fisheries and recreational forecasts and studies, and research studies such as the Shelf Dynamics Program. Continental shelf developments were directed towards improved lower cost meteorological payloads, oceanographic sensor systems, subsurface communications, and hull/mooring designs.

Three continental shelf buoys in their initial developmental configuration were deployed off the west coast of Florida for approximately six months in support of a University of Miami research project having reimbursable funding from the National Science Foundation. Another buoy was deployed for six months, retrieved, refurbished, and redeployed on the Alaska Continental Shelf 65 miles SSW of Yakutat, Alaska. The buoy is being operated for a Bureau of Land Management Program on a reimbursable basis.

The electronics and sensors from two other developmental continental shelf buoys were integrated into a 16-foot-diameter discus hull and a Naval Oceanographic/Meterological Automatic Device (NOMAD) hull for subsequent use on a reimbursable basis in the New York Bight/Baltimore Canyon research projects.

One of the initial developmental buoys was redesigned to acquire water quality data as well as meteorological data, and will be deployed near the mouth of the Delaware Bay, approximately 40 miles southeast of Cape May, New Jersey, for use in a cooperative program with an Environmental Protection Agency laboratory.



18. Arctic Environmental Buoy

The polar ice buoy system development program was continued with the development and test of three prototype ice buoys that utilize the Navy Navigation Satellite System to determine their geographic position. These buoys transmit their environmental data and location by high frequency telemetry to manned stations on the ice. The buoys are capable of measuring relative ice motion to a position accuracy within hundreds of meters, compared to a two-to five-kilometer accuracy for polar-orbiting satellites. These buoys were deployed for 4 months in the Arctic Ocean in support of the Arctic Ice Dynamics Joint Experiment (ADIJEX).

To support studies of ice behavior on the continental shelf and other areas, developmental efforts were initiated for an air-deployable ice buoy and an oceanographic and meteorological ice buoy. The air-deployable buoy will only provide its geographic position, and is designed primarily for use in the marginal ice/water zone where information on ice movement is important to many planned operations. The buoy will be used to track ice motion via the NIMBUS-6 Satellite system. The oceanographic/meteorological buoy will measure barometric pressure and current speed and direction at two levels below the ice. Funding for the development of these buoy systems has been provided on a cost-reimbursable basis by the Bureau of Land Management through the NOAA Environmental Research Laboratories.

Development was started on drifting buoys for use in the open ocean. The impetus for the development of an open ocean drifting buoy capable of measuring a basic set of simple meteorological parameters is provided in part by the Global Atmospheric Research Program (GARP). Prototype drifting buoys meeting GARP requirements were developed and are now under test with the recently launched NIMBUS-6 Satellite. Environmental parameters measured by the buoys are transmitted to the satellite, which in turn sends the data to a ground station. The satellite is able to determine buoy position by measuring relative velocities of the buoy and the satellite. Test results to date are very good. A system such as this is now believed feasible for large scale global atmospheric and oceanographic research programs.

The development of an air/sea interaction buoy was initiated to support large scale experiments covering very large oceanic areas. These programs will study the physical processes which lead to long-term variability in climate. Such studies present formidable observational difficulties in light of the large spatial coverage and density of observations required.

Oceanographic Instrumentation

A substantial number of major state, national and international marine programs and activities requested the services of the National Oceanographic Instrumentation Center (NOIC). The following are examples of the programs and activities, and type of participation requested of NOIC:

1. U.S. Army Corps of Engineers' Dredged Material Research Program. NOIC was contracted to develop a plan for the calibration, standardization, and evaluation of environmental monitoring instrumentation for the Army's

Dredged Material Research Program. Participation included a review of instrumentation plans for monitoring the effects of dumping dredge material in the marine environment, and participation in a current meter intercomparison effort.

2. International Field Year for the Great Lakes (IFYGL). As a result of a contract with the Great Lakes Environmental Research Laboratory, NOIC conducted an instrumental error analysis of the United States and Canadian current meter intercomparison that took place in Lake Ontario during the International Field Year for the Great Lakes (IFYGL) Program. The results of the analysis were reported to the Research Laboratory, and used by the investigators in determining variations between each country's data.

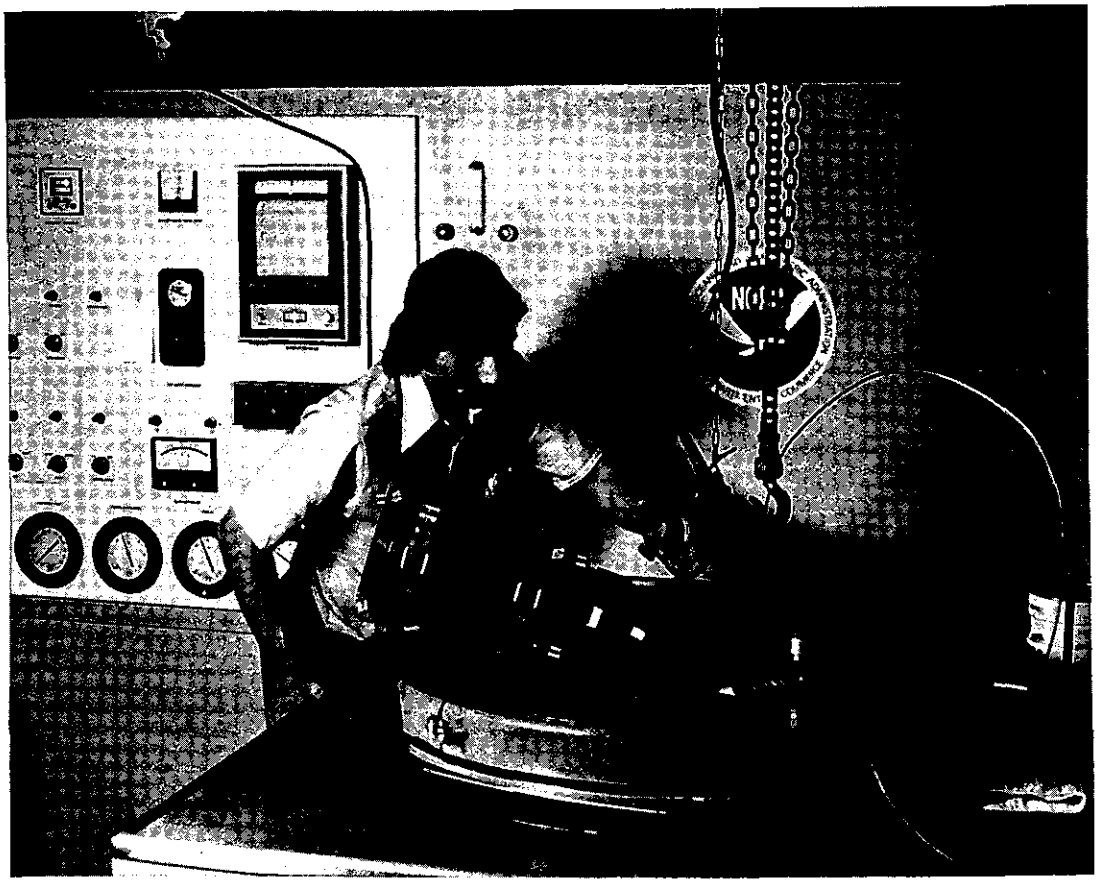
3. U.S. Senate Ocean Policy Study. A report entitled Ocean Instrumentation (November 1974), was prepared by NOIC and submitted to the U.S. Senate Ocean Policy Study via NOAA and the Interagency Committee on Marine Science and Engineering. The report provided comprehensive information for assessing the state of ocean instrumentation used in support of U.S. programs.

4. Bureau of Land Management's Alaskan Marine Environment Baseline Study Program. NOIC's role in the Bureau of Land Management's Alaskan Marine Environment Baseline Study Program culminated in having all program instrumentation calibrated at NOIC's Northwest Regional Calibration Center. This action will assure that all sensors, especially Conductivity Temperature-Depth (CTD) and Aanderaa current meters, are calibrated according to the same procedures and traceable to either national or accepted standards.

5. International Council for the Exploration of the Sea. NOIC participated in salinometer intercalibration of the International Council for the Exploration of the Sea. This intercalibration effort will help to improve international understanding of salinity data, a basic marine parameter.

6. California State Water Resources Control Board. In cooperation with the California State Water Resources Control Board, NOIC will provide instrument calibration services for local monitoring of environmental quality through its Southwest Regional Calibration Center. This project is funded by NOAA and the State of California, and has excellent potential as an example for other coastal states to follow.

7. GARP Atlantic Tropical Experiment (GATE). The GATE salinity intercomparison project was completed. This reimbursable project produced a number of interesting findings. As an example, it was found that several of the participating foreign vessels do not trace their measurements to recognized international standards, i.e., International Association for the Physical Sciences of the Ocean (IAPSO), Standard Sea Water and the UNESCO International Oceanographic Tables. This, rather than instrument performance, could be the major contributor to the large measurement variances seen in the intercomparison. In addition, some GATE researchers used plastic bottles as containers for their salinity samples, which seem to cause significant degradation in salinity values over a 2-month period. (Boro silicate bottles are recommended).

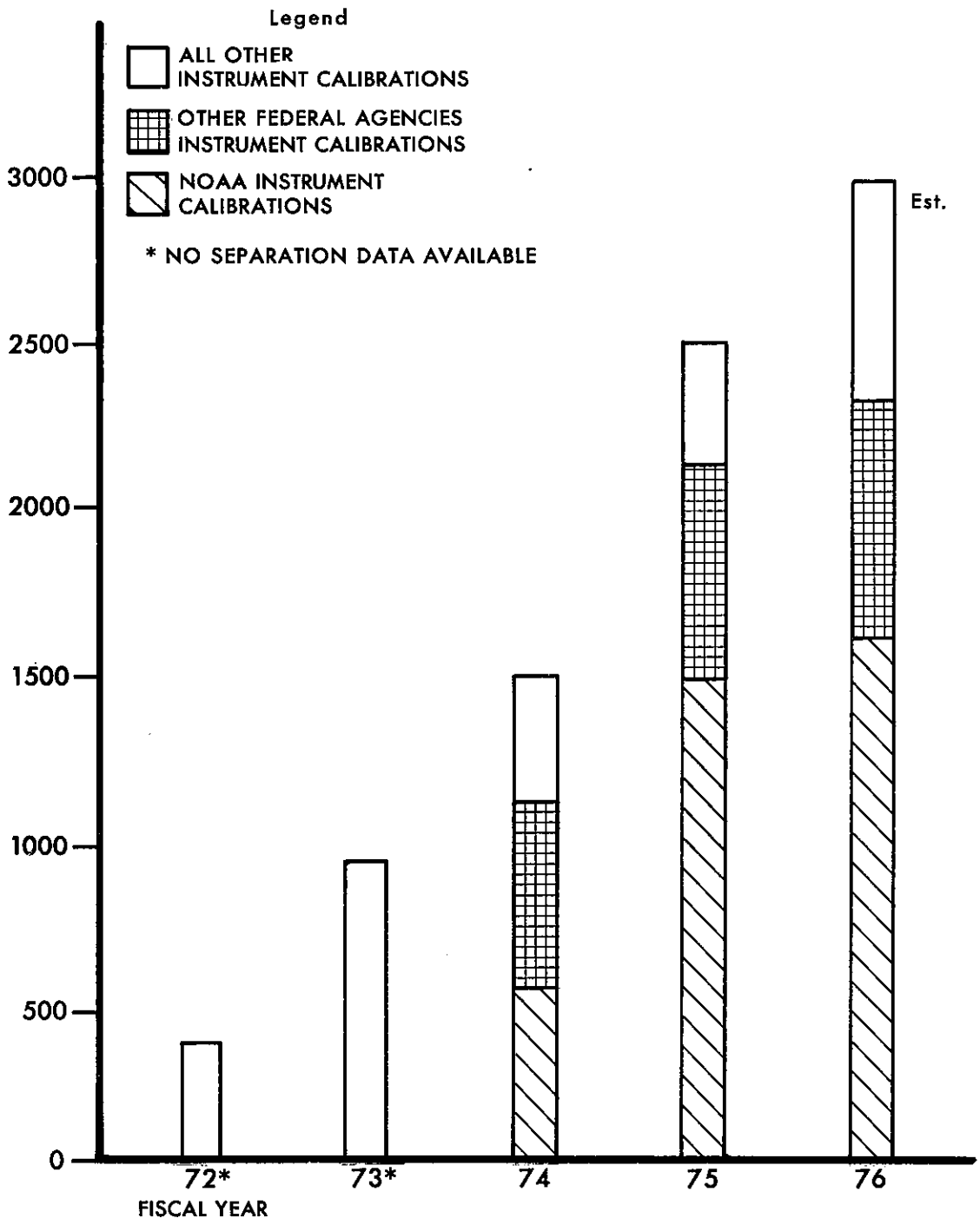


19. NOIC Water Sampler

8. Marine Ecosystems Analysis Project. The New York Bight Project of the Marine Ecosystems Analysis Project was supported through year round operation of the Mobile Calibration Laboratory at the Floyd Bennett Field site. The original New York Bight Project plans did not include extensive winter operation, although year round operation was required. Fortunately, the Mobile Calibration Laboratory was designed to withstand the Brooklyn, New York, winter with only a minimum of special winterizing (insulating and installing strip heaters on the connecting water pipes, insulating and installing an automatic heater for the locally supplied water conditioning facilities).

9. Domestic and International Business Administration of the Department of Commerce. The Domestic and International Business Administration of the Department of Commerce asked NOIC to directly assist with the technical evaluation of applications for duty-free entry of various marine equipment as specified in Public Law 89-651, the Educational, Scientific and Cultural Materials Importation Act of 1966.

MARINE INSTRUMENT CALIBRATIONS



CALIBRATIONS PERFORMED BY THE REGIONAL CENTERS PER FISCAL YEAR

20. Instrument Calibrations

10. General Services Administration's Federal Supply Service. The Federal Supply Service of the General Services Administration solicited comments from NOIC on final draft of the proposed federal supply schedule for Environmental and Oceanographic Instrumentation. The schedule is now in use incorporating the comments.

Under its base program, NOIC provided the marine community with various services: the Testing Program tested and evaluated four current measurements - three acoustic, three conductivity/salinity/temperature/depth (CTD/STD), five in situ water quality and one wave instrumentation systems. This effort led to a total of 12 technical publications being produced, and over 3500 of these publications distributed to interested persons; the Failure Analysis Initiation Log (FAILog) Program's development and beneficial utilization evaluation, performed by NOIC's Analysis Program, was completed and turned over to the Office of Fleet Operations for operational use. NOIC will continue to use the FAILog Program, but it will be managed by the Office of Fleet Operations; and the Metrology Program developed and distributed new calibration procedures for the Aanderaa Recording Current Meter, the inductive laboratory salinometer and CTD/STD (including sound speed) systems to the marine community. The reversing thermometer calibration procedure was also reviewed and updated, making it more applicable to the conditions found in the Regional Calibration Centers.

Studies were completed on the methodology for determining the pressure effects and time response of thermal devices by the Metrology Program. Even though temperature is the most measured ocean parameter and thermal devices are quite reliable compared to other ocean sensors, the properties of the thermal devices must be determined to insure usable data when temperature is used in computing other ocean parameters. The thermal device studies completed will provide a means of producing the needed temperature data. Salinity-Temperature-Depth (STD) Adjustment and Calibration Facility at Southwest Regional Calibration Center and the STD Test Facility at NOIC Headquarters were tested and accepted, and over 2500 instrument calibrations were provided the marine community by the Northwest, Southwest and Gulf Regional Calibration Centers. This represents a 67% increase in the number of calibrations performed in the previous fiscal year.

NOIC responded to 191 inquiries relating to marine instrumentation from 116 federal, state and local governments, and 20 academic and 55 industrial institutions.

OFFICE OF FLEET OPERATIONS

The Office of Fleet Operations (OFO) provides ship support for NOAA programs and manages the operation, utilization, and maintenance of 25 ships of the NOAA Fleet. Fleet operation schedules have been developed to satisfy program requirements as approved by the Fleet Allocation Council. Direct support of the Fleet has been accomplished by the Atlantic and Pacific Marine Centers in the areas of ship logistics, including manning, maintenance/repairs, equipment and instrumentation acquisition, berthing and shore supply services.

Operations

The Operations Division of OFO provided membership to the Committee for International Telecommunications Standards as the U.S. Department of Commerce representative. Liaison was maintained with several national, international, federal and non-federal organizations in the implementation of diplomatic clearances for NOAA ships visiting foreign waters and ports.

NOAA Ships DISCOVERER, SURVEYOR, and MILLER FREEMAN were reactivated to conduct environmental baseline surveys related to outer continental shelf energy resource research and development activities. NOAA Ship TOWNSEND CROMWELL was reactivated to support National Marine Fisheries Service programs in central Pacific Ocean areas. NOAA Ship GEORGE B. KELEZ was reactivated to support Marine Environmental Systems Assessment activities in Northwestern Atlantic coastal waters. It is a great credit to our field engineering and procurement organizations that the very complex task of detailing and on-site supervising of this extraordinary effort, in the midst of their busiest routine fleet overhaul period, was executed as well as it was.

The OFO Staff and Operations Division coordinated the NOAA Ship MT. MITCHELL's visit to the Washington Navy Yard as host to the Federation Internationale Geometres (FIG).

New NOAA forms entitled, "Request for Ship Time and Sailing Schedule, NOAA Fleet," were developed for operational use.

In response to requests from the Associate Administrator for Marine Resources (MR), the Office of Management and Budget (OMB), and program areas within NOS, numerous cost accounting projects were developed reflecting actual and projected operational costs for each class of ship.

OFO and the Marine Centers worked cooperatively in the consolidation of input to NOAA's Contingency Plan for Emergency Preparedness.

Marine Engineering

The Marine Engineering Division, through its Ship and Electronics Branches, continued efforts to be responsive to central NOAA needs in matters relating to ship and small craft construction, alteration, maintenance, and repair, and to provide information for adequate funding for ship and electronics systems.

Agreement was reached with the Marine Data Systems Project for transfer of HYDROPLOT systems management to the Marine Engineering Division. This includes hardware replacements and software developments and changes. A less well-controlled area is the remainder of the Fleet's computerized data acquisition systems. The Division is assuming coordination and control of all DAS software.

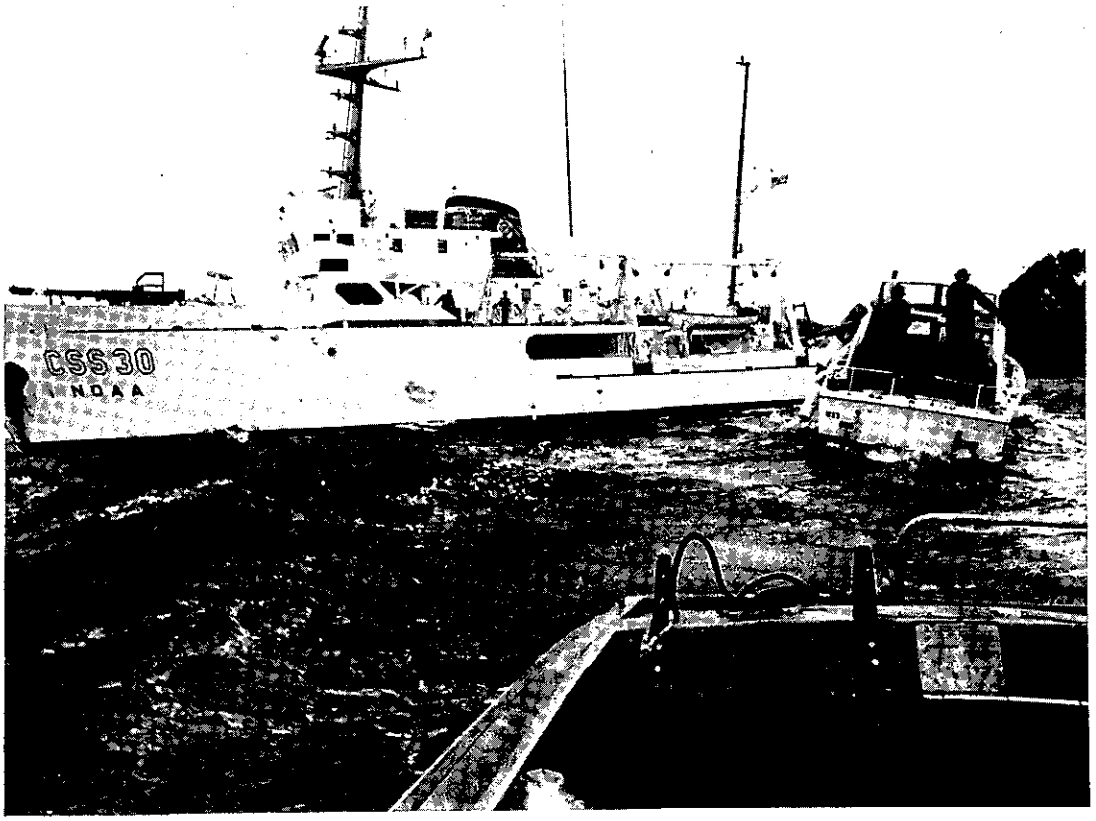
In new ship construction initiatives, an earlier advanced design study led to an in-house concept for a 175-foot coastal research ship. This ship, along with five other hulls which could be modified to provide essentially the same capabilities, was examined by the Maritime Administration and construction cost estimates provided. This work was done in anticipation of a 10-year NOAA construction program. Recent guidance has resulted in deferral of the coastal research ship in favor of hulls which are principally trawlers. The Division is presently developing a "stretched trawler" of about 160 feet length overall, based on an existing design for a 134-footer, which will provide limited multi-disciplinary research capability without seriously compromising the ship's primary function. Other potential ship procurements should be essentially "off-the-shelf" models.

Marine pollution abatement rules for sanitation devices were published in January by the Coast Guard, completing rulemaking in the vessel pollution areas except for solid waste and air media. Marine Engineering revamped the pollution abatement requirements, reestimated costs, and now has a contract let for two aerobic sanitation systems for installation on NOAA Ships PEIRCE and WHITING this coming winter. The past year has seen some improvements in the development of reliable anti-pollution systems. Much remains to be done, however, in the area of sanitation devices and solid waste systems.

Separation of the Fleet's electronic systems maintenance organization from the ship maintenance function was completed during the past year. General schedule electronic technicians are now in service aboard NOAA Ships WHITING, GEORGE B. KELEZ, DISCOVERER, SURVEYOR, and MILLER FREEMAN. The spin-off, and identification of responsibilities for the new organizations, has had a salutory effect on our electronics maintenance program. Failures of equipment have been systematically documented through increased fleet participation in the FAILog system. Analyses of FAILog data are beginning to permit some predictive capability, which in turn should permit stocking of replacement equipment to minimize loss of productivity. This past year also saw significant progress in documentation of all fleet expenditures directly related to electronic systems management. Much effort has gone into preparation of issue papers and other documents in support of our budget initiative for a really adequate electronic support program.

The cost escalations experienced by users of marine construction, repair, and equipment services over the previous two years have continued. There was some indication of a 20% reduction in the escalation for services, while marine equipment and parts costs escalated at a higher rate. The cost of a list of recommended engine repair parts is a typical example, rising 36% in FY 1975.

The Fleet Inspection Team accomplished detailed shipboard inspection throughout the year to insure maximum operational capability of the fleet.



21. NOAA Ship McARTHUR

NOAA FLEET

CLASS	SHIP	OVERALL LENGTH	MARINE CENTER	HOME PORT	PROGRAM USE
Centrally Managed NOAA Ships					
I	OCEANOGRAPHER (OSS 01)	303'	PMC	Seattle	Ocean Investigations
I	DISCOVERER (OSS 02)	303'	PMC	Miami	Environmental Assessment
I	RESEARCHER (OSS 03)	278'	AMC	Miami	Ocean Investigations
I	SURVEYOR (OSS 32)	292'	PMC	Seattle	Environmental Assessment
II	FAIRWEATHER (MSS 20)	231'	PMC	Seattle	Hydrographic Surveys
II	RAINIER (MSS 21)	231'	PMC	Seattle	Hydrographic Surveys
II	MILLER FREEMAN (FRS 21)	214'	PMC	Seattle	Environmental Assessment
II	MT. MITCHELL (MSS 22)	231'	AMC	Norfolk	Hydrographic Surveys
III	PEIRCE (CSS 28)	163'	AMC	Norfolk	Hydrographic Surveys
III	WHITING (CSS 29)	163'	AMC	Norfolk	Hydrographic Surveys
III	McARTHUR (CSS 30)	175'	PMC	Seattle	Hydrographic Surveys
III	DAVIDSON (CSS 31)	175'	PMC	Seattle	Hydrographic Surveys
III	OREGON II (FRS 32)	170'	AMC	Pascagoula	Living Resources Survey
IV	GEORGE B. KELEZ (CRS 41)	177'	AMC	Norfolk	Coastal Research
IV	ALBATROSS IV (FRS 42)	187'	AMC	Woods Hole	Living Resources Survey
IV	TOWNSEND CROMWELL (FRS 43)	163'	PMC	Honolulu	Living Resources Survey
IV	DAVID STARR JORDAN (FRS 44)	171'	PMC	San Diego	Living Resources Survey
IV	DELAWARE II (FRS 45)	155'	AMC	Sandy Hook	Living Resources Survey
IV	FERREL (ASV 92)	133'	AMC	Norfolk	Estuarine Investigation
V	RUDE (ASV 90)	90'	AMC	Norfolk	Hydrographic Surveys
V	HECK (ASV 91)	90'	AMC	Norfolk	Hydrographic Surveys
V	OREGON (FRV 51)	100'	PMC	Kodiak	Living Resources Survey
V	JOHN N. COBB (FRV 52)	94'	PMC	Seattle	Living Resources Survey
VI	MURRE II (FRV 63)	86'	PMC	Juneau	Living Resources Survey
VI	GEORGE M. BOWERS (FRV 65)	74'	AMC	Miami	Living Resources Survey
Program Managed NOAA Ships					
VI	RORQUAL (FRB 61)	65'		Sandy Hook	Living Res.Surveys(NMFS)
VI	KYMA (FRV)	65'		Sandy Hook	Living Res.Surveys(NMFS)
VI	VIRGINIA KEY (ARV 80)	65'		Miami	Coastal Oceanography(ERL)
VI	SHENEHON (ASV 93)	65'		Detroit	Great Lakes Research(NOS)

HPT = Horsepower-tonnage=numerical sum of vessels shaft horsepower plus gross tonnage

Class I	3501 - 9000 HPT	Class IV	1001 - 2000 HPT
Class II	3501 - 5500 HPT	Class V	501 - 1000 HPT
Class III	2001 - 3500 HPT	Class VI	up to 500 HPT

ATLANTIC MARINE CENTER

The Atlantic Marine Center (AMC), located at Norfolk,Virginia, provides operational direction and logistic support to the 12 NOAA vessels operating off the Atlantic and Gulf Coasts. AMC's ability to effectively administer NOS/AMC oriented programs, services, products and activities has been greatly improved due to increased liaison within and public relations throughout the theater of operations.

Increased participation in the U.S. Power Squadron's Cooperative Charting activities by shipboard and office personnel contributed greatly to NOS/AMC field operation, public relations and improvement in quality of chart correction reports.

Marine Engineering

The Marine Engineering Division wrote, edited and monitored all overhaul specifications, acted as ship and base representative during contract periods, and provided technical support to the fleet, the Atlantic Hydrographic Party, and the AMC base. AMC base repairs, Electronic Engineering Division modifications, and other miscellaneous repairs were monitored.

Electronic Engineering

Reorganization of the Electronic Engineering Division, establishing areas of depot maintenance responsibilities and more realistic liaison assignments based on increased personnel, has resulted in greater efficiency. The rotating teams of Electronics Technicians established aboard NOAA ships for the first time (WHITING, KELEZ, and DISCOVERER) seem to be benefitting both ships and technicians. Depot level maintenance is now performed on 15 units: DEC PDP 8/e computer, HS Reader/Punch and Hydroplot Controller, NOS Data Loggers, Raytheon 723B and 723B Fathometers, Ross Digital Fathometer, Del Norte and Radist Horizontal Positioning Systems, Hazlow/Panalogic Navigation Interfaces, SR-206/210 Communications Stations, Teletypes, Roytron HS Punch and Tide Gages. The TICUS System was modified and refurbished. A shop system was obtained for adequate support of HYDROPLOT/HYDROLOG gear. Three new HYDROPLOT systems were installed and a new HYDROPLOT relay expander network designed and installed on all new H/H systems. The MT. MITCHELL CERC System was removed and modified according to PMC design. In conjunction with MED, support was provided the RESEARCHER to repair storm-damaged transducers. All RESEARCHER teletypes were overhauled during the yard period. Support was also provided to the PEIRCE and WHITING. A Radio Direction Finder (RDF) System for the FERREL was developed on short notice to aid in the recovery of adrift TICUS buoys. Reactivation of the DISCOVERER was a major accomplishment of AMC. Refurbishment and replacement of electronic equipment and Electronic Technician (ET) staffing and training was supported by the Division. Additional support was provided aboard during the trip to Seattle. The EED also assisted with special equipment purchases for the reactivation of the SURVEYOR and MILLER FREEMAN.

22. Headquarters, AMC

Operations

The Operations Division provided support for all areas of hydrographic and oceanographic operations. The upgrading of surveying assistance to hydrographic vessels, providing initial location and control prior to the ships' deployment to a given area, greatly speeded operations. Control sites and signals are constructed and work begun as close as possible to the arrival time of ships at the working grounds. The take-over of inventory and maintenance control for all surveying instruments assigned to AMC has provided both the information on a particular vessel's requirements, and the capability to conduct in-house surveying operations. The use of automated typing equipment and secretarial skills has increased the quantity and variety of clerical support services to the AMC vessels. The delays and unnecessary preparation which characterized the Brazilian portion of the AT&T Survey clearly indicated that every possible attempt should be made to obtain diplomatic clearances and iron out international problems prior to the beginning of future surveys of this type. Assistance furnished AMC by NOAA headquarters in obtaining permission for an electronic control site from a state parks department saved valuable time, and increased high level liaison should be stressed for future projects. The eleven and three schedule and the large scale combined operations concept, originated during SCOPE, have played a prominent role in increasing production.

In support of the National Marine Fisheries Service's Marine Monitoring Assessment & Prediction (MARMAP) effort for fisheries assessment, piggyback fisheries operations were included with other program activities on the MT. MITCHELL and DISCOVERER for the first time. Activities included Neuston net tows for assessment and distribution of fish eggs and larva in marine waters. Data collection and disposition of samples were coordinated through the MARMAP Field Office, Narragansett, Rhode Island.

Processing

EDP Branch's automated processing of hydrographic survey data was the prime area of attention. Secondary tasks, such as refinement of the software system, were also sucessfully accomplished. Seventy-six projections were prepared for the MESA Project and forty-four automated hydrographic surveys were converted to magnetic tape and transmitted to the NOS office, Rockville, Maryland. The "EXCESS" program, which identifies overlapping soundings, was revised to give special consideration to plotted depths with a leading or trailing "1" character. This permits many more depths to be automatically selected for plotting. The wire-drag program was modified to fit a catenary to approximate the wire bight. The resultant plot is only a preliminary aid to the verifier evaluating the survey.

The Verification Branch stressed training during the year in order to cope with the large backlog of unverified surveys and the increasing flow of new field surveys. (Sixty-nine surveys were received from the various field units). Rotating cartographic technicians were assigned to ships or field units to participate in actual field operations as part of the program to gain experience and a better understanding of the overall effort. Exposure to the various operations is of tremendous benefit to increase the verification effectiveness of the technicians. Cartographic assistance was furnished to the MT. MITCHELL's AT&T Cable Route Survey, comprised of 19 OSS sheets which were smooth plotted and verified. One cartographic technician was loaned to the National Marine Fisheries Service at La Jolla, California, for three months, and one was sent to the Middle Atlantic Coastal Fisheries Center, Highlands, New Jersey, for two and one-half-months. Twenty-four SCOPE surveys were completed, and remaining verification of this project will be completed by the end of the calendar year. Five smooth sheets, complete with photo-bathymetric additions, and two field investigation sheets, for OPR-51, were verified and forwarded to complete that project. Fifty-one registered smooth sheets, including one wire drag survey, were completed and forwarded to Rockville for review. Three wire drag field investigation sheets and three hydrographic investigation surveys were completed, representing an increase of fifty-eight percent in production of verified smooth sheets over last year. Increased production resulted from training, use of mylar for smooth sheets, and the improved quality of field work.

Coastal Mapping

The Field Survey Branch remained active in support of five different programs.

Photo Party 60 was primarily engaged in field edit operations for the Florida Seaward Boundary Mapping Program, a cooperative program with the State of Florida on a 50-50 funding basis. The party field edited 16 manuscripts; assisted Photo Party 65 in the installation, servicing and removal of tide gages in the Elliott Key, Florida, area for use by the Justice Department; premarked Job CM-7504, Port Canaveral, Florida; and manned tide gages for tide controlled photography on Job CM-7201 in the Florida Keys. The party located the aids to navigation on the south side of Dodge Island at the Miami Ship Base.

Photo Party 61 provided support for the Atlantic Hydrographic Party (AHP) Launch 1260 and field edit operations, and field edited 16 manuscripts.

Photo Party 62 established control in support of hydrographic operations for the MT. MITCHELL, WHITING and PEIRCE, premarked horizontal control and field edit. The party's work ranged from the Hudson River, New York, to Puerto Rico and the Virgin Islands. One hundred and thirteen traverse stations, five Raydist or Sea Fix stations; and six calibration stations for ship use were established. Eighty-one horizontal control stations were premarked prior to aerial projects. Field edit was accomplished on 58 manuscripts for seven different projects.

Photo Party 63 performed field surveys for compilation of Storm Evacuation Maps for the Emergency Warning Branch of the National Weather Service, and completed 10 manuscripts.

Photo Party 64's HUD Mapping duties have now been completed and the party is no longer in operation.

Photo Party 65 installed 117 ADR tide gages, removed 100 gages, collected 396 monthly records, established approximately 350 new tidal bench marks, and made routine checks and/or repairs to 117 gages for the Florida Seaward Boundary Mapping Program. The party assisted with tide controlled photography on Job CM-7201 and established 26 gages for tidal datum required by the Florida Department of Transportation for bridge construction in the lower Keys.

Airport Survey parties completed the field survey for 148 airports, located 129 ILS components, 37 radar sites and five VORTAC's. Verification was completed on 153 airports.

Most of the resources of the Photogrammetric Branch were concentrated on compilation of Coastal Maps and Airport Obstruction Charts. However, for the first time, photobathymetric mapping constituted a significant portion of our total mapping effort. Combination topo-bathymetric maps were compiled of the Beaufort and Oregon Inlets, North Carolina, for the Army Engineers. Several square miles of photobathymetry were supplied to the WHITING in support of classical hydrography in the Virgin Islands.

The management improvement suggestion adopted three years ago, providing for the archiving of manuscripts without recourse to scribing and stick-up, has made it possible to apply available field edit to all of the current and most of the backlogged projects. Plans have been formulated to ease the burden shifted to Final Reviewers so that projects may be cleared from files and forwarded to Rockville for archiving.

There was 365 sq. mi. of coastal mapping; 42 sq. mi. bathymetry; 27 sq. mi. topography; and 62 airport charts compiled. Final review was completed on 182 sq. mi.; field edit application comprised 893 sq. mi.

Tide Branch provided technical and logistical support for field parties and ships installing and maintaining tide stations in the Gulf and Atlantic Coasts and the Caribbean Islands. There are 133 primary control stations in this net. There were 186 tide stations serviced; 63 installed; 210 tidal bench marks established; 711 tidal bench marks leveled; and 29 tide stations removed.

Cooperative and reimbursable projects included work for the Maryland Geological Survey, National Aeronautics Space Administration, MESA, Corps of Engineers, and South Carolina Coastal Boundary Program. Projects DELMARVA, North Carolina and New York Bight have been very active, beginning in February 1975 with the installation of eight tide stations for a period of two years.

Support pertaining to the tide gage installation, trouble shooting and supplies for ships and shore parties rendered for the year were: SCOPE; MESA; DELMARVA; Cape Fear River, North Carolina; TICUS, Lower Chesapeake Bay, Oregon Inlet, and Beaufort Inlet, North Carolina; NE Atlantic Coast; Portsmouth, New Hampshire; Virgin Islands; and New York Bight.

The Tide Branch consists of six people, four fulltime field positions and two office complement which spend sixty percent of the time in the field doing reconnaissance maintenance and generally supporting field parties.

Repairs and Modifications

The ALBATROSS IV underwent routine repairs dockside in Newport, Rhode Island, in December 1974. Repair consisted of gantry quadrant bearing renewal, chain tightening plate alteration and inflatable life raft outfitting and inspection.

The GEORGE M. BOWERS received emergency repairs for correction of a leak and marine gear repairs. The vessel was also drydocked for annual painting and shipyard repairs.

The OREGON II was drydocked for annual overhaul and the DELAWARE II shipyard repairs consisted of trawl winch repairs and other routine items.

Extensive MESA modifications were accomplished on the GEORGE B. KELEZ. Emergency dockside repairs were performed to correct electrical and hydraulic problems.

Alongside repairs to the FERREL consisted of piping and vent system installations, modification and installation of TICUS System monitoring equipment and other items accomplished by the ship's crew.

Dockside repairs to the MT. MITCHELL consisted of engine and generator repairs, boat davit modifications, and other routine repairs.

23. Docking Area, AMC

The PEIRCE was drydocked and painted. Other shipyard items included tailshaft, bearing, double drum winch, engine and piping repairs. Alongside repairs consisted of generator, sewage system, and CPP system repairs performed at AMC.

The WHITING was drydocked and painted. The ship was repainted later in the year at no cost to the government, as the paint manufacturer accepted responsibility for bad paint used in previous painting of the WHITING and the PEIRCE, which will also be painted. AMC dockside repairs included CPP System and main engine repairs as well as boiler and evaporator cleaning.

The RUDE & HECK shipyard repairs consisted of drydocking and painting, generator overhaul, piping repairs, and overhaul of Raydist antenna. Dockside repairs included crane and engine repairs. Emergency engine overhaul and electrical repairs were accomplished as a result of the sinking of the HECK's Launch 1275.

The RESEARCHER was drydocked in the fall for painting, tailshaft and CPP repairs, bow propulsion overhaul, engine and generator repairs, and transducer repairs and installations. In May, she was again drydocked for emergency repairs to correct damage to the NBES dome, shafts and propellers resulting from grounding of the vessel, and to correct generator problems.

Launch repairs consisted of engine overhauls for Launches 1255 and 1257. Launch 1257 underwent routine drydocking repairs and painting. Annual repairs and maintenance were accomplished on Launches 1207, 1261, and 1277. Launch 1207 was automated, a new engine was installed in Launch 1260, Launch 1002 repairs were completed and several ships' launches underwent routine maintenance.

Vessel Operations

DISCOVERER. The highlight of the year was the reactivation of the DISCOVERER. The vessel was berthed at AMC in an inactive status during FY 1975. Early in FY 1975 repairs commenced for reactivation of the vessel. Dockside repairs at AMC were accomplished to prepare the ship for getting underway for further repairs at a shipyard. On November 13, under the command of RADM A. C. Holmes, a successful one-day cruise was conducted prior to arriving at the shipyard for repairs. During this contract period, the ship was drydocked and painted. Other repairs included overhaul of three ships' service generators, conversion of fuel tank to a sewage holding tank, and reduction of topside weight by removal of flying bridge wings. At the end of repairs the DISCOVERER returned to AMC where interior modifications were completed. Sea trials were conducted March 17-18 and final preparations accomplished. The ship, under the command of Captain Clinton D. Upham, departed AMC for Seattle, Washington, where she arrived April 15. She sailed May 8 after an inport period for Alaska to engage in operations on the Marine Environment Assessment Project (MEAP) in the Bearing Sea.

MT. MITCHELL. The MT. MITCHELL, commanded by Commander Ronald M. Buffington, was engaged in ship and launch hydro operations off the southern coast of Georgia and northern coast of Florida on OPR-436 (SCOPE) from July 1 through October 9; participated in the Federation Internationale des Geometres (F.I.G.) in Washington, D.C., September 6-17. After her inport period at AMC (October 11, 1974 through January 5, 1975), the ship departed running a trackline for AT&T from Jacksonville, Florida, to the U.S. Virgin Islands. Hydro operations resumed on OPR-423 off the south coast of Puerto Rico in the Salinas area from January 14 to April. On April 7, operations commenced on SP-AMC-2-MI-75, AT&T Cable Route Survey, which was completed May 14. Tracklines were run to and from the following: West Palm Beach, Florida, to St. Thomas, Virgin Islands; St. Thomas, Virgin Islands to about 300 miles off the coast of Fortaleza, Brazil; St. Thomas, Virgin Islands to 12 miles off Marquetia, Venezuela; Florida City, Florida, to 12 miles off Pt. Barries, Guatemala. The ship was inport at AMC from May 16 to June 9 when she departed to conduct ship hydro on OPR-517, New York Bight, off the southern coast of New Jersey until June 30.

WHITING. The WHITING, commanded by Commander Robert Trauschke, conducted hydro operations off the coast of Georgia on OPR-436 (SCOPE) from July 1 to October 11, 1974, when she returned to AMC for the winter inport period. On August 28, she escorted visiting dignitaries and participated in the sinking of the Liberty Ship USS WEBSTER in the vicinity of the Triangle Wrecks, 31 miles off Cape Henry, assisting in the development of the largest artificial fishing reef in the world. Principal participating agencies included the Virginia Marine Resources Commission, National Marine Fisheries Service, the Tidewater Artificial Reef Association of Virginia, U.S. Navy, U.S. Army Corps of Engineers, as well as NOAA/NOS. After the sinking, the bottom location of the USS WEBSTER was verified for marking on NOS charts. 1975 Field Season began when the ship departed Norfolk on January 21. Hydro operations on OPR-423 off the north coast of St. Thomas, Virgin Islands,and the Mona Passage were conducted from January 26 to April 29. She was inport at AMC from May 5 to May 26 when she departed to conduct hydro on OPR-517 off the coast of New Jersey.

PEIRCE. Commander Joseph Dropp assumed command of the PEIRCE from Commander Ralph J. Land on June 3, 1974. The PEIRCE conducted ship and launch hydro operations off the North Carolina coast from Cape Lookout to Cape Hatteras on OPR-437 (SCOPE) from July 1 to October 20. On October 21, she commenced work on RP-8-PE-74, Continental Margin Sedimentology (COMSED) from Cape Hatteras, North Carolina,to Virginia Beach, Virginia. The project was completed on November 10 and she returned to AMC for the winter inport period. The 1975 field season began when she departed February 18 to engage in operations on OPR-511 (Chart Adequacy Survey) off the Florida Keys. After a short inport period at AMC, April 2-9, the ship was engaged in ship hydro on OPR-517 off the coast of Long Island from April 19 to June 30.

RESEARCHER. The RESEARCHER, commanded by Captain Lavon L. Posey, was engaged in Project GATE from July 1 to September 23, covering a broad area about 400 miles southwest of Dakar, Senegal;she began a trackline September 26 for the Trans-Atlantic Geotraverse (TAG, RP-6-RE-73) from Spanish Sahara, Africa,to Cape Charles, Virginia. After a two day inport period at AMC, she departed for Miami where she remained until February 19 and departed to engage on the MESA Project (RP-1-RE-75) in the New York Bight area. Operations were conducted on RP-2-RE-75, COMSED-Rational Use of the Sea Floor (RUSEF) from March 11 to April 15 along the Continental Shelf from Cape Hatteras, North Carolina,to the New York Bight area. The ship operated on the Bureau of Land Management-CICAR-Currents Project from May 16 through June 30. Captain John O. Boyer assumed command on January 15, 1975.

ALBATROSS IV. The ALBATROSS IV cruise schedule consisted of various surveys for the Northeast Fisheries Center, one for the Mid-Atlantic Coastal Fisheries Center and one Cable Route Survey for AT&T.

DELAWARE II. The DELAWARE II completed a full schedule of cruises after being reactivated in April 1974. The ship hosted the NOAA Corps Fisheries Training Class from the University of Rhode Island and made approximately 20 tows with the training class handling all gear involved.

A camera crew from WGBH, Boston, was aboard November 18 to film the ship's activities for the NOVA Science Series, which was broadcast on various stations in the spring of 1975.

GEORGE M. BOWERS. The GEORGE M. BOWERS, operating out of Miami, conducted various Fisheries' cruises including Scallop Assessment off Cape Canaveral using RUFAS: Spiney Lobster; Plankton Sampling gear testing, and an NOIC cruise testing acoustic releases.

OREGON II. Working out of Pascagoula, Mississippi, the OREGON II's principal cruises involved groundfish studies.

GEORGE B. KELEZ. The GEORGE B. KELEZ joined the AMC fleet upon reactivation in November. After shipyard repairs at Port Everglades, Florida, she operated on the MESA project in the New York Bight area through the end of the reporting period.

FERREL. The FERREL, commanded by Commander Philip C. Johnson, was engaged in MESA operations in the New York Bight from July 1 to November 25 at which time she returned to AMC for the winter inport period. The ship departed AMC March 20 and conducted operations on SP-AMC-1-FE-75, TICUS Reintegration Survey, Lower Chesapeake Bay, Virginia, and vicinity until April 29. Current survey, OPR-513, in the area of Oregon Inlet, North Carolina, was conducted from April 30 to June 17. After a short inport period, June 18-25, she departed for Portsmouth, New Hampshire, to commence operations on OPR-501, Northeast Atlantic Coast Estuaries, Great Bay Phase. Lieutenant Commander C. Dale North, Jr., assumed command April 14.

RUDE & HECK. The RUDE & HECK, commanded by Commander Leonard E. Pickens, conducted wire-drag operations of the sea lanes off Pensacola, Florida, on OPR-479 from July 1 through August 31. September 1 through November 15 was spent on investigations of items on the west and east coasts of Florida, the Florida Keys, and the Chesapeake Bay area on SP-AMC-6-RU-HE-74. They were inport at AMC from November 15 through February 18. Commander Robert Ganse assumed command on October 6. Wire-drag operations were conducted from February 19 to May 19 on OPR-515, Wire Drag, East and Gulf Coast Investigations; May 22 through June 30 on OPR-479 in the vicinity of Sabine Pass, Texas.

Atlantic Hydrographic Party

Launch 1260 (28 ft. Monark, aluminum hull, gas power) - OPR-409, Potmac River; OPR-510, Gunpowder River, Maryland; OPR-436, Cape Fear River, North Carolina, OPR-492, Delaware Bay.

Launch 1270 (22 ft. Pen Yan, fiberflass hull, gas power) - OPR-409, Potomac River; OPR-505, NW Coast of Florida; OPR-512, York, Chester, and Choptank Rivers in the Chesapeake Bay.

Launch 1277 (28 ft. Monark, aluminum hull, diesel power jet drive, automated) - OPR-436, Tybee Roads, Georgia; OPR-437, Cape Fear River, North Carolina; OPR-513, Beaufort Inlet and Oregon Inlet, North Carolina.

Launch 1255 and Launch 1257 (50 ft., steel hull, twin diesel, automated) - OPR-436, East Coast of Florida from St. Augustine to Jacksonville; OPR-508, West Coast of Florida off Clearwater and St. Petersburg.

Summary of Accomplishments

Automated hydrographic surveys verified	51
Special projects and field investigations verified	3
OSS sheets plotted and verified	19
Wire-drag surveys processed and verified	4
Surveys given preliminary inspection prior to automation	53
Wire-drag surveys given preliminary inspection	16

Unverified Surveys on Hand Beginning of FY 75

Automated hydrographic surveys	96
Backlog, manually plotted surveys	10
Wire-drag surveys	7

Surveys Received

Automated hydrographic surveys	53
Wire-drag surveys	16

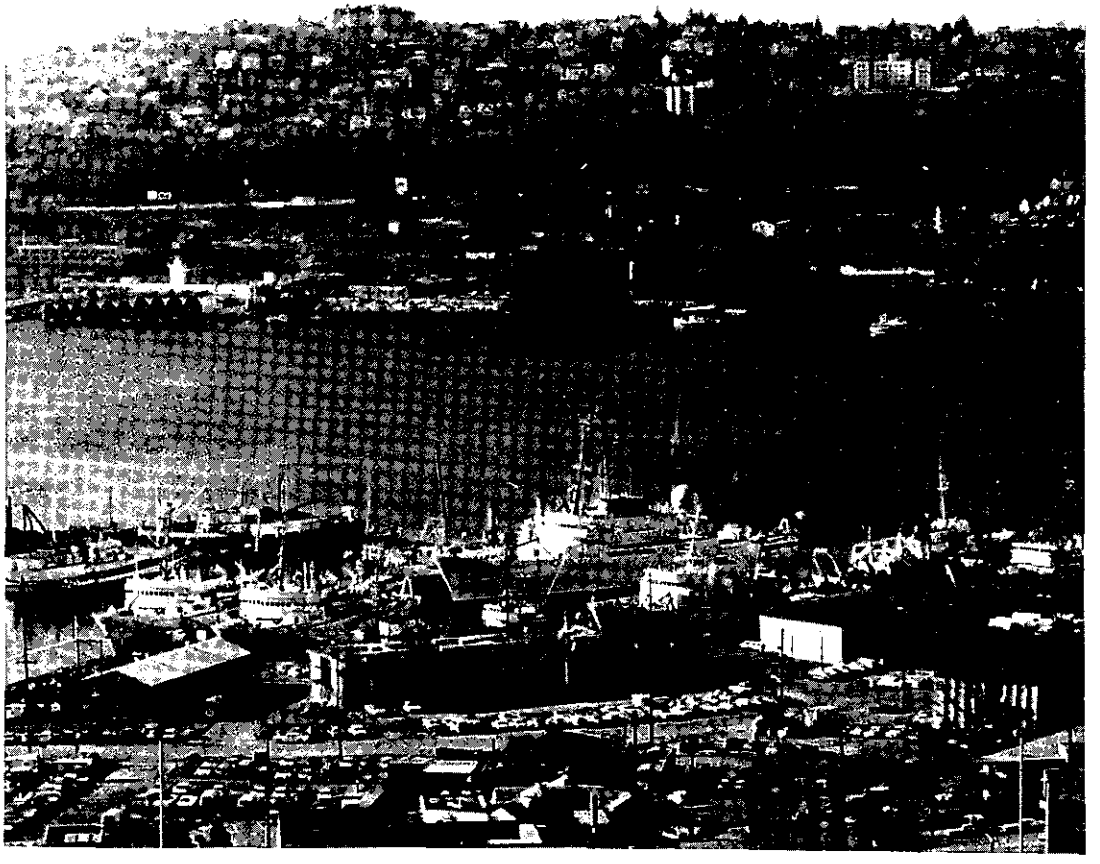
Unverified Surveys Transferred to Rockville

Incomplete hydrographic surveys	1
Hydrographic field investigations	2

Unverified Surveys on Hand End of FY 75

Automated hydrographic surveys	95
Backlog, manually plotted surveys	10
Wire-drag surveys	19
Old manual surveys to be automated and verified	6

PACIFIC MARINE CENTER



24. Docking Area, PMC

The Pacific Marine Center (PMC), located on the eastern shore of Lake Union at Seattle, Washington, provides operational direction and logistic support to thirteen NOAA vessels operated by the National Ocean Survey along the West Coast.

These vessels are operated in support of various NOAA programs including NOS Marine Surveys and Maps, ERL/PMEL, ERL/OCSEP, NMFS, and NWS.

A significant increase in responsibility was assumed this fiscal year with the reactivation of the SURVEYOR, TOWNSEND CROMWELL, and the MILLER FREEMAN. In addition, the transfer of the DISCOVERER from east to west coast operations provided for additional logistic support over and above past operations. As a matter of record, PMC has experienced an increase in budget of 106%, an increase in the number of ships of 86%, with an increase of only 13% in base personnel, all over the last 6 years.

Marine Engineering

The Marine Engineering Division experienced an extremely demanding and active year characterized by the reactivation of four ships (KELEZ, CROMWELL, FREEMAN and SURVEYOR), and the transfer of the DISCOVERER to the Pacific Marine Center.

Routine drydocking and repairs were accomplished on the FAIRWEATHER, JORDAN, OREGON, COBB and the MURRE II. Dockside repairs at PMC were also accomplished on the OCEANOGRAPHER, RAINIER, DAVIDSON and McARTHUR, including overhaul of the ship service generators on the RAINIER and McARTHUR. Due to an operational casualty, the RAINIER required emergency drydocking to repair propellers. ABS loadline certificates were renewed on the OCEANOGRAPHER, FAIRWEATHER, RAINIER, SURVEYOR and the FREEMAN.

Reactivation of the four ships included drydocking of the KELEZ and repairs to prepare that ship for transfer to AMC. The CROMWELL was drydocked and modified with installation of new bait tanks, two new 175 KW generators, a soundproof engine control room, a new aftermast and a modified boom arrangement. In addition, upgrading of the ship's hydraulic system was accomplished.

The MILLER FREEMAN was drydocked and completely repainted. In addition, PMC let its largest single ship contract ($914,000) for completion of the living and office spaces and outfitting for combined fishing and oceanographic projects on the MILLER FREEMAN. This office accomplished the conceptual engineering work for the modification based on the working drawings prepared by Nickum and Spaulding Associates. Modifications included: addition of fish sorting and processing equipment on the upper and second deck; installation of a new freeze locker; installation of a new bi-pod mast and 10 ton boom; renovation of the ship's hydraulic system; installation of a net reel; installation of six new staterooms; new mess, new office, and new library; and installation of a sound proof control room in the engineroom.

The SURVEYOR was reactivated with considerable difficulty, resulting from the continuing problem in obtaining engineers' sources. Contracts were let on the SURVEYOR totalling in excess of $500,000, far exceeding any funds expended on this ship in one fiscal year. Major repairs included: drydocking; boiler overhaul; generator overhaul; hydro launch and whaleboat overhaul; installation of a helicopter fueling system with JP-5 storage tanks; switchboard overhaul; overhaul of boat and cargo cranes; complete represervation of bilges in the engineroom, boiler room and shaft alley; and considerable topside painting.

Electronic Engineering

Efforts continued to establish viable electronics support for the units based at PMC. These include the establishment of a usable electronic equipment inventory, preventive maintenance program, support programs for individual equipment, and training programs.

Reactivation of the SURVEYOR, MILLER FREEMAN, and TOWNSEND CROMWELL, the subsequent transfer of the DISCOVERER to PMC, and complex instrument procurement for the energy related research have diverted much of the available manpower from the planned activities to improve the conditions of the existing equipment.

In spite of the increased activity, the division has continued to pursue the goals set when it was established in FY 1974. The electronic equipment inventory has been compiled and placed on IBM cards for convenient listings. Maintenance requirement procedures for various equipment have been established, and increased participation of all units in the FAILog and Engineering Field Change reporting system has improved standardization of equipment; these programs have eased maintenance and improved reliability. Other major activities and accomplishments include:

1. Installation of HYDROPLOT systems aboard the SURVEYOR and DAVIDSON;

2. Installation of CERC system and upgrading of engineroom sensors on the RAINIER;

3. Procurement and installation of Raydist aboard the SURVEYOR and RAINIER;

4. Installation of a net sounding system aboard the MILLER FREEMAN;

5. Improved level of support for tide gages.

The major influence on electronic support improvement has been the staffing of high caliber rotating electronic technician teams aboard the SURVEYOR, DISCOVERER, and MILLER FREEMAN, and new technicians and instrument repair personnel at the base. The new personnel have made great strides in increasing the availability of equipment to satisfy mission requirements. The units directly affected by the new personnel have shown a well above average state of electronic readiness and the level of support of all units based at PMC has been increased.

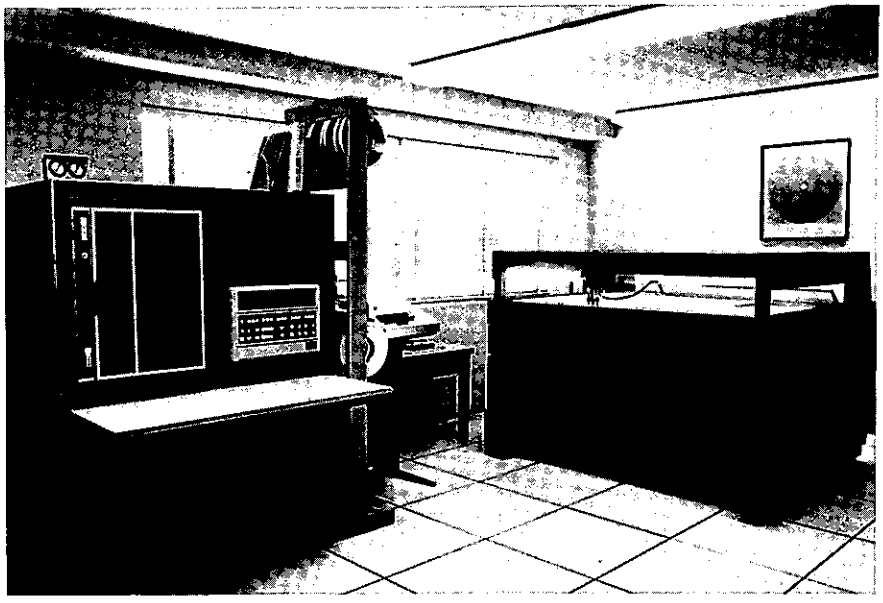
Operations Division

The Operations Division has primary responsibility for the coordination of operations and support activity of NOAA vessels based along the West Coast. Project Instructions are finalized for implementation in compliance with the policies and programs of the National Ocean Survey, the Environmental Research Laboratory, and the National Marine Fisheries Service. Progress is monitored and logistical support is provided such that all instructions are carried out as efficiently as possible. As part of this support, a base radio station (KVJ) provides daily contact with the vessels during periods of deployment. To support the survey vessels and to provide additional survey services to NOS, a geodetic and photogrammetric field party is based at PMC. Also under the purview of this division is the Pacific Tides Party and a Technical Services staff. Through the efforts of this latter

activity, PMC has become a principal contact point for increased public awareness for information relating to NOS products and services for the entire West Coast. The reinstallation of retail sale of nautical and aeronautical charts and related publications has contributed to this awareness. Increased activity with the U.S. Power Squadron and the U.S. Coast Guard Auxiliary has been reflected by the general improvement in the quality and quantity of Cooperative Charting reports received from these organizations.

Processing

The Processing Division at PMC is responsible for the verification and plotting of hydrographic surveys conducted by PMC ships. Processed surveys are transmitted to Marine Charts Division, Rockville, for incorporation in the published nautical chart series.



25. Digital Plotting System, PMC

A backlog of 70 unverified surveys was carried over into FY 1975, and 40 new surveys were received from PMC ships. A total of 68 surveys cleared the verification process during the year, leaving a 48-survey backlog to be carried over into 1976. In addition to the processing of current surveys, the division has been assigned to process a number of previously unverified surveys from the Rockville backlog.

The implementation of the new electronic data processing system has been a continuous effort throughout the year. The Harris 6024/5 (formerly Datacraft 6024/5) was upgraded to requirements as specified in initial

feasibility studies by the addition of one 10.8 M byte disk and 16K memory. One alphanumeric cathode ray terminal for verification purposes was added to the system. Power to the system is to be stabilized by the installation of an electric motor-generator in October 1975. Software development for the replacement of the IBM 1620 system is 80% operational. Target date for total replacement is mid FY 1976.

26. Computer System, PMC

It is anticipated that full implementation of the new electronic data processing system will yield benefits in the timeliness and quality of verified surveys. Training of division personnel to exploit the capabilities of the system will be continued. Emphasis will be placed on the qualitative aspects of the processing system, including increased attention to incoming data. With the dimishing backlog and improved capabilities, it is anticipated that a more constructive interchange of information between this division, the ships, and the chart compilation function will be realized.

Field Party Activities

At the beginning of the fiscal year the PMC two-man field party was occupied installing tide gages and establishing triangulation stations in Icy Bay and Yakutat Bay, Alaska. This was done in preparation for aerial photography scheduled in 1975 and hydrographic surveys planned for 1976. Two triangulation stations were also established on a reimbursable basis for a consortium of 33 oil companies conducting geophysical surveys in the area. This project continued to late August. On return to Seattle, mark

maintenance projects were completed in the Puget Sound area. This involved moving of triangulation stations, location of aids to navigation, and bench mark maintenance.

In October and November, field operations were conducted to determine photo-elevation points for nautical chart mapping of the Snake River, Lower Granite Pool and Dam, Washington-Idaho. On return to Seattle, the party performed mark maintenance of the USN Trident site, Bangor, Washington.

During the winter, party personnel conducted training classes in photogrammetry and geodesy for junior officers and survey technicians of the PMC fleet. In February, the party assisted a Canadian hydrographic survey project. March activities included measuring old triangulation lines in the vicinity of Tacoma Narrows, and assistance in measuring the metric tape base at the University of Washington.

The field party returned to Alaska in the spring and provided shore-based geodetic support for the Ship SURVEYOR in the Gulf of Alaska, and geodetic support to the Ship DAVIDSON on the special Navy project at Montague Island. In June, panels were installed over horizontal control stations at Icy Bay, Yakutat Bay, and Cook Inlet in advance of aerial photography. The party remained in Cook Inlet through the end of the fiscal year to support the Air Photo Mission in tide controlled photography.

Pacific Tide Party

The Pacific Tide Party continued to operate the nation's network of control tide stations in the Pacific Ocean basin. Support of this program entailed the construction and maintenance of tide stations, leveling, hiring and training of tide observers, furnishing supplies, scanning monthly marigrams for quality control, and forwarding information on to Rockville for processing.

Support of the Tsunami Warning System in the maintenance and operation of tsunami tide stations continued. Telemetering at tide stations was inspected and maintained for the National Weather Service. A report for each station inspected was submitted to the National Weather Service outlining equipment, communications, and tsunami reporting procedures to Honolulu Observatory. At the request of the National Weather Service, four foreign tide (tsunami) stations were inspected during the year.

In the Puget Sound area, assistance and installation and inspection of tide stations was rendered in support of the NOAA Ship McARTHUR.

Reimbursable projects were completed in San Francisco Bay, the Tijuana River Estuary, and the Siuslaw River. At the end of the fiscal year, a tide gage was installed at Prudhoe Bay, Arctic Ocean.

The present complement of the Pacific Tide Party is three commissioned officers and two civilians, one of whom is part time.

Vessel Operations

OCEANOGRAPHER. The Ship OCEANOGRAPHER, commanded by Captain William Barbee, was involved in the Global Atmospheric Research Project - Atlantic Tropical Experiment (GATE) at the beginning of the fiscal year. This project was an intensive international study of the tropics, with emphasis in the North Atlantic Ocean. The OCEANOGRAPHER occupied positions within an area centered about 500 nautical miles southwest of Dakar, Senegal. The ship departed Dakar for Seattle via the Panama Canal on September 24. XBT drops were made during the return trip in support of the IGOSS program. The 1974 field season ended when the ship arrived at Seattle on October 18.

The OCEANOGRAPHER sailed from Seattle for the Gulf of Alaska on January 27 to begin operations on the Outer Continental Shelf Energy Program (OCSEP). The primary objective of the cruise was the retrieval and deployment of physical oceanographic instrumentation. The ship completed work on the project and returned to Seattle on March 5.

The OCEANOGRAPHER again departed Seattle on April 15 to commence Deep Ocean Environmental Studies (DOMES) in the North Pacific centered about 15°N, 126°W, approximately 1,000 miles west of Mexico. The DOMES program is designed to acquire information necessary for independent assessment of the impact on the marine ecosystem before commercial mining operations begin. Inport during the project was San Diego. OCEANOGRAPHER returned to Seattle on June 6, and sailed again on June 19 to commence Ocean Atmosphere Response Studies (OARS) off the coast of Oregon. Operations on OARS continued through the end of the fiscal year. XBT observations were obtained by the OCEANOGRAPHER all through the year where possible in support of the IGOSS program.

SURVEYOR. The SURVEYOR was reactivated and sailed under command of Captain Kenneth MacDonald from Seattle on April 1 to participate in the Outer Continental Shelf Energy Program (OCSEP) in the Gulf of Alaska. The primary mission of the ship was geophysical work in support of the U.S. Geological Survey and intertidal sampling for the National Marine Fisheries Service. All operations were completed and the ship returned to Seattle on June 15. The SURVEYOR went immediately to Lockheed Shipyard for repairs during the remainder of the fiscal year.

DISCOVERER. The DISCOVERER was reactivated at AMC and sailed for PMC under command of Captain Clinton Upham on March 18. The ship transited the Panama Canal on March 30 and arrived at PMC on April 15. The ship sailed from Seattle for the Bering Sea on May 8 for operations on OCSEP. The primary objectives were to sample the biologically active area adjacent to the Bering Sea ice edge and to sample the Southeast Bering Sea and Bristol Bay utilizing Conducting Temperature and Depth (CTD) casts, Niskin bottle hydrocasts, plankton tows, grab samples, and bottom cores. The ship successfully completed her mission and returned to Seattle on June 17. The DISCOVERER remained alongside at PMC for the remainder of the fiscal year.

TOWNSEND CROMWELL. The TOWNSEND CROMWELL was reactivated and sailed from Seattle under command of Commander Merrit Walters on April 28 to commence operations on OCSEP in the Gulf of Alaska. The specific objectives were to occupy certain of the standard 59 CTD stations, perform combinations of biological-chemical operations, and geological bottom sampling. The ship completed operations in the Gulf of Alaska and returned to PMC on June 11. The TOWNSEND CROMWELL departed Seattle on June 19 to conduct Albacore-Oceanographic investigations in transit to Honolulu through the end of the fiscal year.

FAIRWEATHER. The FAIRWEATHER, under command of Commander Charles Burroughs, conducted hydrographic survey operations in the vicinity of Kalgin Island, Upper Cook Inlet, Alaska, from July 1 to August 29 when she returned to PMC for a brief inport. The ship departed Seattle on September 10 to conduct hydrographic survey operations along the California coast south of Long Beach. FAIRWEATHER returned to PMC on November 8 for the winter inport period. With transfer of the captain to Chief, Operations Division, PMC, Commander Freddie Jeffries assumed interim command until the arrival of Commander Richard Alderman prior to the ship's departure on February 24 to resume hydrographic survey operations along the California coast in the Los Angeles-Long Beach area. The ship concluded operations in California and returned to PMC on April 18 to stage for the Alaska cruise. The FAIRWEATHER again departed Seattle on May 5 and conducted hydrographic survey operations in Shelikof Strait, Alaska, through the end of fiscal year.

The FAIRWEATHER made Expendable Bathythermograph (XBT) drops enroute between all projects in support of the IGOSS program.

RAINIER. The RAINIER, under command of Commander William Jeffers, was engaged in hydrographic survey operations in Knik Arm, Upper Cook Inlet, Alaska, from July 1 to August 29 when she returned to PMC for a brief inport. Change of command to Commander Charles Townsend took place during this period.

The RAINIER sailed from Seattle for southern California on February 19. Hydrographic surveys of Avalon Harbor and the northeast side of Santa Catalina Island were completed. A large scale survey of Isthmus Cove was accomplished using digital sextants, the first use of these instruments on the West Coast. The ship returned to PMC on April 4 for outfitting for the OCSEP project in the Gulf of Alaska.

The RAINIER was converted from hydrographic to oceanographic operations with considerable expenditure of effort and sailed for the Gulf of Alaska on April 21 to commence OCSEP operations. The primary objectives of the cruise were the deployment and retrieval of current mooring arrays, and STD transects. On completion of work in the Gulf of Alaska, oceanographic equipment was transferred to the Ship SURVEYOR and the ship converted back to hydrographic operations prior to commencing hydrographic surveys in Trading Bay, Upper Cook Inlet, Alaska, on May 19. Operations in Trading Bay continued through the end of the fiscal year.

XBT drops were made by the RAINIER enroute between projects in support of the IGOSS program.

DAVIDSON. The DAVIDSON, commanded by Commander Michael Fleming, was engaged in navigable area surveys in Prince William Sound, Alaska, at the beginning of the fiscal year. A special investigation was conducted at Knight Island. All assigned work in Prince William Sound was completed and the ship sailed for Tracy and Endicott Arms on July 30. Navigable area surveys of Tracy and Endicott Arms were completed on October 6. A tagline survey of Skagway Harbor was completed in early October. The DAVIDSON then shifted operations to Duncan Canal, Sumner Strait, Alaska. Hydrographic surveys of Duncan Canal were completed and the ship returned to PMC on October 31 for the winter inport.

The DAVIDSON departed Seattle on February 19 for San Diego, California, and the beginning of chart adequacy surveys on the West Coast. Chart adequacy surveys were completed north to Los Angeles-Long Beach and the ship returned to PMC on April 17 to prepare for the Alaska cruise.

The DAVIDSON sailed for Alaska on May 5 and began work on the Amphibious Training Chart Survey at Montague Island, Prince William Sound. Work at Montague Island was completed on June 6 and the ship departed for Cook Inlet, Alaska. Hydrographic survey operations in the vicinity of Kalgin Island, Upper Cook Inlet, continued through the end of the fiscal year.

McARTHUR. The McARTHUR, with Commander Austin Yeager in command, conducted tide and current surveys in Upper Cook Inlet, Alaska, from July 1 to August 25 when the ship returned to PMC. McARTHUR sailed again on September 9 and was involved in tide and current surveys in the San Juan Islands and vicinity, Washington, to November 8. The ship returned to PMC on November 9 for the winter inport.

The McARTHUR resumed tide and current surveys in the Strait of Georgia, Washington, on February 3. All assigned work was completed and the ship returned to PMC on April 15.

The McARTHUR sailed for Alaska on May 1 and commenced tide and current surveys in Upper Cook Inlet. Work in Cook Inlet continued through the end of the fiscal year.

MILLER FREEMAN. The MILLER FREEMAN was reactivated and sailed from Seattle under command of Commander Sigmund Peterson on March 17 to Marine Ironworks Shipyard, Tacoma, Washington. The ship remained in the shipyard undergoing major modification and improvements through the end of the fiscal year.

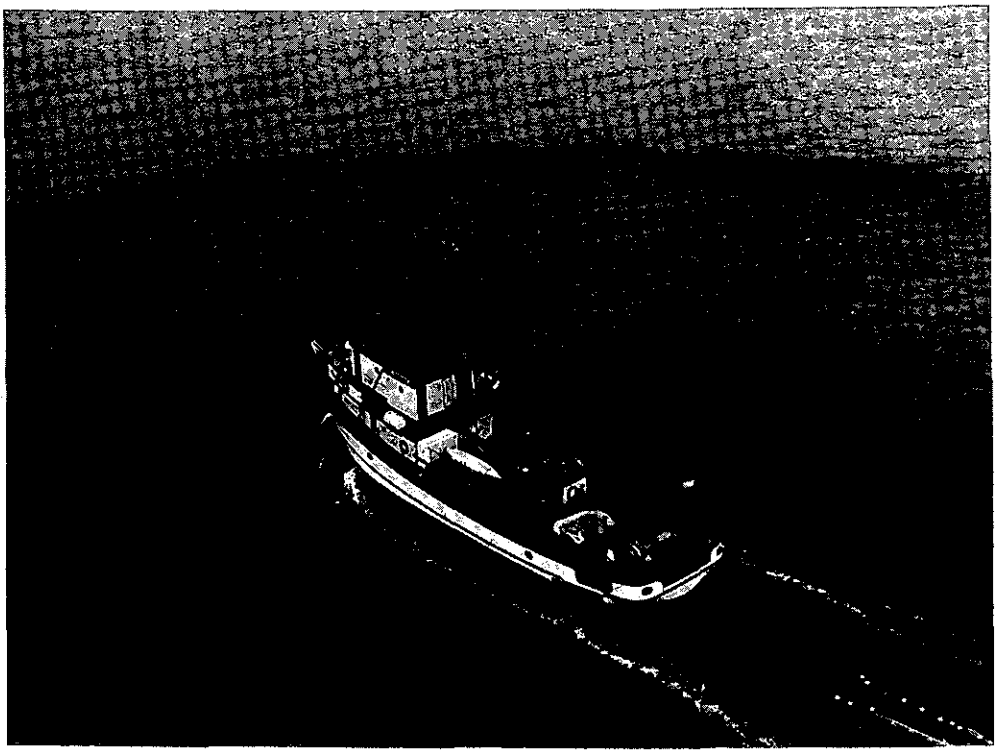
DAVID STARR JORDAN. Participated in the Southwest Fisheries Center (SWFC) research conducted in the Central Eastern Pacific based out of La Jolla, California. The vessel was involved in an albacore study and bioacoustical research in the summer, larval fish studies and California Cooperative Fisheries Investigation (CalCOFI) survey in the fall, winter, and spring.

MURRE II. The MURRE II, based at Juneau, Alaska, participated in the Northwest Fisheries Center (NWFC) Auke Bay Laboratory research conducted in Southeastern Alaska. The vessel was involved in a number of short cruises that were engaged in a herring survey, freight hauling to outlying biological stations, and logging effects to bays and inlets.

JOHN N. COBB. Participated in NWFC research conducted in the North-eastern Pacific. The vessel conducted a pollock survey in the Gulf of Alaska in the summer, a hake survey along the coast of Oregon, Washington, and British Columbia in the fall, a trawl evaluation study in Puget Sound during the winter, and a juvenile hake survey off California during the spring.

OREGON. Participated in NWFC Kodiak Laboratory's research in the North-eastern Pacific. The vessel conducted a crab and bottomfish survey in the Bering Sea in the summer, a shrimp assessment survey in the Gulf of Alaska in early fall, a trawl evaluation study in the late fall, and a shrimp survey in the Gulf of Alaska in the spring.

GEORGE B. KELEZ. The GEORGE B. KELEZ underwent repairs at Duwamish Shipyard, Seattle, in preparation for transfer to AMC. Sea trials were conducted on October 17-18, and the ship departed Seattle for Norfolk, Virginia, on October 23. The ship transited the Panama Canal on November 12 and arrived at AMC on November 22.



27. NOAA Ship Oregon

STATISTICAL SUMMARY

HYDROGRAPHY

	LAUNCH				SHIP				TOTAL	
	ELECTRONIC		VISUAL		ELECTRONIC		VISUAL			
	L.N.M.	S.N.M.	L.N.M.	S.N.M.	L.N.M.	S.N.M.	L.N.M.	S.N.M.	L.N.M.	S.N.M.
FAIRWEATHER	4845	421	35	1.1	984	145	0	0	5864	567
RAINIER	4887	262	225	7.05	168	42	0	0	5280	311
McARTHUR	0	0	0	0	0	0	0	0	0	0
DAVIDSON	2504	198	428	33.1	401	83	2	0.1	3335	314

OTHER

	BOTTOM SAMPLES	TIDE GAGES UTILIZED	CURRENT METER (HOURS OBSERVED)
FAIRWEATHER	551	22	0
RAINIER	240	10	0
McARTHUR	4	40	111,683
DAVIDSON	131	24	0

STATISTICAL SUMMARY

	DAYS AT SEA			TOTAL	DAYS IN PORT	
	Production	Launch Only	Survey Support	Days At Sea	Work Days	Days Observed
OCEANOGRAPHER	190	0	0	190	116	59
*SURVEYOR	67	0	0	67	13	9
FAIRWEATHER	91	88	11	190	92	83
RAINIER	135	48	10	193	95	77
McARTHUR	166	5	39	210	72	83
DAVIDSON	101	80	12	193	92	80
**DISCOVERER	65	0	1	66	38	18
*TOWNSEND CROMWELL	38	0	0	38	22	12

* Reactivated Spring, 1975

** Reactivated Winter, 1975

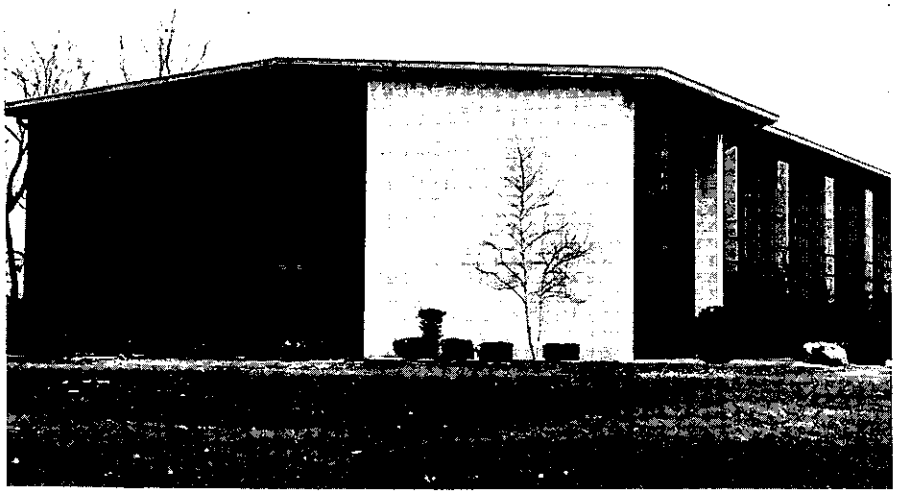
LAKE SURVEY CENTER

The Detroit-based Lake Survey Center (LSC) was reorganized during late FY 74 and early FY 75, upon the transfer of certain of its functions to other agencies. In July 1974, the compiling, engraving, printing and mail distribution of Great Lakes charts were transferred to the National Ocean Survey facilities in Rockville and Riverdale, Maryland, and in Washington, D.C. The Lake Survey Center does, however, still maintain an over-the-counter sales room in the Federal Building in Detroit for the convenience of the local customers.

Under its reorganized mission, LSC conducted comprehensive charting and water level surveys of the Great Lakes and their outflow rivers, Lake Champlain, portions of the Hudson River and New York State Barge Canal, Lake of the Woods, Rainy Lake, and the Minnesota-Ontario Border Lakes. It provides engineering support to various state, regional, federal and international organizations, and performs the necessary administrative, technical and scientific service operations required to support both its own work and that of NOS.

28. Catamaran JOHNSON, LSC

LSC responsibilities for water levels and vertical control continue to include the processing and dissemination of Great Lakes water level information and related data, and the maintenance of the network of vertical control points (bench marks) which are, in general, located on the perimeter of the Great Lakes and along their connecting channels. Dissemination of up-to-the-minute water level information is required for forecasting lake levels and lake regulation and is especially important at this time because of the abnormally high water levels, which, during severe storms, can cause extensive damage to shorelines and shoreline structures. In coordination with the Corps of Engineers, current information relating to water levels and lake conditions are supplied regularly to the news media. Both weekly and monthly news releases are distributed, and special releases are issued when conditions warrant.



29. Engineering Division Headquarters, Monroe, Michigan

The LSC's Facilities Division was redesignated as the Engineering Division and was relocated to Monroe, Michigan, 38 miles south of Detroit. It was organized similar to a NOS marine center base to handle ship dockage and logistic support for the Center's vessels and survey parties conducting charting operations, as well as that for the limnological research activities of the Great Lakes Environmental Research Laboratory (GLERL), Ann Arbor. The base is located on the banks of the Raisin River and consists of 7,500 square feet of modern office and instrument laboratory, 14,000 square feet of shop and storage space, five acres of grounds and parking, and 350 feet

of wharfage, suitable for LSC's three vessels, NOAA Class III vessels, and several small craft boats. It has facilities to equip and maintain scientific and charting hardware, and shop space including wood, machine, welding, vehicle and paint shops, as well as a wash booth. Space lockers are also available for storage of scientific and surveying equipment.

A design study was completed for LORAN C navigation system for the R/V SHENEHON, which is now in use on Lake Michigan in support of GLERL. In addition, a digital fathometer phase checker for calibrating survey fathometers was designed, fabricated and put into use.

The Division provides the support services to maintain and repair the vessels, instruments, electronic, and automotive equipment used by NOAA in carrying out its various missions.

Hydrography

Nautical Charts - Navigational Charts and Publications. The Marine Mapping and Charting Division (renamed Charting Operations Division) supplied material for a new edition of the Great Lakes Pilot and prepared six monthly supplements thereto (supplements have since been discontinued). The set-up of the Pilot in new format has been completed and sent to NOS. Data for 84 new editions and additional prints of Great Lakes charts were gathered, compiled and sent to NOS for printing and distribution. A Monthly Bulletin of Lake Levels was prepared each month. A volume containing tabulations of the daily and monthly average water levels as recorded at permanent gaging sites for the year 1974 has been printed. Material for the chart catalog, a navigator's training chart and the Hydrograph of Great Lakes Levels were sent to NOS for publication.

A large number (approximately 1,500) of Cooperative Charting Reports, received from U.S. Power Squadrons and the Coast Guard Auxiliary, were processed.

Nautical Charts - Hydrographic Surveys. Revisory surveys were made at harbors on Lakes Erie, Huron, Ontario, Michigan, and St. Clair, as well as along the Niagara, St. Lawrence, St. Marys, Detroit and St. Clair Rivers. Hydrographic and horizontal control surveys were carried out along the south central shore of Lake Erie. The HYDROPLOT/HYDROLOG system designed and developed by NOS was used for the first time by the LSC in support of automated data acquisition in hydrographic surveys.

Assignments were completed in the continuing joint NOS-CHS (Canadian Hydrographic Service) Technical Exchange Program.

In addition, during the course of their activities, the field parties checked and serviced water level gages in the areas surveyed.

Coastal Zone Mapping and Services - Estuarine and Lake Investigations. A total of 51 permanent and 40 temporary and seasonal water level gages were operated and maintained during the year. The gages are located on the shores of the Great Lakes and along the connecting channels to monitor water level fluctuations. Two graphic non-recording telemetering gages are in operation year-round on Lake Erie and the lower Detroit River. Eight recording telemetering gages are in operation year-round on Lakes Ontario, Erie, Huron, St. Clair, and Superior. Six of these telemetering units were installed at the request of the Corps of Engineers to aid in carrying out its responsibilities on Lake Superior and the St. Lawrence River International Boards for coordinating outflow requirements from Lakes Superior and Ontario. Four digital water level gages were installed to provide data for a special study being undertaken by the Corps of Engineers Coastal Engineering Research Center.

A network of 18 water temperature recorders was operated and maintained for the Great Lakes Environmental Research Laboratory.

A total of 186.243 kilometers of precise leveling were completed on the Inland Route and Lake Huron as part of the long-range program of updating the International Great Lakes Datum (1955).

Photogrammetry

The preliminary stereocompilations of Duluth-Superior Harbor and Baileys Harbor were completed. Parts of the St. Clair River and Detroit River were also compiled for a total of 14 stero models. Aerotriangulation work was completed on Milwaukee Harbor prior to stereocompilation.

Photogrammetry support was given to all three field units in the form of aerial photography, as well as supplying field support for targeting horizontal control stations prior to having aerial photography flown.

APPENDIX A

PUBLICATIONS ISSUED

Annual

Coast Pilot 1, Atlantic Coast, Eastport to Cape Cod; 1974 Edition

Coast Pilot 2, Atlantic Coast, Cape Cod to Sandy Hook; 1975 Edition

Coast Pilot 3, Atlantic Coast, Sandy Hook to Cape Henry; 1975 Edition

Coast Pilot 4, Atlantic Coast, Cape Henry to Key West; 1975 Edition

Coast Pilot 5, Atlantic Coast, Gulf of Mexico, Puerto Rico and Virgin Islands; 1975 Edition

Coast Pilot 7, Pacific Coast, California, Oregon, Washington and Hawaii; 1975 Edition

Sixth Supplement to Coast Pilot 8, Alaska, Dixon Entrance to Cape Spencer; 1969 Edition

Tenth Supplement to Coast Pilot 9, Pacific and Arctic Coasts, Cape Spencer to Beaufort Sea; 1964 Edition

Great Lakes Pilot, 1975

Tide Tables. East Coast of North and South America, 1976

Tide Tables. West Coast of North and South America, 1976

Tide Tables. Europe and West Coast of Africa, 1976

Tide Tables. Central and West Pacific Ocean and Indian Ocean, 1976

Current Tables. Atlantic Coast of North America, 1976

Current Tables. Pacific Coast of North America and Asia, 1975

Miscellaneous

NOAA Technical Report NOS 64, The Temporal and Spatial Variability of Tidal Datums and the Accuracy of Tidal Datum Determination from Short Series of Observations

Collected Reprints - National Ocean Survey, 1974

Tide and Current Glossary of the National Ocean Survey

Supplemental Tidal Current Tables, Boston Harbor, Massachusetts, 1974-75

Supplemental Tidal Predictions, Anchorage, Alaska, 1975

Our Restless Tides

An Introduction to NOAA's National Ocean Survey

APPENDIX B

PAPERS PRESENTED AT MEETINGS

International Symposium on Recent Crustal Movement, Zurich, Switzerland (August 1974)

Morrison, Nancy - Vertical Crustal Movements Preceding and Accompanying the San Fernando Earthquake of February 9, 1975

Meade, Buford K. - Report of the Working Group on Recent Crustal Movements in North America

International Symposium on Terrestrial Electromagnetic Distance Measurements and Atmospheric Effects on Angular Measurements, Stockholm, Sweden (August 1974)

Meade, Buford K. - High Precision Distance Measurements in the United States

ASP/ACSM Fall National Convention, Washington, D.C. (September 1974)

Upham, Clinton D. - The Status of Chart Automation in the NOS

Dracup, Joseph F. - A Small Beginning Directed at a Big Need: Multipurpose Integrated Survey System

Hodahl, Jeanne H. - The National Geodetic Survey Vertical Publication Data Base

First European Conference on Ocean Data Acquisition Systems, Southampton, England, (September 1974)

Winchester, James W. - Offshore Data Acquisition and Role of Buoys

XIV International Congress of the F.I.G., Washington, D.C. (September 1974)

Bossler, John D. - Status of the New Adjustment of the North American Horizontal Datum

Wallace, Jack L. - A Study in Depth

Thomas, Ernest E. - Marine Information Processing and Orthophotography within the National Ocean Survey, National Oceanic and Atmospheric Administration

Collom, James M. - Automation of Geodetic Control Diagrams

10th Annual Marine Technology Society Conference, Washington, D.C. (September 1974)

Withee, Gregory W. - An In Situ Ocean Data Comparison System

Professional Land Surveyors of Ohio Seminar, Akron, Ohio, (October 1974)

Dracup, Joseph F. - Fundamentals of the State Plane Coordinate System

Cosmos Club, Washington, D.C. (October 1974)

Lill, Gordon - The Impact of the International Geophysical Year on Oceanography

Fall Meeting of the American Geophysical Union, San Francisco, California (December 1974)

Strange, William E. - The Relation of Gravity Change and Elevation Change in Sedimentary Basins

Bossler, John D. - Status of the New Adjustment of the North American Horizontal Datum

Dracup, Joseph F. - Corrections to Horizontal Observations in Seismic Areas as a Function of Time

Douglas, Bruce C. - Geodetic Analyses from ISAGEX Data

Hanson, Robert H. - Applications of Normal Equation Reordering and Helmert Blocking to the New Adjustment of the North American Datum

Morrison, Foster - Geopotential Modeling with Equal-Area Surface Density Blocks

14th Annual Canadian Hydrographic Conference, Halifax, Nova Scotia (March 1975)

Winter, Donald D. - National Ocean Survey - Canadian Hydrographic Service Technical Exchange - A United States Evaluation

Oceanography Seminar, The John Hopkins University, (March 1975)

Hicks, Steacy D. - A Composite, Long-Period, Sea Level series for the U.S. - An approach to glacial-eustacy

ASP/ACSM Spring National Convention, Washington, D.C. (March 1975)

Keller, Morton - Aerial Photography for Photogrammetric Mapping in NOS Coastal Mapping Division

Buczek, Joseph - Densification of the National Geodetic Control Networks through Cooperative Effort

Alger, David, and Gurley,Joseph - A Design for a Geodetic Data Base Management System

Rector, John - Color Prints for Photogrammetrists and Photo Interpreters

Chovitz, Bernard H. - Future Programs in Ocean Geodesy

Keller, Morton - Photogrammetric Circulatory Surveys (PHOCIS)

Oceanology International Conference, Brighton, England (March 1975)

Winchester, James W. - Practical Experiences with Buoys Developed by the NOAA Data Buoy Office

Virginia Association of Traffic Engineers, Richmond, Virginia (May 1975)

Collins, James - NOAA's Involvement with the Nation's Transportation Systems

Spring Meeting of the American Geophysical Union, Washington, D.C. (June 1975)

Morrison, Foster - Algorithms for Computing the Geopotential Using a Simple-Layer Density

Douglas, Bruce C. - Tests and Comparisons of Satellite Derived Gravimetric Geoids with Skylab Altimeter Data

Carroll, D. G. - The Astrogeodetic Geoid in the United States

Hothem, L.D. - Evaluation of Precision and Error Sources Associated with Doppler Positioning

Strange, William E. - Results of Doppler Station Positioning in the United States

68th Annual Meeting of the Canadian Institute of Surveying, University of New Brunswick, Fredericton (June 1975)

Baker, Leonard S. - Geodesy's Contribution to Land Surveying

The Institute of Navigation, Washington, D.C. (June 1975)

Flior, Arthur - The Computer Generated Waypoint Grid: RNAV Control for Airborne Surveys

APPENDIX C

PAPERS PUBLISHED

Bossler, John D. - The New Adjustment of the North American Horizontal Datum and the Surveyor; for the ACSM-ASP Convention; November 1974

Bossler, John D., and Stem, James E. - Map Projections for Use in a Land Records System; for the North American Conference on Modernization of Land Data Systems; April 1975

Chovitz, Bernard - Geodetic Theory; U.S. National Report on Geodesy; 1975

Fitzgerald, I.Y. - Monitoring Movement of Acid Wastes; for the American Society of Photogrammetry; March 1975

Henriksen, Sroen W. - The Radar-Range Equation; for the Proceedings of the Institute of Electrical and Electronics Engineers; December 1974

Hicks, Steacy D. - Book Review of "Sea Level Changes"; for Marine Geology; December 1974

Hodahl, Sanford R., and Morrison, Nancy L. - Regional Investigations of Vertical Crustal Movements in the U.S. Using Precise Relevelings and Mareograph Data; for Tectonophysics Journals Fall 1974

Hull, Wesley V. - Tidal Datums and Mapping Tidal Boundaries; A technical support program brochure; March 1975

Meade, B. K. - Geoceiver Positions Compared with Results of Precise Surveys; for the XIV FIG Congress; March 1975

Munson, Robert C. - Hydrographic Surveying; for the FIG Congress; March 1975

Orlin, Hyman - Offshore Boundaries Engineering and Economic Aspects; the Coastal Zone Management Journal

APPENDIX C

PAPERS PUBLISHED

Bossler, John D. - The New Adjustment of the North American Horizontal Datum and the Surveyor; for the ACSM-ASP Convention; November 1974

Bossler, John D., and Stem, James E. - Map Projections for Use in a Land Records System; for the North American Conference on Modernization of Land Data Systems; April 1975

Chovitz, Bernard - Geodetic Theory; U.S. National Report on Geodesy; 1975

Fitzgerald, I.Y. - Monitoring Movement of Acid Wastes; for the American Society of Photogrammetry; March 1975

Henriksen, Sroen W. - The Radar-Range Equation; for the Proceedings of the Institute of Electrical and Electronics Engineers; December 1974

Hicks, Steacy D. - Book Review of "Sea Level Changes"; for Marine Geology; December 1974

Hodahl, Sanford R., and Morrison, Nancy L. - Regional Investigations of Vertical Crustal Movements in the U.S. Using Precise Relevelings and Mareograph Data; for Tectonophysics Journals Fall 1974

Hull, Wesley V. - Tidal Datums and Mapping Tidal Boundaries; A technical support program brochure; March 1975

Meade, B. K. - Geoceiver Positions Compared with Results of Precise Surveys; for the XIV FIG Congress; March 1975

Munson, Robert C. - Hydrographic Surveying; for the FIG Congress; March 1975

Orlin, Hyman - Offshore Boundaries Engineering and Economic Aspects; the Coastal Zone Management Journal

APPENDIX D

AWARDS PRESENTED

Silver Medals were presented to:

Donald R. Tibbit, for developing a new concept of concentrated resource usage for the planning and direction of the Southern Coastal Plains Expedition (SCOPE).

Friason G. Travis, for developing the Airway Fix File requested by the Flight Services Division, Federal Aviation Administration, in January 1971.

Bronze Medals were presented to:

John R. Almquist, Office of Aeronautical Charting and Cartography, for major contributions to the preparation and maintenance of accurate aeronautical charts.

Herbert Burgoyne, in recognition of achievements in the nautical charting program, enabling NOS to keep pace with the increased demands for dissemination of more charting information while maintaining traditional excellence.

Robert A. Cummings, in recognition of distinguished contributions to tidal analysis and precision using the electronic digital computer.

Frederick O. Diercks, in recognition of excellence in effectively directing and coordinating NOAA's Aeronautical Charting Program.

Gilbert K. Fissell, in recognition of more than 39 years of dedicated duty and for numerous notable contributions to the NOS.

Robert W. Franklin, in recognition of achievements as Officer in Charge of the Miami Ocean Engineering Facility.

Lowell J. Genzlinger, for extraordinarily well-organized planning and efficient execution of extensive photographic flight operations in St. Thomas, Virgin Islands, and Key West, Florida, during the 1974 flight season.

Earl R. Krick, in recognition of achievements as Chief Survey Technician aboard the NOAA Ship FAIRWEATHER.

Alfred A. Litz, in recognition of superior performance, professionalism and knowledge of art of seamanship aboard NOAA research vessels for almost three decades.

Clinton D. Upham, in recognition of achievements as the Chief, Marine Data Systems Project, and outstanding technical and managerial leadership in the development of the NOS automated nautical charting system.

Joe F. Wilson, in recognition of the outstanding contributions to increased production capacity and the improved quality of reproduction resources through application of color process printing to aeronautical charting.

Unit Citations were presented to the:

Information and Distribution Branch, National Geodetic Survey Information Center, National Geodetic Survey

Horizontal Branch, National Geodetic Survey Information Center, National Geodetic Survey

Chart Sales and Control Data Office, National Geodetic Survey

New Datum Section, Horizontal Network Branch, Control Networks Division, National Geodetic Survey

Marine Field Support Group, Scientific Services Division, Office of Program Development and Management

Mobile Calibration Laboratory, National Oceanographic Instrumentation Center, Office of Marine Technology

Fleet Inspection Team, Office of Fleet Operations, Pacific Marine Center, and Atlantic Marine Center

Processing Division, Atlantic Marine Center

Processing Division, Pacific Marine Center

NOAA Ship McARTHUR, Pacific Marine Center

NOAA Ship FAIRWEATHER, Pacific Marine Center

NOAA Ship MT. MITCHELL, Atlantic Marine Center

Special Achievements Awards were presented to:

Lewis S. Cotten, NOAA Data Buoy Office, Office of Marine Technology

Type Composition Section, Photo-Mechanical Branch, Reproduction Division, Office of Aeronautical Charting and Cartography (Group Award)

NOAA Public Service Award was presented to:

Joseph Dracup, Horizontal Network Branch, Control Networks Division, National Geodetic Survey

Society of American Military Engineers Karo Awards were presented to the:

NOAA Ship OCEANOGRAPHER, Atlantic Marine Center

NOAA Ship RESEARCHER, Pacific Marine Center

Society of American Military Engineers Colbert Medal Award was presented to:

Raymond W. Tomlinson, Operations Division, National Geodetic Survey

APPENDIX E

VISITORS TO NOS

Four students from Kenya, Africa, in training in the Geography Division, Census Bureau, visited NOS on July 5, 1974. They were briefed on geodesy and given a tour of the Marine Chart and Coastal Mapping Divisions.

Twenty students attending the Marine Science Consortium at Lewes, Delaware, were given a tour of the marine charting and photogrammetric areas of NOS on July 10, 1974.

Mr. Guy Ducher, in charge of the Research and Development Department, Institut Geographique National, Paris, France, visited NOS facilities on July 17, 1974. He was briefed on the operations of the Marine Data Systems Project and the Coastal Mapping Division.

On September 11 and 12, 1974, visits were made to NOS by delegates from various foreign countries attending the XIV International Congress of Surveyors (FIG). They toured the National Geodetic Survey, Marine Data Systems Project, and the Coastal Mapping Division.

Dr. Yoshio Iwabuchi, Deputy Director, Surveying Division, Hydrographic Department, Maritime Safety Agency, Tokyo, Japan, visited NOS on October 8, 1974. He toured the Marine Data Systems Project and the Office of Marine Surveys and Maps.

Mr. Gehrke and Mr. Baclawski, CIA, visited NOS on December 3, 1974, for general orientation on NOS activities.

Five members of the Directorate of Military Survey, United Kingdom, visited NOS on February 12, 1975. They were briefed on NOS operations by Dr. Lill and toured the marine charting, aeronautical charting, and geodesy areas.

On April 10, 1975, students of the Metropolitan Washington School of Printing toured the NOS printing plant in the Main Commerce Building.

On April 14, 1975, students of a class, Introduction to Cartography, from George Washington University, toured the NOS printing plant. A slide program was presented followed by a tour through the plant.

On April 7, 1975, Mr. Willis T. Gehrke and Mr. Joseph Baclawski of the Central Intelligence Agency toured the Marine Chart Automation Project and the Aeronautical Chart Division.

Mr. and Mrs. Antonio Cornejo of the Planetarium of the City of Buenos Aires, Argentina, visited NOS on April 3. They were given a tour of the Marine Chart Division, the Marine Data Systems Project, and the National Geodetic Survey.

On April 14, 1975, twenty students from Colonel Zadok Magruder High School visited NOS. The group toured facilities of the Marine Chart Division, including compilation, digitizing, and terminal rooms as well as other associated areas.

Mr. John H. Eberly, Executive Officer, NOAA, and Ms. Ruth Barritt, Secretary to Dr. White, visited NOS on May 14, 1975. They were briefed by the Director, NOS, and toured the National Geodetic Survey, the Marine Data Systems Project, and the Office of Aeronautical Charting and Cartography.