

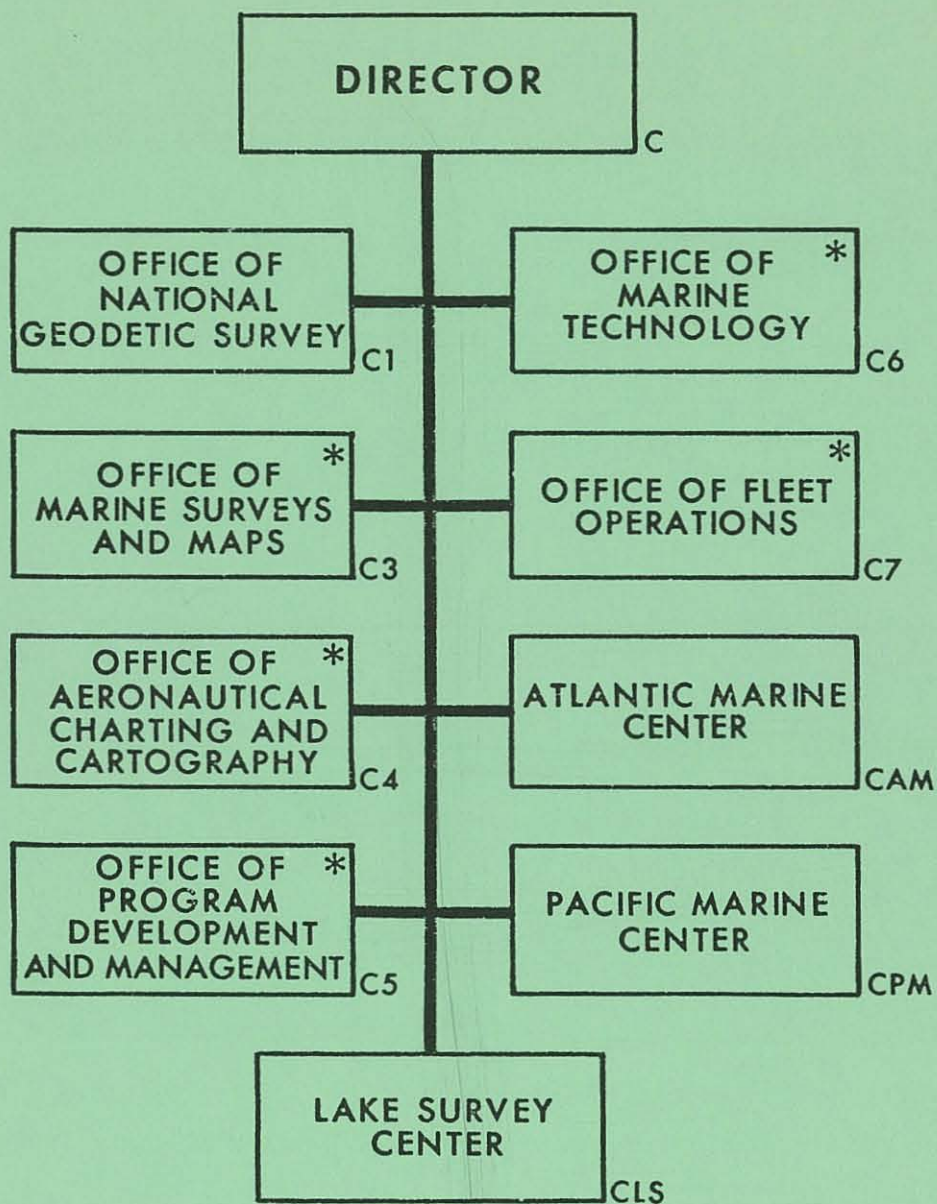
XI

107-10429

RETURN TO 101



NATIONAL OCEAN SURVEY



* ASSOCIATE DIRECTOR OF NATIONAL OCEAN SURVEY

NATIONAL OCEAN SURVEY

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A MESSAGE FROM THE DIRECTOR

This annual report about the people and their work in the National Ocean Survey is characterized by the many changes taking place in the organization. While our basic missions and activities remain essentially as they have been over the years, the reasons for doing things and the way we do these things are changing. Although we have new methods, new goals and an ever increasing number of those who use our products and services, tradition will continue to be a solid foundation for our work.

The most dynamic forces acting to modify and expand NOS programs are the complex and interrelated elements of the coastal zone - offshore oil and gas development, offshore nuclear power plants, basic marine research, offshore deepwater ports, expanded coastal shipping, marine pollution control, coastal land use, beach control, ocean dumping, law-of-the-sea negotiations, harbor and port development, living resources development and preservation, marine recreation, undersea mining, near-shore construction - all under the umbrella of coastal zone management and energy self-sufficiency.

The products and services of NOS are being required by an ever widening circle of users in other government agencies, industrial firms, state governments and by the individual citizen. The work we perform is basic to national and world affairs. Our efforts relate to economics, technology, science, social matters, politics and the environment. NOS can be proud of its contributions.

This demand and need for NOS expertise and products offer an unusual opportunity in three respects - (1) we must react to these requests for information in the most efficient way possible, (2) we must recognize the uniqueness of NOS expertise and make certain that our capabilities are extended to the maximum degree, and (3) we must plan and move ahead of the demand so as to be in a position to adequately respond to anticipated requirements for NOS products and services.

I am pleased to report that we are well on our way with substantial progress in all three areas. Within our designated missions we are acting to influence our own destiny by utilizing the latest technology and management skills.

Electronics, computers and automation are the order of the day as we constantly search for new hardware and new techniques to get the most output per dollar per person. Sensors, readers, tape files, lasers, time sharing, digital converters, remote terminals and data banks are fast replacing the conventional tools of our trade. Most aspects of our operations are affected - adjustment of the North American Datum, fleet electronic equipment maintenance, hydrographic data acquisition, nautical chart production,



aeronautical chart production, bathymetric data processing, the National Geodetic Control Data Base, fleet operations, buoy development, field party structure, and tidal data processing.

All of the essential elements of good management are being employed to make NOS a more efficient group - planning, organization, communications, and training. Our task group studies are proving to be a most effective means of critical self-evaluation and analysis. On-the-job training, seminars, university programs and many other job-related activities are improving the skills and knowledge of our people. The Management-By-Objective system is documenting goals, objectives and milestones for real-time program monitoring and evaluation.

It is significant that NOS people are motivated to look objectively at what they do - not necessarily to find fault, rather to see what can be modified or changed, what can be eliminated, and what should be added in order to be more efficient and better achieve our objectives and goals.

We will continue to examine every facet of our organization for critical and meaningful analysis. Despite serious budget restrictions and manpower reductions, NOS is making progress mainly because we know that the only permanent part of our organization is change.

Allen L. Powell

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

OFFICE OF THE DIRECTOR

A New Look at the Tides

The oldest mission of the National Ocean Survey lies in the coastal zone. Since the first tide tables were issued in 1857 the National Ocean Survey has been predicting tides in the coastal zone. Tides are the most predictable of all coastal natural phenomena and control many of the other natural events that occur there.

The recent emphasis on the coastal zone, that is coastal zone management, coastal boundaries, and coastal flooding has prompted us to take a new look from a different viewpoint at our monitoring of the tides to ascertain if we were getting all the available information from our enormous collection of data.

As a result, one of the Research Associates in the Office of the Director has under development a new theory of tidal flooding potential which is expected to contribute markedly to the assessment of danger in future potential flooding situations. The publication of this work is expected early in 1975.

An Emphasis on Science

The aim of the Office of the Chief Scientist is to foster the engineering and scientific capabilities of the National Ocean Survey to better satisfy those national goals included in NOAA's mission. In order to achieve this aim, it is necessary to cultivate a research and development climate which encourages efforts to resolve current and future problems; to develop lines of communication between NOAA scientists and engineers and those of other agencies, and the industrial and academic communities; to recognize the accomplishments of individual scientists and engineers; and to encourage management to support viable research and development activities.

As with all science and engineering organizations, that of NOS depends upon the development of its young persons. Therefore, a program of Executive Research and Development Seminars was instituted where these individuals can present their accomplishments and be recognized by NOS leadership. Also recognizing that peer group evaluation is important in the growth of every individual, the Office of the Chief Scientist has encouraged the participation of young persons in national and international scientific and engineering conferences and seminars.

Another aspect of development is the improvement of skills of on-board employees. This involves upgrading the abilities of on-board scientists and engineers and the training of technicians and other employees for higher level science and engineering positions. This is accomplished by encouraging on-the-job training, in-house seminars and short- and long-term university programs.

The encouragement and development of interdisciplinary programs are among the major efforts of the Office of the Chief Scientist. These include programs entirely within the National Ocean Survey to those involving many components of NOAA, other agencies, and the academic community. The magnitude of these efforts range from that of SCOPE (Southern Coastal Plains Expedition) which was intended to incorporate the requirements and participation of many user groups to the in-house investigation of the relationship between geodetic leveling and local mean sea level.

To document NOS accomplishments in the area of Research and Development, an annual publication of scientific and engineering papers has been initiated. The first published set will cover the Calendar Year 1974. A loose-leaf version, compiled for 1973, has been deposited in the Marine and Earth Sciences Library.

OFFICE OF THE NATIONAL GEODETIC SURVEY

The Office of the National Geodetic Survey (NGS) is responsible for the geodetic operations of NOS and for coordinating Federal geodetic activities. Functions include field observations for horizontal and vertical control; astronomic and gravity work and operation of observatories for polar motion; office processing, analysis, and computation of results of observations; publication and distribution of data; and special related geodetic activities including worldwide geodetic studies, research in methods and equipment, miscellaneous observations, and mathematical solutions.

The Office was reorganized during the year into four major divisions and a Geodetic Research and Development Laboratory. A Systems Development Division was organized to devise mathematical and computer programs for evaluating, analyzing, and processing the observations in preparation for the new horizontal network adjustment. A new Datum Section was organized in the Horizontal Network Branch to begin the adjustment analysis and computations.

The total average personnel of NGS in FY 74 was about 340 including 11 commissioned officers; an average of about 152 were in the office and 188 in the field, including the Instrument Support Unit and the Observatories.

Vertical Network

Leveling by the National Geodetic Survey totaled 1,958 miles of first-order and 56 miles of second-order on which 1,461 new bench marks were set, either to replace old bench marks which were destroyed, or because the level line followed a different route than the original survey.

Leveling by other organizations (state highway departments, state geodetic surveys, county engineer departments, etc.) which was computed and adjusted into the national network by NGS, totaled 170 miles of first-order and 1,011 miles of second-order.

Major projects included:

1. Releveling of 441 miles by NGS in southern California from Caliente via Barstow to the Imperial Valley area. This releveling served the following purposes:

- a. Update the network in an area of large tectonic activity.
- b. Strengthen the southern California Cooperative Level Net.
- c. Monitor the vertical movement of the geothermal area in Imperial Valley.

2. Releveling of 175 miles in Georgia by the NGS and new leveling of 88 miles by the Metropolitan Atlanta Rapid Transit Authority (MARTA).

3. Releveling in the State of Washington of a 314-mile, first-order line. This releveling from Blaine, at the Canadian border, to the Seattle-Tacoma area will provide up-to-date elevations for the local users and information about seismic activities in this area for future plannings.

4. The 312 miles of releveling in New York State, from Cornwall Island via Rouses Point to Saratoga Springs, is part of a project which will connect the International Great Lakes Vertical Datum to the mareograph station at the Battery in New York City. It is also part of Basic Net A.

Special projects included:

1. The releveling of the NGS test network in Gaithersburg, Maryland, to evaluate the new Jena Ni 002 self-leveling, level instrument and monitor the movement of the 10 different types of bench marks. The new NGS temperature gradient meter was also tested during this releveling.

2. Leveling of 6 miles in Washington, D.C., to connect the five METRO-built, deep bench marks into the national net and connect the White House bench marks to these special marks. The deep bench marks are mounted on 2" diameter extra strong steel pipe which extends 10 feet into the bedrock. This inner pipe is protected by a 3 1/2" diameter outer pipe which extends from the surface to the top of the bedrock. The space between the two pipes is filled with heavy grease. They are being used to monitor the movement of various historical buildings, including the White House.

3. Fifty miles of leveling centered around the geysers geothermal area about 15 miles northeast of Geyserville, California, to establish a base for future studies of vertical movements in this important area.

Horizontal Network

The High Precision Traverse operations continued with approximately 1300 km being surveyed during the year. Included were segments between Aberdeen, Maryland, and Maine; West Central Nebraska west to Rawlins, Wyoming; and from Salt Lake City westward.

Extensive evaluations of about 70 Geociever positions determined in the conterminous United States showed excellent results. Of these, 30 stations are in the High Precision Traverse Network. Position, scale, and orientation determined through Geociever observations to control a rather extensive triangulation system compared favorably in one test, with those obtained through classical methods.

First-order, metropolitan-type surveys were completed in Orange County, California; Pinellas County, Florida; Erie and Saratoga Counties, New York; Salt Lake County, Utah; and King County, Washington. Resurveys to study crustal movement along the San Andreas fault system were completed at the COLT, DEVIL, and RIALTO sites, California.

Several sections of the United States - Mexico Boundary were surveyed to delineate the boundary where questions have arisen or to redefine the boundary where new agreements have been reached. The Transpeninsular Boundary Line between Maryland and Delaware has been resurveyed in cooperation with the States.

Special surveys were undertaken for the U.S. Navy in Florida and New York; for the National Environmental Satellite Service project in Hawaii and Washington; in Hussey Sound, Maine, for the Marine Ecosystems Analysis project; and to assist the Justice Department in a suit against the United States involving an oil spill.

Base lines were measured in cooperation with local professional societies for use by local surveyors and engineers in calibrating their electronic, distance-measuring equipment in New York, Washington, Oregon, and California.

Major effort is being directed to the new North American Network Adjustment. During FY 74 progress was made in developing evaluation procedures and coordinating activities. First-stage, evaluation studies were completed for 134 projects involving about 14,000 stations in the eastern section of the country; at the end of the year, 30 employees were assigned to this adjustment work.

Forty-six projects were adjusted during the fiscal year, adding data for 2,380 stations to the files. Major adjustments completed included first-order traverses in Northern Iowa and Kansas; a combined first-order triangulation and traverse network in North Carolina and a first-order area net in Alabama. Several projects involving more than 3,000 stations are nearing completion.

At the request of users, constrained adjustments were made for three networks consisting of 435 stations. Lack of personnel, adjustment program revisions, and computer problems reduced output. In addition, during a two-month period, all personnel were involved in a test to evaluate utilization of the Horizontal Network Branch in the new adjustment activities.

Surveys accomplished to National Network Standards by the U.S. Geological Survey; the Highway Departments of the States of California, Florida, Louisiana, Minnesota, and New Mexico; the North Carolina Geodetic Survey; Monroe County, New York, Geodetic Survey; and other local organizations, are being processed and published. The field data for these surveys are now furnished to NGS in a punch card or tape format to expedite the adjustments.

An evaluation of horizontal control surveys and datums in the south San Francisco Bay area since 1850 was completed to assist in the resolution of a land ownership problem between California and private interests.

A detailed review was made for one project accomplished by the Southeastern Wisconsin Regional Planning Commission (SEWRPC). Implementation of suggestions given will assure that future surveys will meet acceptable standards.

Gravity and Astronomy

Gravity Observations. On July 1, 1973, the gravity party was in the Great Lakes Region, completing work begun the previous summer. This last leg of the survey, St. Ignace, Michigan, to Chicago, Illinois, consisted of 628 observations made to obtain gravity values along level lines to enable determination of geopotential elevations. In October 1973, the team completed operations in this area, and returned to southeast Texas to complete Phase II of a program initiated in January 1973. This included lines from Katy to Austin, Conroe to Riverside, and Angleton to Placedo Junction, comprising some 400 additional gravity stations. This survey, along with future repeat surveys along the same lines, will provide a basis for determining the nature of elevation and gravity anomaly changes associated with land subsidence in the Galveston area. After completion of work in southeastern Texas, in February 1974, the party moved to California and began the first in the series of reobservations over level lines in the Imperial Valley to provide information on changes in gravity anomalies associated with tapping geothermal sources. In May 1974, the party completed this project and began observations over level lines in Riverside, San Bernardino, and Los Angeles Counties, California, for land subsidence study. Approximately 15 percent of this had been completed by July 1.

Gravity Reductions and Geoid Studies. A geoid map was produced showing the locations and the latest readjusted values of geoid heights in the United States. From these values, a map was drafted with a contour interval of one meter.

Approximately 20,000 stations were added to the automated U.S. Land Gravity Bank, making the total about 320,000. Programs are being developed to manipulate these data for other studies.

Geodetic Astronomy. Two units have been in the field throughout the year. Astronomic positioning has been accomplished through both organizational and cooperative funding arrangements.

Astronomic positions for Laplace control, which covered approximately 700 km of the High Precision Traverse, were observed during the year. In addition, positions for Laplace control of cooperative projects in Washington, Oregon, California, Utah, Georgia and Florida were completed.

A total of 126 positions and 44 azimuths were determined.

Astronomic Computations. Astronomic data processing has remained current with field work during the year. Modifications for maintaining maximum flexibility in data processing are in progress for the CDC 6600 latitude and longitude program. In addition, new programs have been written for the Wang 720 B calculator-printer for further minimizing manual calculations by office personnel.

The utilization of the FK 4 supplement, as reported in the FY 73 report, has been suspended pending a review of star position uncertainties.

Variation of Latitude. The variations-of-latitude observatories at Ukiah, California, and Gaithersburg, Maryland, continued in operation throughout the year. However, there was a period of approximately 4 weeks when the Ukiah Observatory was inoperative awaiting the fabrication and installation of a new ocular gear. At Ukiah, 2,322 star pairs were observed on 155 nights with complete sets on 97 nights. At Gaithersburg, 2,965 star pairs were observed on 238 nights with complete sets on 72 nights. Latitude observing records were transmitted weekly to the Central Bureau of the International Polar Motion Service in Misuzawa, Japan.

Satellite and Marine Applications

Doppler Geceiver observations were obtained at 22 stations throughout the United States including seven stations along the Transcontinental Traverses. Two stations were located on offshore oil platforms in the Gulf of Mexico to test the feasibility of establishing geodetic control at sea by satellite methods.

During FY 74, the Defense Mapping Agency reduction program for Geceiver data was converted for use by NGS. Observations from 18 stations were reduced. This includes two stations reduced for the Bureau of Land Management's Geceiver program.

Network Maintenance

The maintenance of the horizontal and vertical control network is presently being done by 15 full-time field engineers, who regularly recover or reset markers in danger of being disturbed, promote assistance from private surveyors, state and local governments by personal contacts and by attending state conventions of surveyors. Maintenance personnel participate in special tasks such as selecting Geceiver sites, establishing calibration base lines for Electronic Distance Measuring Instruments, and inspect control being established by states in their area.

There were 1,235 vertical control marks and 1,232 horizontal control stations visited and found in good condition by maintenance personnel. A total of 899 marks were preserved or relocated. This total includes 572 vertical control marks and 317 horizontal control stations. In addition, 212 vertical control marks were reset by private, state and county engineers.

The National Geodetic Survey received and processed 5,854 Report of Condition of Survey Mark Cards of which 10 percent required maintenance.

During the period, 695 witness signs and 581 posts were issued to private surveyors to be set near our horizontal and vertical control points.

The New Adjustment of the Horizontal Network

A decision was made in early April 1973, to begin preliminary tasks associated with the New Adjustment of the North American Horizontal Network, starting July 1, 1973. A five-year plan was devised for FY 75 through 79. In June 1973, discussions were held with Ing. J. A. Villasana of the Geodetic Survey of Mexico and Louis A. Gale of the Geodetic Survey of Canada, during which preliminary plans and communication links were established among the three countries in order to carry out a cooperative North American Adjustment.

Four working groups within the National Geodetic Survey were given significant responsibility for the New Adjustment.

1. The New Datum Section, Horizontal Network Branch, is assembling, analyzing and evaluating the observational data.

2. The NGS Information Center is keypunching the geodetic position cards, and developing and monitoring contracts to keypunch the descriptive station information.

3. The Systems Development Division is developing a data base which is general in concept, allowing for the interrogation by users in almost any mode of recovery. Time-sharing equipment, for use in the future on field parties, arrived during December.

4. The Geodetic Research and Development Laboratory is responsible for the research aspects of the New Adjustment.

Some highlights related to the New Adjustment are: In November 1973, steps were taken toward organizing an international symposium which will hopefully generate a recommendation to the International Union of Geodesy and Geophysics (IUGG) to adopt a new reference ellipsoid. Representatives of the United States attended the "International Symposium of Problems Related to the Redefinition of North American Geodetic Networks," in May 1974 at Frederickton, New Brunswick, Canada.

Systems Development

The Systems Development Division (SDD) was formed in October 1973, with the primary function of the design, development, implementation, and maintenance of the computer software required to create a geodetic data information system or data base. It will form the basis for the publication

of data and for the adjustment of new observational data into the networks. The data base will be accessible, through a computer-oriented "query language," to any qualified user.

The data base has been made general in concept so that vertical, astronomic, and gravity data may eventually be included.

"Micro-publication" utilizing a computer, cathode ray tube (CRT) plotter, and standard print procedures was demonstrated. The computer permitted the merger of textual and graphical data. The CRT plotter recorded the information on 35 mm film and standard printing techniques produced the printed page.

The establishment and maintenance of a library of computer programs used for NGS production purposes has been implemented. These programs have been made available to the surveying community upon written request.

Geodetic Instrumentation and Equipment

An average of eleven 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) Trailer-mounted Portable Tower; (2) Short Range EDM Offset Bar; (3) Azimuth Timing Modules; (4) Replaced the 2 milliwatt laser in the Model 4L Geodimeter with a less expensive 3 milliwatt laser and replace the modulator with a less expensive one; (5) Long Range Laser show light; (6) T-3 Eyepiece to use with Long Range Laser show light; (7) Jig to make field adjustments on the crosshairs and bubble on the Wild Tribrach; and (8) Peck Towers.

Geodetic Research and Development

Work continued on the Selenocentric Reference System project under contract with the NASA Johnson Center. The objective of the project is to obtain the inertial orientation of the lunar axis and the lunar rotational rate by photogrammetric analysis of Apollo 15, 16, and 17 photography. The results will provide an independent check on dynamically-determined methods. Block adjustment programs have been completed and applied to those portions of the data which have been made available thus far by the National Aeronautics and Space Administration.

A combined global solution for ground station positions and the gravitational field up to the 12th degree and order in spherical harmonics was completed and published. This solution is novel in two respects: it uses a combination of Doppler data, ground gravity data, and data from the geometric worldwide satellite triangulation network, and it employs the simple density layer method for parametrization of the gravity field.

Final results for positions of the 45-station world satellite triangulation network were obtained and prepared for publication. There are two final solutions: a set of station coordinates constrained only by the observation of the geometric BC-4 network, and a solution combining these observations with the results of the Naval Weapons Laboratory Doppler solution for 34 stations in common between the BC-4 and Doppler networks. The average standard deviation per station coordinate is less than 5 meters.

In connection with the North American densification network, preliminary coordinates based on a total of 470 plates have been obtained for 14 stations.

Work has begun, under contract to NASA Wallops Station, for the preparation of programs to reduce altimeter data expected from the forthcoming GEOS-C satellite. These data should yield an improved global gravity field and finer information on the geoid in selected areas.

Programs have been prepared for reduction of Doppler data from Geociever stations and turned over for operational use.

Support was provided in the form of theoretical studies for the North American Datum readjustment project. Examples are the reordering of the unknowns of a set of normal equations for more efficient processing and storage on the computer, and a thorough review of the observation equations used in the variation of coordinates method.

Theoretical research was carried out in a number of fields. The density layer method was analyzed more deeply so that it could be applied to a wider variety of data. Formulas and programs were developed for an oblique conformal projection within a two-cusped epicycloid in response to a request from the office of the NOAA Administrator. Nonlinear iterative methods were subjected to a detailed, constructive critique.

On the instrumental side, progress was made in developing a remote control system for the Ranger III Geodimeter, and the construction of a lens cone was contracted to Wild Heerbrugg for obtaining high-precision photography to be used in analytical photogrammetric experiments for obtaining lower-order geodetic control.

Geodetic Information

The National Geodetic Survey Information Center (NGSIC) is responsible for the preparation, publication, and dissemination of horizontal and vertical control data of NOS and that of other Federal agencies, and state and local governments in the National Network. Approximately 200,000 horizontal and 500,000 vertical control points are in the present data file. To provide pictorial and working references to the Horizontal and Vertical Networks, various series of control diagrams are prepared and maintained.

Geodetic data mailed consisted of 14,755 units of data involving 1,632,000 sheets.

Data Automation

During FY 74, approximately 40 percent of the NGS Information Center work force was directly involved in preparing data in automated form to support the new horizontal adjustment and to provide the nucleus for the National Geodetic Control Data Base. The Defense Mapping Agency (DMA) domestic geodetic data file which was transferred to NGS, agreements with USGS, TVA, Forest Service, and similar agreements with various state and local organizations will provide additional geodetic control data for the National Geodetic Control Data Base. Also, in conjunction with automation of the vertical control data files, new automated cartographic and micro-publishing procedures were implemented in preparing the vertical control 30' quad diagram and data. More automation techniques are planned in FY 75 and FY 76.

TABULATION OF GEODETIC FIELD WORK

Leveling

<u>State</u>	<u>Miles 1st-Order</u>	<u>Miles 2nd-Order</u>	<u>New Bench Marks</u>
California	491		282
District of Columbia	6		5
Florida	11	2	12
Georgia	175		71
Hawaii		3	
Illinois	57		33
Kentucky	56		33
Michigan	71*		34*
Mississippi	318		310
New York	312		176
Tennessee	128		207
Texas		46	44
Washington	314	5	254
Wisconsin	19		
Other Organizations	<u>170</u>	<u>1,011</u>	<u>1,600</u>
Total	2,128	1,067	3,061

* Lake Survey Center

Horizontal Control

<u>State</u>	<u>Marked Stations FY 74</u>	<u>Intersection Stations</u>	<u>Total Stations to June 30, 1974</u>
Alaska	49	4	21,884
Hawaii	1		2,040
Puerto Rico			1,489
Guam			133
Conterminous U.S.	3,554	690	176,539
Samoa			121
Wake Island	<u>1</u>	<u>—</u>	<u>1</u>
Total	3,605	694	202,207

Summary of Geodetic Field Operations

	<u>FY 74</u>	<u>Total Stations to June 30, 1974</u>
Horizontal Control Stations	4,299	202,207
Bench Marks	3,061	437,725
Precise Traverse (kilometers)	1,174	18,400
Latitude Stations	126	3,501
Longitude Stations	126	3,303
Azimuth Stations	44	2,895



Figure 1. Geodetic survey for crustal movement studies along seismic fault planes.



Figure 2. Truck-mounted portable tower.

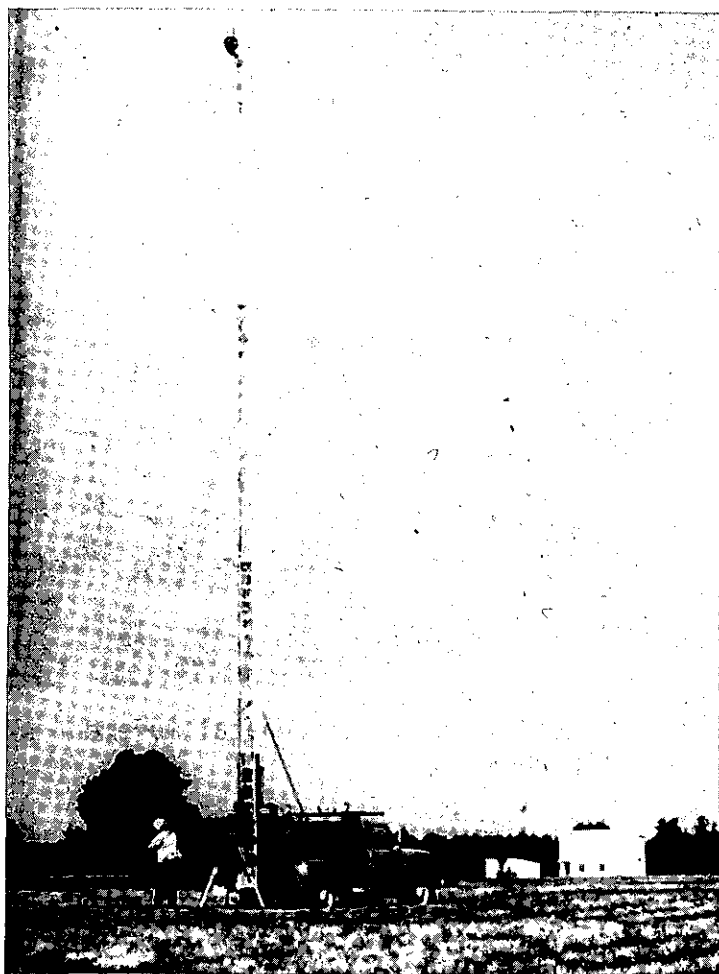


Figure 3. Extended portable tower with show light.

OFFICE OF MARINE SURVEYS AND MAPS

The Office of Marine Surveys and Maps (MS&M), is responsible for all data acquisition for, and the production of the Survey's most important marine product, the nautical chart. This Office serves as the focal point for planning and managing marine programs in addition to the analysis and dissemination of data collected within the more than two and one-half million square miles of NOS responsibility for charting.

Marine Charting Accomplishments

Nautical Charting. A new chart numbering system that brings the Defense Mapping Agency Hydrographic Center (DMAHC) and NOS under a unified national system was developed.

A program to provide Loran C charts was begun with the publication of the first two NOS nautical charts showing Loran C lines of position.

Loran A charting extension continued with the publication of Loran A lines of position on five additional coast charts on the Atlantic and Gulf Coasts.

Eight new large-scale insets were produced and the limits of four charts were revised in response to user requests for improved charting.

New traffic Separation Schemes established by the Coast Guard for the approaches to Portland, Boston, Narragansett Bay, and Buzzards Bay were added to the numerous charts affected.

Offshore pipelines in the Gulf of Mexico oilfields are being added, as recommended by the Bureau of Land Management (BLM) and U.S. Geological Survey (USGS), to affected charts as they are revised; the first two charts displaying this information were produced in FY 74.

Compilation of NOS-Committed International Charts is in progress, with the first two charts well along.

The Cooperative Charting Program continued to reflect a high level of participation and interest. In addition to individual reporting, special projects were developed for 13 U.S. Power Squadron districts and 5 U.S. Coast Guard Auxiliary (CGAUX) districts. Marine Chart Division support included annotated charts indicating items suitable for volunteer investigations, and the publication of a Chart Up-Dating Manual to assist and instruct observers. The latest year of record, ending December 1973, showed a total of 17,716 items reported by cooperating observers.

The NOS Hydrographic Manual revision was begun with publication scheduled during FY 75.

The first NOS nautical charts employing orthophoto imagery for the topographic base were produced.

A general review of chart coverage to explore the possibility of reducing the number of charts and yet provide detail necessary for safe navigation has been initiated.

A senior cartographer was assigned full time, effective January 1974, to review and update charting policies and specifications. Revised and restated specifications are oriented toward guidance for computer programming and will be the basis for a revised charting manual.

Hydrographic survey review output was up by 11 over FY 74, reflecting buildup of personnel. Of the 12 Navigable Area surveys received, 6 were reviewed and 3 returned for corrections. Many of the reviewers are new but are rapidly gaining training and experience. The review function continued to cope with assorted problems which increased review time while reaffirming the need for this definitive evaluation.

A meeting in September 1973 with processing chiefs from the Atlantic Marine Center (AMC) and the Pacific Marine Center (PMC) and the Marine Chart Division/Marine Data Systems Project (MCD/MDSP) personnel has improved the interaction of the several groups and has led to some new procedures. Follow through by MDSP is expected to result in further improvements in procedures and communications.

A standing committee was established to coordinate and assign priorities to jobs in the automatic data processing system.

A study is being made, in cooperation with the Reproduction Division, Aeronautical Charting and Cartography, to determine the best approach to improve service in furnishing copies of NOS surveys.

Field inspections for new editions for Coast Pilots 7 and 9 were completed.

Bathymetric Mapping. Four bathymetric maps in the Gulf of Mexico were compiled and printed, and one map in the Gulf of Alaska was compiled in response to expressed needs of the Bureau of Land Management.

Seaward Boundaries. The Marine Chart Division, through the Special Assistant for Seaward Boundaries, has assumed a broader role in the portrayal of U.S. boundaries by initiating the drafting of boundary changes and additional coverage for approval by the Interagency Committee on the Determination of the U.S. Coastline. There are now 162 boundary maps, with additional maps of U.S. territories programmed.

The Special Assistant acted as Assistant to the DOC representative to the Law of the Sea (LOS) Task Force Boundary Committee, and was a member of the LOS Task Force Special Delimitation Subcommittee.

Computer-Assisted Charting. The Marine Chart Division and Marine Data Systems Project continued the development of a computer-assisted charting system and support for present chart production:

Second chart produced by computer-assisted techniques.

Continual maintenance status achieved for Area 1 (NE Coast) in preparation for the computerized system.

Review completed for 66 base plates for charts in the Gulf of Mexico as part of digital files certification.

Computer-assisted preparation of facilities tabulations for small-craft charts.

Computer-assisted maintenance and plotting of oil wells and platforms, Gulf of Mexico.

Automated scribing of offshore pipelines and mineral leasing blocks.

Processing of ocean survey data for International Charts and Bathymetric Mapping.

Acquisition of seven automated hydrographic survey data acquisition systems for installation onboard the NOAA Ship DAVIDSON and the auxiliary sounding launches of the DAVIDSON, PEIRCE, and WHITING.

Implementation of a replacement ADP System at the Pacific Marine Center (PMC) included interactive Cathode-Ray Tube (CRT) terminals, which allow the cartographer to edit the digital survey file in real time, and an off-line plotting system.

Implementation of interactive CRT terminals at NOS Headquarters for use in compilation and editing of nautical charts.

Acquisition of a raster scan laser optical plotter system to support the preparation of chart printing negatives on a production basis.

General

Accomplishments

Reconstructed Conventional Nautical Charts	2*
Maintained Conventional Nautical Charts	400
New Small-Craft Nautical Charts	1
Reconstructed Small-Craft Nautical Charts	1**
Maintained Small-Craft Nautical Charts	67
Articles Published in Notices to Mariners	1,428
Chartlets Published in Notices to Mariners	50
Surveys from non-NOS Sources Processed	2,708

Accomplishments (Cont.)

Pre-Survey Review	4
Pre-Survey Review Update	10
Hydrographic Survey Verified	4***
Hydrographic Survey Reviewed	60
Hydrographic Survey Registered	82
Copies, Hydrographic/Topographic Surveys Disseminated	2,250
Coast Pilots-New Editions	5
Coast Pilots-Supplements	3

- * One with orthophoto topography
- ** Utilized computer-assisted techniques
- *** Rockville only (28 by AMC, 56 by PMC)

Detailed information concerning field work pursuant to support of the Nautical Charting Program will be found in the Office of Fleet Operations' section of this report.

Oceanographic Accomplishments

A five-year tide and tidal current survey of Puget Sound and approaches commenced with operations focused on Rosario Strait, with additional operations in Haro Strait. Due to the potential development of this area as a major oil terminal (southern end of the Trans-Alaska Pipeline System (TAPS) Marine Leg) with the expected increase in supertanker traffic and the increase in commercial support traffic, there is a definite need for circulatory surveys to ensure safe navigation of these often hazardous waters.

Oil spills and construction related to port development will be an ever present threat to the ecological balance of the area. Also, the need for well-determined tidal datums has greatly increased in recent years because, in addition to hydrographic survey support, these determinations are used to resolve boundary disputes, for engineering applications, and shoreline control for ecological purposes.

This survey is being conducted in cooperation with the Pacific Marine Environmental Laboratory (PMEL), the Northwest Coordinator of the Office of Coastal Environment, and the Department of the Environment, Marine Sciences Directorate of the Canadian Government.

The Cook Inlet Tide and Current Survey continued with its second field season. The progress made by the NOAA Ship McARTHUR in Lower Cook Inlet during 1973 was excellent, for a first year effort with a new system. Therefore, it is anticipated that the project will be completed in less than four years. If the 1974 field season continues ahead of schedule, the project might be completed in 1975.

The need for more extensive and accurate knowledge of the tides and tidal currents in Cook Inlet is accentuated by the increase in oil drilling, the use of supertankers to transport the oil, and the ever-present danger

of oil spills and their threat to the area's wildlife and ecological balance. Predictions based on this information will be useful to determine ice movement by tidal forces and to properly design and construct surface and subsurface structures in Cook Inlet.

As a result of land movement, the hydrographic features of this area may have been altered considerably. A means of determining the direction and amount of change is made possible by the comparison of tidal datum planes, established prior to tectonic events, with those determined from new observations.

The Deep Sea Tides Program was quite successful during the past year with 100 percent retrieval of the equipment on three deployments. The first deployment of a deep-sea tide gage was 40 nautical miles offshore from Vancouver Island, British Columbia, in a cooperative effort with the University of Washington, but is also applicable to the reduction of hydrography and related to the Tide and Tidal Current Survey of Puget Sound and approaches. The second deployment was on the Project SCOPE at a site 250 nautical miles east of Jacksonville, Florida, at a depth of 3,800 meters. The tide gage recorded tidal fluctuations at half-hourly intervals throughout a six-month period, comprising one of the longest time series thus far obtained in the deep ocean. This information, used in conjunction with data from tide gages located along the coast, will help determine the progression of the tide wave as it travels from the deep ocean across the continental shelf. A preliminary evaluation of the data indicates that the mean tide range at the deep ocean site is approximately one-half that of the inshore region.

One of the technological problems associated with offshore tide measurements is the calibration of the tide gages in their operating environment. In an effort to resolve this problem, NOS participated in the Scientific Committee on Ocean Research (SCOR), Working Group 27 Deep-Sea Tide Gage Inter-calibration Experiment. The site selected was in the Bay of Biscay, west of Brest, France, and the gages were deployed from the British Royal Research Ship DISCOVERY. The NOS gage was successfully recovered and the intercomparisons of data and analyses with the other participants should improve the standardization of open ocean tide measurements.

Oceanographic Division personnel provided support for the Marine Ecosystems Analysis Program (MESA) New York Bight Project by processing the Aanderaa current meter data acquired during the past year, and by increasing the tidal observation coverage of the New York Bight. A very important tide gage was installed on Ambrose Light Tower by NOS personnel with the Engineering Development Laboratory (EDL) providing the design and engineering support. NOS has developed considerable expertise in translating Aanderaa data and converting it to time-adjusted calibration corrected engineering units. This data is routinely forwarded to the Atlantic Oceanographic and Meteorological Labs (AOML) for inclusion in their research efforts and to the National Oceanographic Data Center (NODC) for

dissemination. The NOS will also perform analyses of this data and related tidal data to determine harmonic constituents, tide and tidal current characteristics, and also prepare predictions for 1975. This information will be included in a joint publication by NOS and MESA.

A major effort to improve the automation of the processing of tidal data commenced this year. Analog-to-Digital Recording (ADR) tide gages were purchased for installation on the West Coast of the United States, in Alaska, and the Hawaiian Islands. Most of the tidal observations on the East Coast and the Gulf Coast are already recorded in digital form. The capability to translate this digital data directly onto computer compatible magnetic tape was added and the computer processing programs were improved. It was evident that a high-density-storage rapid-retrieval system was necessary, to manage the historic and present tidal information in a manner that would enable NOS to be responsive to requests for assistance from the public, private surveyors and engineers, and local, state, and Federal government agencies with responsibilities for coastal zone management. A system was designed to micro-copy tidal information, which can then be incorporated in a rapid-retrieval system, and also provide high-density automated storage retrieval for the tremendous amount of data in the processing system.

Requests for tidal information continued to increase at an almost exponential rate. During FY 74, NOS entered into agreements with the U.S. Army Corps of Engineers; Department of Interior Geological Survey, and Bureau of Sport Fisheries and Wildlife Service; U.S. Department of Justice; National Aeronautics and Space Administration; as well as state and local governments to establish tide gages and provide data for marine boundary determinations, jurisdictional control and estuarine modeling purposes. Projects were conducted in New York, New Jersey, Maryland, North Carolina, South Carolina, Florida, Texas, California, Oregon, and St. Croix, Virgin Islands.

The majority of requests is for tidal datums to be used in litigation and immediate response is required. In many instances, court cases are postponed pending results of the tidal measurements.

In several recent cases, the judge has issued orders for tide gages to be installed to determine tidal datums at the sites in question.

A project was conducted for the State of California to research the historical records on the tidal datums in South San Francisco Bay. The State is in litigation with private property owners who claim property rights extending to the mean low-water line of 1857. The connection of the continuous records had never been established. The Tidal Datum Planes Section was successful in tracing the station datum from the Presidio tide station to Sausalito and then back to Fort Point. The mean low-water datum was then computed from the records observed in the 1800's.

Over the years, many unsuccessful attempts have been made to recover these historic datums. It was only after extensive research that the single historic record was found in the Federal Records Storage Center at Suitland, Maryland. This record provided the connecting link.

Statistical Accomplishments

Tide Tables	4
Tidal Current Tables	2
Supplemental Tide Tables	1
Flushing Predictions	24
Revised Tidal Current Charts	4
New Stations in Tables	
Tide	5
Tidal Current	3
Tidal Datum Plane Zoning and Tide Reducers supplied to	
Nautical Charting:	
No. of Hydrographic Sheets	140
Tidal Datum Planes Established	
New stations	187
Re-determined or re-occupied stations	150
Tidal Datum Planes Published (Stations)	120
Level Books Processed	761
Tide Records Processed (Station Months)) Does	3,282
Tide Records Received) not	2,948
Backlog of Tide Records (Beginning FY 74)) include	1,210
) IAGS	876
Harmonic Analyses	
365 day	29
29 day	134
15 day	6
Current Data Acquired (Meter Days)	
McARTHUR (NOS)	3,170
FERREL (MESA)	3,541
Total	6,711
Current Data Processed (Meter Days)	2,957
Current Data Processing Backlog (Meter Days)	3,754
(from FY 74 only)	
Current Data Analyzed (Meter Days)	4,168
Current Data to NODC (Meter Days)	1,621
Surface Water Temperature-Density	
Data Processed (Station Months)	1,360
Serial Salinity-Temperature-Density	
Data Processed (Stations)	850

Inter-American Geodetic Survey Activities

Tide Data Received (Station Months)	127
Tide Data Processed (Station Months)	9
Tide Data Backlog (Station Months)	
Beginning of FY 74	689
End of FY 74	807

Coastal Mapping Accomplishments

About 12,000 linear miles of metric aerial photography were flown by the two NOAA photographic missions. Field survey units were assigned to various coastal zone mapping jobs; approximately 130 maps were compiled for the marine charting program and in support of hydrographic operations. Field surveys for 163 airports were completed for the FAA and obstruction charts were compiled and published for 144 airports. Approximately 4,300 corrections were applied to 85 nautical charts.

Photogrammetric Research and Development. The research and development effort during FY 74 consisted of activities to support ongoing and proposed programs of the Coastal Mapping Division as follows: automation of map compilation; application of analytic aerotriangulation methods to SKYLAB photography; estuarine circulatory surveys by photogrammetric methods; water penetration film emulsions; a study of Defense Mapping Agency facilities, equipment, and methods; testing of automatic film processing equipment; development of the Color Matrix System; an inventory of available government-wide excess photogrammetric instrumentation; target studies; comparator studies; and camera calibration.

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. The first 33 maps in the series have been registered. Office progress was reduced significantly during the third and fourth quarters of the fiscal year, awaiting the results of a horizontal control readjustment in southeastern Florida, based on recent geodetic surveys.

Photobathymetric Mapping. Photogrammetric compilation of bathymetry has been successfully accomplished using higher-altitude aerial photography than was previously deemed feasible. Photobathymetry on seven maps is in progress to assist the Corps of Engineers with a study on the environmental impact of deepening the entrance channel at Beaufort Inlet, North Carolina.

Storm Evacuation Mapping. The preparation of storm evacuation maps in cooperation with the National Weather Service continued; ten maps were published. This 15-year program will cover the Atlantic and Gulf Coasts. The National Weather Service (NWS) uses these maps and distributes them to state and local officials to facilitate the evacuation of people from endangered areas.

Flood Insurance Mapping. Operations on the reimbursable Coastal Inundation Mapping Program remained at about the previous year's level. Map plates were delivered to the Federal Insurance Administration, Department of Housing and Urban Development, for 15 communities with accompanying study reports.

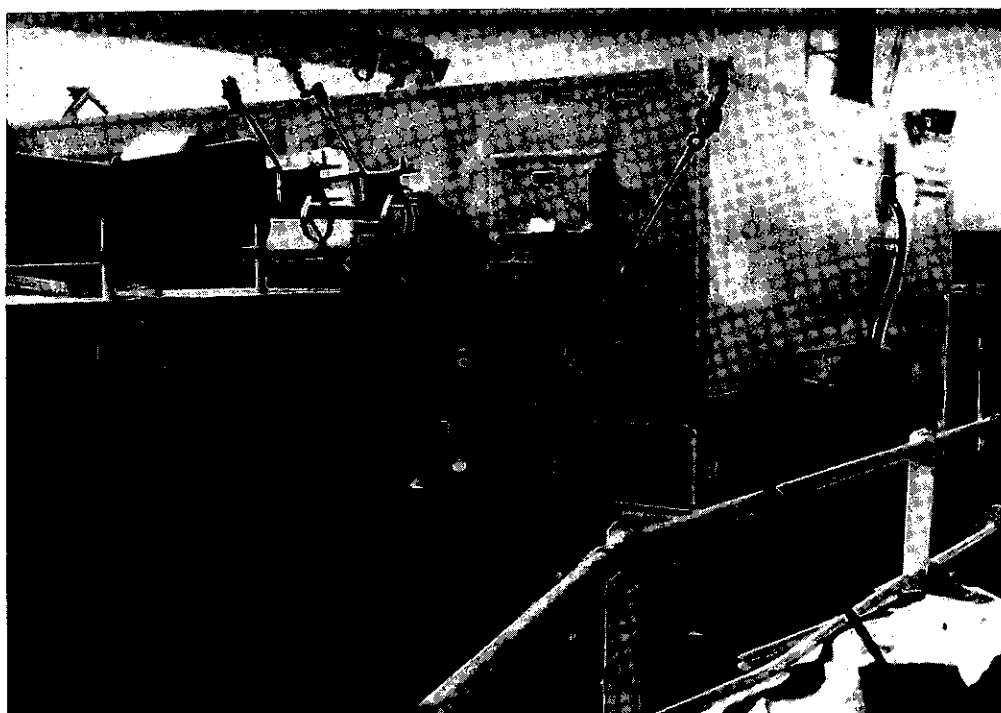


Figure 4. Specially outfitted instrument van aboard the NOAA Ship McARTHUR.

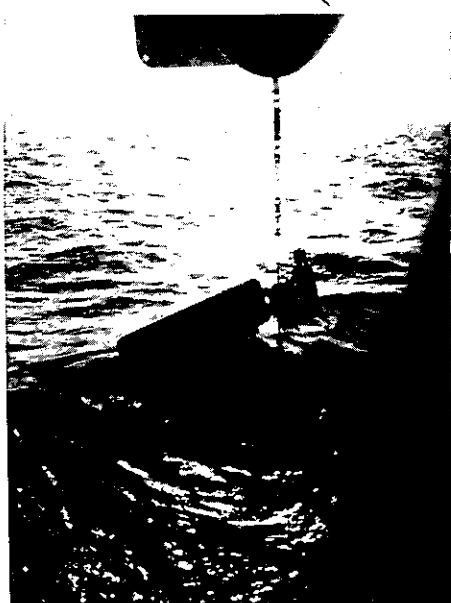


Figure 5. Aanderaa current meter and buoy being lowered into Cook Inlet, Alaska.



Figure 6. ADR Tide Gage on Ambrose Light Tower in entrance to New York Harbor.

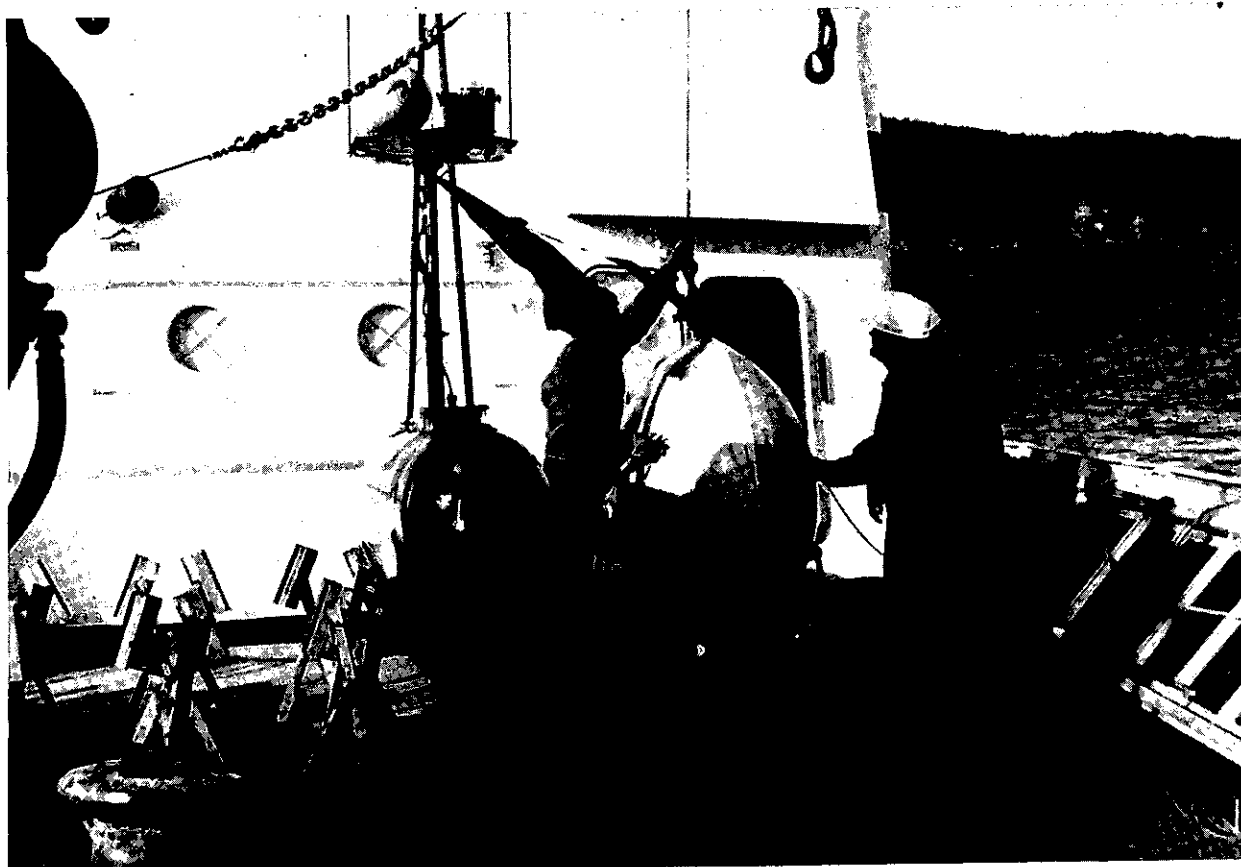


Figure 7. Surface and subsurface buoys being readied for deployment in Cook Inlet, Alaska, aboard the NOAA Ship McARTHUR.

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 Airspace System. Reproduction and distribution support for other NOAA programs was also provided.

The Associate Director, Frederick O. Diercks, retired June 30, 1974. He will be succeeded by Captain James P. Randall.

Training

AC&C personnel attended 193 training courses, of which 47 percent were in science and technology, 26 percent were in management and supervision, 10 percent were in automatic data processing and 9 percent were in general education for high school diplomas.

Management

FY 74 saw the beginning of paper shortages and concurrent price increases in most printing supplies. Substitute papers and printing supplies are being investigated and tested to alleviate this situation.

As a result of FY 73 studies, a lower-cost United Parcel Delivery service for bulk shipments to chart agents was implemented. A savings of 50 percent per unit postage for visual aeronautical charts and a savings of 40 percent per unit postage for nautical charts were realized. The five-color lithographic offset press installed in June 1973 produces the NOS visual aeronautical charts in one press run and has resulted in the elimination of the third shift in the press room of the Reproduction Division. Plans for integrating and merging the Lake Survey Center printing programs into the Reproduction Division are underway.

A \$91,000 contract for a study and plans for merging the housing and activities of the Office of Aeronautical Charting and Cartography into a single, modern, integrated facility was awarded. This contract follows up the Perkins study of last year indicating the necessity for a more efficient plant.

During June, initial delivery of components of a new source data collection system was made to the Reproduction Division. This system will substantially reduce the time and effort now spent in manually obtaining and processing production data and will provide a rapid, relatively error-proof means of monitoring jobs in progress, thus allowing better deployment of personnel and optimum use of equipment.

The Planning Research Corporation completed their contract on the design of a Turnkey System for the Automated Production of Instrument Approach Procedure Charts. A task group was formed to evaluate NOS planning for aeronautical chart automation, to assess the feasibility of automation and to develop a program development plan. This plan resulted in the establishment of a Charting Automation Projects Office, reporting to the Director of the National Ocean Survey, which will manage both the Marine Data Systems and the Aeronautical Charting Automation Projects.

In-house development for computer assistance for on-going charting requirements resulted in expansion of the Airway Fix File System, which has been producing the Controller Chart Supplement for the last three years. The Airway Fix File System was expanded into the Airspace and Chart Support System, and the Data Management System.

The Director, National Ocean Survey, was presented an Executive Research and Development Review of the developmental study of an interim computer-assisted Radar Video Map System.

A three-year contract was negotiated with the American Federation of Government Employees (AFGE) Local 2640, representing employees of the Reproduction and Distribution Divisions.

Equipment

The Reproduction Division received an additional photon (photo-type composing machine) and photographic camera accessories. In the Type Composition Section, a complete conversion to photo composition has been achieved and the additional photon enables the maintenance of work flow of this system. The camera accessories include a programmable calculator used primarily in conjunction with the video program, and an exposure calculator used in conjunction with the film processors and cameras as an aid in automating photo operations. The calculator allows the camera operator to immediately determine the lens setting and bed setting (focus) of the camera when the operator inputs the original copy size. This not only increases production capability but assures accuracy and the ability to duplicate the preciseness, essential to the video program. The exposure calculator is the link between the camera operation and the automatic film processors. It determines the camera exposure required to achieve optimum results in consideration with the speed of the processor and the strength of the chemical developers. (See Figures 8, 9, and 10 on pages 27 and 28.)

Products

The Federal Aviation Administration (FAA), the Defense Mapping Agency and the National Ocean Survey reached agreement on the production change of the Alaska Enroute Chart package from a 28-day to a 56-day cycle. This change became effective with the May 23, 1974, chart edition. Simultaneous with the lengthened production cycle of the Alaska Enroute Chart package, was the production of the Alaska Terminal publication containing, in a bound-book format, Standard Terminal Arrival Routes (STAR's), Instrument



Figure 8. Text and tabular type composition is converted to perforated tape with the use of an electronic keyboard as shown in the photograph.



Figure 9. The data obtained from the densitometer reader determines the dial settings of the instrument on the left, and it, in turn, automatically controls the camera exposure for that particular copy.

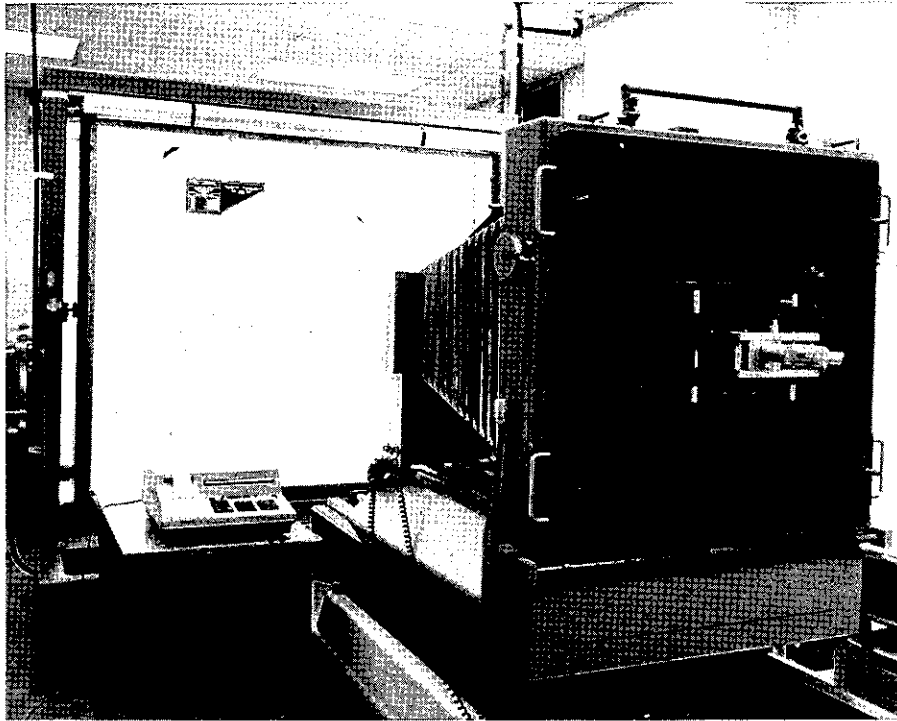


Figure 10. View of programmable calculator with micro-camera, used in making video plates. This photograph shows the microscopic focusing instrument on the camera back, with a video engraving on the copy board.

Approach Procedures (IAP's), Standard Instrument Departures (SID's), and Airport Taxi Charts of Alaska. Experience gained by this reduced frequency of issuance may provide data on changes to production cycles of other chart series assigned to the Radio Facility Chart Branch.

The new Flight Case Planning Chart became operational effective with the first edition, January 31, 1974. This chart is 30" x 50" and is designed for pre-flight and enroute planning for VFR. It depicts the conterminous United States and adjacent portions of Canada, Mexico, and the Bahama Islands. The reverse side contains a mileage table of distances between 174 selected aerodromes; a cross-reference index of cities/aerodromes depicted on the face map; a tabulation of special-use airspace areas; and other information useful for flight planning. The publication is available flat or folded, and will be revised every 24 weeks (168 days). The initial printing was some 40,000 copies.

A new three-chart High Altitude Controller Chart series for the conterminous United States, scale 1:23 NM was completed and added to the 28-day production cycle. This series provides current data to air traffic controllers on jet routes, Area Navigation (RNAV) high altitude routes, and other information required for use above 18,000 feet.

A controller chart update program was initiated and completed. The program consisted of the construction of a new Panama Area Chart, scale 1:2,000,000; a new Panama Terminal Chart, scale 1:200,000; and the reconstruction of the Miami/Jacksonville and San Juan Area Charts, both at scales 1:2,000,000 to conform to FAA/NOS controller chart specifications.

The Radar Video Mapping Program continued to increase during FY 74. At the beginning of the fiscal year there were 332 operational maps at the facilities serviced--264 terminal and 68 enroute. At the close of the year, there were 415 operational maps consisting of 339 terminal and 76 enroute. Approximately 1,340 Radar Video Plates and 3,940 paper prints were delivered to FAA facilities. The Video mapping program also provided FAA with technical advice and cartographic support consisting of Video test plates; Radar Sort Box Grids; Air Route Traffic Control Center and Sector Boundary plots; bearing and distance computations; plotting base maps; and, several instances of expeditious handling of urgent requirements for Video plate revisions to alleviate critical air traffic control problems.

Cartographic support increased to the FAA Air Traffic Control Systems Command Center (ATCSCC). This facility was provided with: 81 weather radar facsimile charts; three weather radar sort box grid overlays; and automated plots of high altitude Air Route Traffic Control Center boundaries on a map of the conterminous United States on the polar stereographic projection. This support was in addition to the plotting charts supplied on regular schedule.

Cartographic support to other areas of FAA consisted of: Special-use graphics for the Airman's Information Manual; Terminal Radar Service Area (TERSA) graphics; Terminal Area graphics; Olive Branch chartlets; Budget overlays; Defense Readiness Overlays; and a display map showing 761 selected airports with 10 NM radius circle on a topographic mapping progress bases.

Cartographic support was also provided to the Aeronautical Charting and Cartography's Research Group consisting of: a mock-up of a revised Visual Aeronautical Chart legend; a prototype VFR Radio Navigation Chart, scale 1:1,000,000; a revised 5" x 10" Aeronautical Information and Chart Symbols book; a new VFR Planning Chart for the Caribbean area that will back up the revised Puerto Rico-Virgin Islands Local Aeronautical Chart. This chart will depict all airports of entry, principal airline distances, a tabulation of special-use airspace areas, search and rescue procedures, customs requirements, and many other items useful for pilots planning flights in the area.

Ten new VFR Terminal Area Charts were published during FY 74. This brings the total of Terminal Area Charts produced and maintained by the Visual Chart Branch to 17. Work is in progress on four additional Terminal Area Charts scheduled for publication in FY 75. This will complete the charting of scheduled Groups 1 and 2 Terminal Control Areas.

Twenty-five requests for National Weather Service charts were completed. The National Weather Service Chart requirements total more than 60 charts for their Radar and Hydrology Forecast Centers. There are 26 requests now on file and eight are in progress.

The drawings for the first APC/OMEGA Chart were delivered to Reproduction on June 13, 1974. This prototype chart produced to permit operational evaluations will use the basic APC 3071 with LORAN removed and three sets of OMEGA lines-of-position overprinted.

The sample 12-page Air/Ground Communication and Chart Supplement developed for the FAA as reported in the previous FY 73 Annual Report has been expanded in scope and a new sample publication developed. This new proposal will be known as the U.S. Aerodrome/Facility Directory and will contain complete aerodrome information in addition to the communications and nav aids data contained in the initial proposal.

On May 13, 1974, an agreement was reached between the Departments of Defense, Transportation and Commerce for the printing and distribution of civil versions of Operational Navigation Charts of Mexico. It was agreed that the DOD would provide and maintain color separation reproducible and the National Ocean Survey would print and distribute these charts.

The Flight Edit Team of the Office of Aeronautical Charting and Cartography, flew a total of 420 hours, covering 513,500 square nautical miles, in support of the Visual Chart Program.

STATISTICAL DATA

	Fiscal Year 1973			Fiscal Year 1974		
	<u>Charts on Issue</u>	<u>Total Copies of Charts Produced</u> (Amounts in Thousands)	<u>Total Copies of Charts Issued</u> (Amounts in Thousands)	<u>Charts on Issue</u>	<u>Total Copies of Charts Produced</u> (Amounts in Thousands)	<u>Total Copies of Charts Issued</u> (Amounts in Thousands)
PRODUCTS						
<u>Aeronautical</u>						
Visual	86	3,127	2,781	92	2,890	2,460
Instrument	2,576	45,326	28,233	2,830	37,236	22,248
Related Data	N/A	17,939	17,939	N/A	14,919	14,919
<u>Nautical</u>						
Charts	895	2,628	2,189	909	2,848	2,208
Publications	16	161	102	16	70	110
Related Data	N/A	2,415	2,415	N/A	1,019	1,019

PUBLIC CHART SALES

	<u>FY 73</u>		<u>FY 74</u>	
	<u>Copies Issued</u>	<u>\$ Issue Value</u>	<u>Copies Issued</u>	<u>\$ Issue Value</u>
<u>Aeronautical</u>				
Visual	1,550,987	927,840	1,507,488	1,069,167
Instrument	24,737,574	1,354,977	17,359,073	1,254,719
<u>Nautical</u>				
Charts	1,201,474	1,224,722	1,252,416	1,336,870
Publications	87,345	105,484	97,994	117,144

SUBSCRIPTION SERVICE

	<u>1973</u>	<u>1974</u>	
Paid Public Subscriptions	76,970	63,495	18% decrease
Paid Public Subscribers	40,788	33,434	18% decrease

PROCEEDS FROM CHART SALES

<u>1973</u>	<u>1974</u>
\$3,639,617	\$3,937,081

AUTHORIZED AGENTS

	<u>1973</u>	<u>1974</u>
Aeronautical	1,383	1,553
Nautical	1,053	1,096

OFFICE OF PROGRAM DEVELOPMENT AND MANAGEMENT

Scientific Services

Lists of approved names were furnished for 79 hydrographic survey sheets and 147 planimetric maps. In addition, 31 topographic quadrangles were prepared for the field investigation of geographic names. Five geographic name reports were received and processed.

Some 60 inquiries were sent out to solicit information on geographic names. The responses, in some cases, provided information utilized by the Board on Geographic Names in making its decision, thus giving the public a feeling that they are in some small way participating in decisions made by a Federal organization. Also, during the year, many responses were made to the public, private firms, NOAA components, and other Federal agencies, who were seeking answers not only about geographic names problems, but also about related geographical subjects. For example, the National Geographic Society wanted to know the size of Green Island and Kure Island, Hawaii.

Approximately 700 items were added to the Division's card file of Board on Geographic Names decisions. Well over 500 advance copies of U.S. Geological Survey quadrangles were received and reviewed. Numerous errors were reported to the USGS for correction before final printing, and other inconsistencies were noted and corrected on NOS products. About 730 charts and publications were received and formed into new geographic name standards. As a result of Board decisions, direct liaison with USGS, public response, office research, and various other sources, some 425 names were altered on NOS products.

The NOS Publications Program budget was prepared and coordinated with the various offices. NOAA and Departmental clearance of all NOS publications was obtained without difficulty. As a result of planned scheduling, manuscripts were submitted to the Environmental Science Information Center (ESIC) for printing at the Government Printing Office (GPO) in time to meet the Department's deadline for acceptance of work to be printed during the fiscal year. A proposal to increase the price of Coast Pilots, Tide Tables and Tidal Current Tables, effective July 1, 1974, was approved by NOAA and the Department of Commerce Office of Publications. NOAA and Departmental approval was also obtained to increase the prices of aerial photographs. Administrative printing requests were monitored to arrange scheduling, to determine the facilities to be used, to establish priorities and to expedite printing to meet deadlines.

Several papers published and papers presented at meetings were edited and cleared. A listing is included in the appendices along with a listing of the awards presented.

Programs were prepared for the visits of dignitaries from several foreign countries. Arrangements were also made for the visits of students from various schools and other individual groups. A list of visitors is included in the appendices of this report.

A total of 103 accident reports were reviewed and processed. Two fires in paper towel refuse containers, one in Building 1 and one in Building 2, were discovered and extinguished before any damage was done. A fire drill for Buildings 1 and 2 was held during Fire Prevention Week. For the first time in a year, no bomb threats were received.

Arrangements were made by the NOS Safety Management Officer to enroll several NOS employees in a NOAA-sponsored basic first aid training course. This course was primarily established for floor wardens to equip them to handle emergencies arising during evacuations. Two employees also enrolled in the instructors course. NOAA's aim is to have two instructors for each component. During the spring of the year, Building 1 was infested with rodents. Although this problem remained for several weeks, it was eliminated through the efforts of the NOS Safety Management Officer working with the Vector Control Representative of the Montgomery County Department of Environmental Protection.

The Chief, Support Services Branch, was designated to head the NOS Combined Federal Campaign for this year. He also served as backup to the Deputy Director who was designated as Vice Chairman for NOAA of the Interdepartmental Savings Bond Campaign.

For the first time in many years, an NOS Annual Report to the Director was prepared.

Approximately 83,000 maps, charts, and photographs were received from state and Federal agencies. More than one-half of these items were distributed in support of the NOS cartographic program. In excess of 32,000 maps and charts were eliminated from the files as obsolete or superseded. Source material and indexes were furnished for the revision of 177 aeronautical charts. An average distribution of aeronautical charts was made monthly to 21 states and 10 agencies on an automatic exchange basis.

A total of \$14,448.38 was realized from the sales of charts from the Rockville Sales Office. More than 9,400 inquiries for cartographic and technical inquiries were processed. As a result of the continuing foreign exchange program NOS received more than 600 nautical charts and distributed approximately 400 charts. As a result of litigation actions, NOS was required to furnish more than 200 charts for court cases.

Security storage requirements continued to be met. Cartographic information included the dissemination of nearly 3,200 nautical charts and over 3,800 topographic quadrangle maps through reference facilities at Rockville.

Special Graphics increased its scope of operation to include program presentations for the Office of the Director as well as its responsibilities in budget, organization, and specialized graphics for program review.

Development of the NOS program for participation in the bicentennial celebration is continuing. More than 1,300 hand pulled engraving prints are ready and a catalog providing descriptive information on the sale and distribution of 19th century nautical charts is anticipated to be completed by the fall of 1974. An article on the goals for calendar year 74 of NOS program areas was published by the Society of America Military Engineers, Military Engineer Magazine.

NOS directives on Charts and Related Publications, Coastal Mapping Division, Photogrammetric Instructions, Designation of NOS Acting Director and International Training Programs were published in the NOS Operations Manual. The Division submitted revisions of several NOAA directives and coordinated NOS responses to draft NOAA issuances on Research and Development Projects; Mail Management; Funding of EEO Officers; Per Diem Allowances for "Hi-Cost" Areas; Authority on Personnel Management; Sale and Distribution of Scientific and Technical Publications; Independent Review of NOAA R&D Efforts; and commented on several draft Department of Commerce directives.

Special investigations were conducted on: legal aspects of public hearings on nautical chart requirements; the management of current hydrographic records in NOS; a survey of areas in which the Department of Commerce and Department of Defense cooperate in training courses, reimbursable programs, mutually-beneficial operations and memoranda of agreements; NOS authority to do hydrographic surveying in Pacific Trust Territories; a study of "active" retired records to be transferred from the Washington National Records Center (WNRC) to the NOAA Holding Area; NOS participation in the Hoover Centennial Celebration, 1974, and the Bicentennial Observance, 1976; historical tide data from Columbia River, Oregon, 1829-33; the District of Columbia-Virginia boundary, 1935; and Cook Inlet, Alaska, 1910-12.

Several requests from the WNRC for authority to dispose of NOS records were coordinated with the responsible officials for approval or disapproval.

The FY 74 revision of the Federal Domestic Assistance Catalog on NOS Programs was coordinated.

Revisions were made to the NOS portion of the NOAA Reports Catalog.

A study of current and obsolete NOS/NOAA forms was completed by an Administrative Intern.

NOS Research and Technology Resumes for FY 74 were reviewed, approved and forwarded to the Smithsonian Science Information Exchange.

The Director's collection and reference set of NOS slides was revised and expanded considerably, and visual aids were loaned to several NOS and NOAA offices for presentation and reproduction purposes.

The Division assisted the National Geodetic Survey with the planning for the processing of a major shipment of geodetic data transferred from Defense Mapping Agency to NGS and also assisted the Chief Scientist of NOS with the transfer of over 1,000 cubic feet of International Decade of Ocean Exploration records from the University of Connecticut to the WNRC.

During the past year, over 5,500 NOS field and headquarters current records were registered and processed; 181 ships' records were registered; more than 3,900 loans were furnished from current records; approximately 520 cubic feet of inactive records were transferred to the NOAA Holding Area and the WNRC; 727 documents and boxes were retrieved from the Holding Area/Federal Records Center and 551 such items returned to the Records Center. Approximately 500 projection slides and 23 still photographs were added to the Director's collection.

ADP personnel prepared the Feasibility Study, Specifications, and Request For Proposal to upgrade the HYDROPLOT/HYDROLOG (H/H) Computer Support System and served on the Source Evaluation Board (SEB) for the selection of vendors.

Reviews were made of the Office of Aeronautical Charting and Cartography's Feasibility Study to install Source Data Preparation Machines in the Reproduction Division, and the Marine Data System's Justification for installing H/H Data Acquisition Systems aboard the Ships DAVIDSON, WHITING and PIERCE and their associated launches.

ADP management reports, by month, quarter, and year, on computer usage, costs and obligations, were prepared for each component of NOS.

Graphics software for displaying Current Meter Data, Video Maps and Tidal Current Diagrams was developed for the Cal-Comp and Gerger plotters.

A Programmed Instruction Course in FORTRAN was administered to 12 NOS employees.

The Marine Field Group continued to develop and maintain system programs for the H/H Data Acquisition System for Class II and Class III Vessels and their associated launches.

The Administrative Support Group maintained the Charts Inventory System of Aeronautical Charting and Cartography, supported the administrative areas within NOS and interfaced with software and data of the NOAA Administrative Areas.

Programs were extensively modified to change the card processing system of the Tides Branch to a magnetic tape system. Complete conversion of S/360/40 programs and production runs to S/360/65 at the Georgetown site was accomplished.



Figure 11. Chart sales and cartographic information provide the public with NOS products and services.

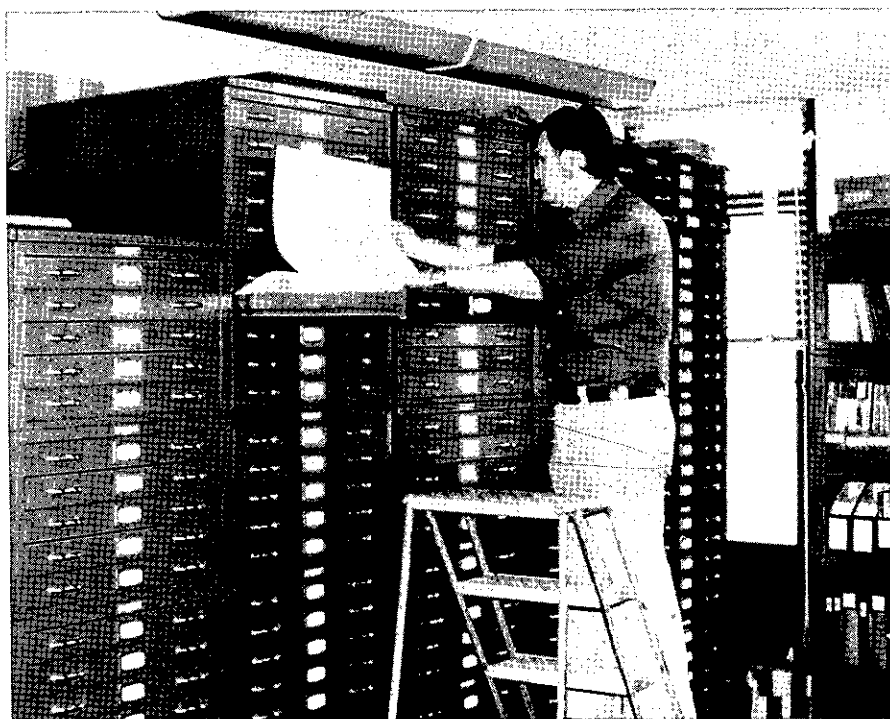


Figure 12. The Map Library contains some 40,000 cartographic items available to program areas of NOAA.

Program Development

The Program Development Division prepared the NOS portion of the FY 76 NOAA Program Memorandum for presentation to the Department of Commerce.

Staff members served as the NOS focal point and coordinating area to develop a Management-by-Objectives (MBO) package for all NOS programs. As a part of this effort, program goals, objectives, and measurable milestones were developed for FY 74. The entire package is being refined and updated and a management reporting system on accomplishment of milestones is being developed for FY 75. Personnel are also working closely with program officials to update and refine a previously developed productivity measurement system for NOS programs:

Acting as the focal point for information on NOS plans and programs, contributions were made by this area toward the development and review of federal programs involving interagency cooperation and participation. Some of the more important programs are: (1) the Interagency Committee for Marine Science and Engineering (ICMSE); (2) Interagency Committee for Marine Environmental Prediction (ICMAREP); (3) Interagency Committee on Atmospheric Sciences; and the (4) Trans-Alaska Pipeline Study.

Personnel served as NOS representatives and contacts for special committees, such as the Commerce Coordinating Group for ICMAREP and Council on Environmental Quality (CEQ)--Studies of Offshore Nuclear Power Plants. The Division also fulfilled NOS responsibility for comments on Draft Environmental Impact Statements (DEIS's) by overseeing the preparation and distribution of over 200 DEIS's.

Continuing efforts were made to make NOS programs more responsive to the needs of commerce, industry, and the general public, and to improve the operation and management of these programs to establish the most effective use of resources. During the past year, a task group consisting of personnel from the Program Development Division and other program areas completed the Phase II study of the Nautical Charting Program. The published report covers those activities of the nautical charting system that contribute to the determination of requirements and the establishment of priorities for hydrographic surveys. The task group derived a systematic, quantitative procedure for establishing priorities of conducting these surveys among competing coastal areas. In addition, they studied the utilization of the survey products of the Nautical Charting Program, focusing on the expressed demand for these products and services. Situations were found where meeting present and expected future demand has and will cause severe internal problems, and recommendations were made to alleviate these problems by introducing more realistic pricing policies, effective utilization of trust funds, and introduction of more cost/effective techniques.

The Division coordinated the preparation of information on NOS energy-related research and development projects and provided support to the Associate Director, Marine Surveys and Maps, who represented NOS at the annual U.S./Canada Mapping, Charting, and Aerial Photography meeting in June 1974.

Representatives were designated to serve on a task group for development of NOS services to support a Deep Ocean Terminal System (DOTS) and on a task group on the cost of operating and maintaining vessels of the NOAA Fleet.

Several responses were made to Congressional inquiries concerning NOS programs and activities in the districts of the members on the House Committees on Science and Astronautics and House Committee on Rules.

Submission of NOS' projects for inclusion in NOAA's Managers' Improvement Program (MIP) Plan for FY 74 were: (1) Modernization of Tide Data Processing; (2) Computerization of Mailing Lists; (3) Five-Color Printing of Visual Aeronautical Charts; (4) Automation of Flight Hazard Files; (5) Automatic Plotting System; (6) Reorganization of Hydrographic Field Party 742; (7) Bilby Tower Replacement; and (8) Inactive Ship Concept.

A task group consisting of personnel from the Division and from the Office of Marine Surveys and Maps began a general study of the mission, operations, products, users, and the inter- and intra-agency relationships of the Oceanographic Division. Problems which may be uncovered will be the subject of detailed studies by the task group.

Program Management

Fiscal Year 1974 constituted the second year for the new Financial Management System (FIMA). The FIMA System and all related financial reports are completely automated to cost-based budgeting. In conjunction with the new FIMA reporting system, NOS established a task group in the Program Management Division for the purpose of developing new and improved material for the Director's Resource Review for Program Managers. This Review also provides the Director with current information on all phases of NOS operations prior to his monthly resources review with the Administrator and Associate Administrator.

The National Ocean Survey, in its endeavor to increase the effectiveness of its operations, has initiated a series of management reviews of its headquarters and operating elements. The Office of Program Development and Management, NOS, led a team effort to perform an in-depth management and administrative systems review of the Office of Marine Technology (OMT). The study commenced on September 12, 1973, and was completed in January 1974.

A second task group was established to conduct a management and personnel study of the National Geodetic Survey (NGS). This study commenced March 20, 1974, and will be concerned primarily with the administrative management of the Office and satisfying the position maintenance review requirements.

National Ocean Survey is participating in the Scientific Upward Mobility Training Program. The program has been met enthusiastically by the participants, offering both a personal challenge and an opportunity for real career growth. NOS has 10 people in the Science Technician Program, one in the 20/20 Program, one Science Intern, and one in the Graduate Program.

The NOAA Voluntary Action membership drive was held June 10-21. Floor monitors were appointed and, through their efforts, NOS enrolled 72 new members, with a total pledge of \$429.85.

The Program Management Division was responsible for submitting nominations for the Medal Awards, the highest awards bestowed by the Department of Commerce. The recommendations consisted of one Gold Medal, four Silver Medals, and three Bronze Medals. Also, there was one recommendation for the NOAA Program Administration and Management Award. (See Appendix).

The full-time permanent ceiling for personnel for FY 74 was reduced by 24 positions to a year-end total of 2,054. The graph on page 41 illustrates the status of full-time permanent positions for FY 74.

During FY 74, approximately 2,000 requests for personnel action were initiated. These included such actions as appointments, reassignments, promotions, and other miscellaneous ones.

Direct Cost and Obligations Plans for FY 74, are summarized below (in thousands of dollars):

	<u>Cost Plan</u>	<u>Obligation Plan</u>
Operation Research & Facilities (OR&F) (Opera.)	\$33,127.1	\$30,555.8
Operation Research & Facilities (OR&F) (Research)	22,037.2	17,277.4
Reimbursable	5,747.7	5,585.7
Management Fund	7,518.2	6,852.9
Public Law 91-412	<u>2,016.2</u>	<u>2,211.5</u>
Total	\$70,446.4	\$62,483.3

Funds Transferred to NOS for Support of Other Programs

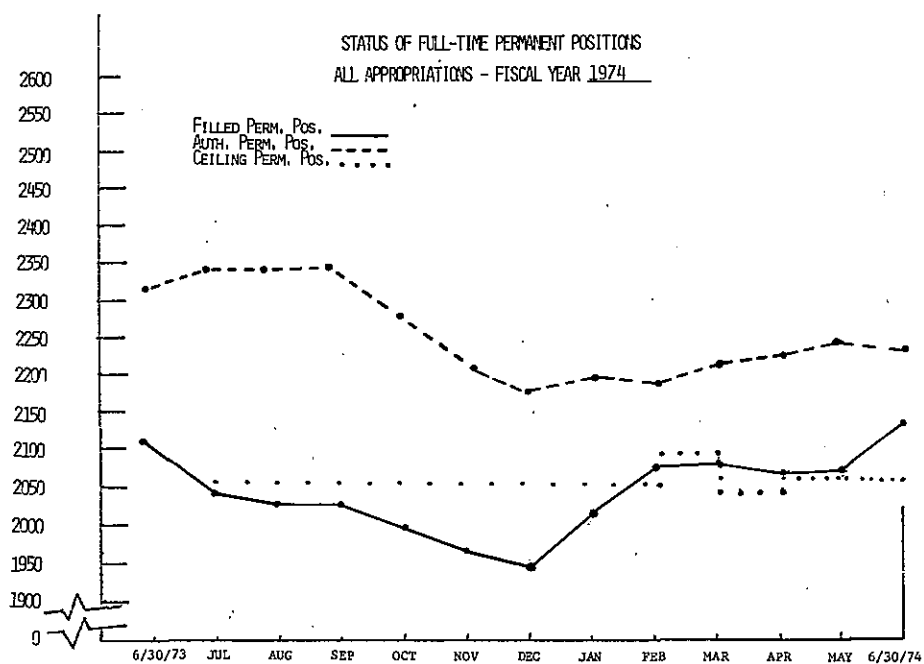
(in thousands of dollars)

Support of GATE	\$1,021.3
Support of IFYGL	140.0
Support of MESA	530.3
Other	<u>158.5</u>
Total	\$1,850.1

Funds Transferred from NOS for Support of Our Programs

(in thousands of dollars)

To AD for Computer Services	\$422.8
To EDS for Digitizing - Marine Chart Automation	<u>534.0</u>
Total	\$956.8



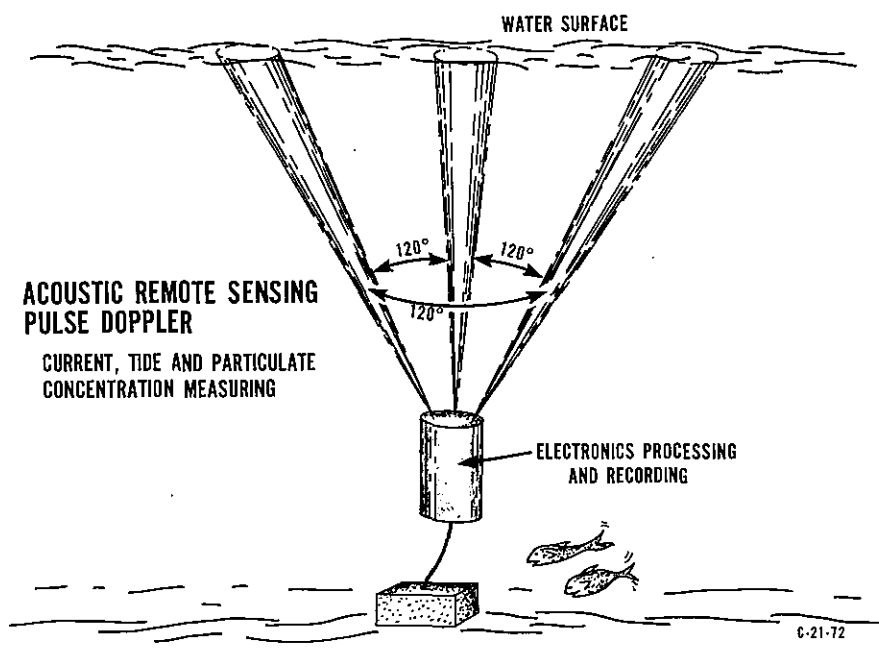
OFFICE OF MARINE TECHNOLOGY

The Office of Marine Technology (OMT) has continued to expand its engineering support function by strengthening its regional calibration services through the National Oceanographic Instrumentation Center (NOIC), assumption of new challenges by the Engineering Development Laboratory (EDL), and the propagation of proven buoy technology learned at the NOAA Data Buoy Office (NDBO). These divisions of OMT have engendered cooperation and earned professional respect by proving the merits of their applied technology in support of NOAA, interagency, and international marine programs.

Engineering Development

In FY 74, the major engineering provided by EDL was in support of the Cook Inlet Circulatory Project and the Marine Ecosystems Analysis Project (MESA) in the New York Bight.

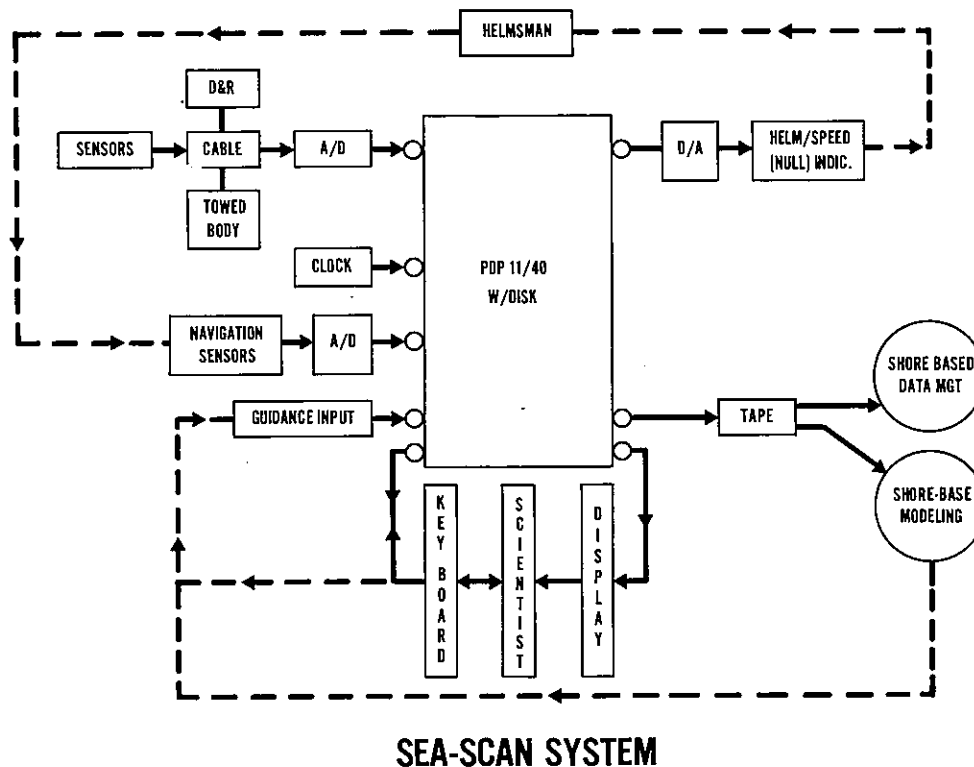
Two key tasks were completed for the Cook Inlet Project. A current meter mooring system capable of operating in currents up to 5.5 knots was designed and tested, and assistance was provided in the development of the software required to process the current data acquired from the field. Over 80 percent of the field data was processed successfully. This level of return represents a highly effective field data acquisition program. In preparation for measuring currents of the order of 10 knots in the upper Cook Inlet, the basic design of a bottom resting remote sensing acoustic doppler current measuring system was completed, and one of the three channels was constructed for use in conducting engineering tests. The following illustration shows an artist's concept of this bottom current measuring system.



The MESA engineering support was divided into five principal parts: integration of subsystems for the acquisition of data; assistance in the development of software to process the data in final form; design, development, and test of four data acquisition subsystems; development of procurement specifications; and shipboard interface which included evaluation of several vessels for use in the New York Bight. Of particular importance was the design and development of a bottom resting current measuring system and camera combination. This system is being used to determine the relationship between bottom currents, soil types and scouring effects.

A laboratory field test and evaluation of a towed undulating data acquisition system (designed and developed in the United Kingdom) was conducted in support of the National Marine Fisheries. The unit measures salinity, temperature and depth; it samples plankton density and type. The results of the tests show that modification of the watertight seals, modification of the data logging unit, and the redesign of the data translator unit are necessary to increase the reliability and overall usefulness of the system.

A system for measuring water quality parameters is under development at the Draper Laboratory. This system, when completed, will acquire and process data while the vessel is underway and provides an interactive capability for the onboard scientist. To date the systems study has been completed and the development and test of the software is underway. The following illustration shows a block diagram of the major elements of the system.



The laser depth sounder evaluation contract jointly sponsored with the Office of Naval Research and the National Aeronautics and Space Administration is completed. Results of the work indicates that the propagation characteristics of a blue-green laser through water can be modeled through physical analysis of water and bottom samples. In addition, the laser technique is feasible for depth sounding measurements to depths of at least three fathoms in the vast majority of near shore areas of interest to NOS.

The following three new developments in support of hydrography were initiated. Two contracts were initiated to determine the feasibility of (1) heave error correction of depth sounders aboard launches in the 26-foot to 60-foot category and (2) air/water coupled acoustic transducer for use in near and offshore hydrography from surface-effect type ships. Successful demonstration of these efforts will lead to more accurate depth sounding and more effective near shore hydrography.

Data Buoy Program

During FY 74 NDBO developmental efforts culminated in the contracting for a prototype operational deep ocean moored meteorological buoy. The buoy is designed to remain on station for a period of three years with annual at-sea service visits and is the forerunner of a planned 35 environmental data buoy array to be located off the coasts of the United States and in the Great Lakes.

Modifications to enhance the reliability and capability of existing experimental large-hull, high-capability buoys resulted in significant performance improvements. An overall mean-time-between-failure rate of 182 days was established for EB-3, 10, 12 and 13. The National Weather Service received 80 percent of all regularly scheduled weather messages originating from the large buoys.

During March, the oldest of NDBO's 40-foot discus buoys, EB-01, incurred damage to its hull and mast and ceased reporting data to the Shore Communication Station at Miami. In the 14-year period of its deployment, the buoy transmitted data to meteorologists that aided in revealing the formation of more than 50 major storms off the mid-Atlantic and New England coasts. A replacement buoy will be deployed at EB-01's ocean station in December 1974.

After a successful 7-month test in the Gulf of Mexico, EB-02, the boat-shaped, deep keel buoy, was retrieved in September, and returned to the NASA Space Technology Laboratory, formerly Mississippi Test Facility (MTF), for refurbishment and modification. On May 30, following several configuration changes, the buoy was anchored approximately 300 nautical miles west of Astoria, Oregon, at a depth of 9,300 feet.

EB-03 was retrieved from the Gulf of Alaska in June, and towed to the U.S. Coast Guard Station at Seattle, Washington, for refurbishment. During 1974, the buoy transmitted over 50 percent of its required data

messages which were instrumental in the prediction of several unusual storm conditions. The buoy will be returned to its ocean station 185 nautical miles southeast of Kodiak Island in December 1974.

The buoys in the Gulf of Mexico, EB-10 and EB-12, operated on a continuous basis for 8 months with EB-10 transmitting 99 percent of the required synoptic reports and EB-12 transmitting 100 percent of its requirements until mid-June when it became inoperative. EB-12 is scheduled for repair in early July.

On December 10, 1973, EB-13, a 40-foot discus-shaped buoy, was anchored at a depth of 13,200 feet approximately 150 miles south-southeast of Cape Hatteras, North Carolina. The buoy is furnishing environmental data from an area that frequently generates "Hatteras" lows and severe weather effecting the eastern United States.

The NDBO initiated an Ice Buoy Development Program to develop ice buoys intended for use by a number of experiments in both the arctic and antarctic including the Artic Ice Dynamics Joint Experiment (AIDJEX), Polar Experiment-Artic (POLEX-NORTH), First GARP Global Experiment (FGGE), and possible Polar Experiment-Antarctic (POLEX-SOUTH). Three experimental buoy systems were procured in coordination with the AIDJEX Project Office and are undergoing test and evaluation. These nonexpendable buoys are designed for high accuracy (300 meters) ice position tracking and long term high accuracy (0.2 mb) barometric pressure measurements. Other low cost (\$5-\$10K) expendable ice buoys are under development to acquire the Global Atmospheric Research Program (GARP) meteorological data and to track ice motion with an accuracy of five kilometers. An arctic data buoy, deployed in the ice during October 1972, was recovered during March, for engineering test and evaluation. A single failure, the loss of a lower air temperature sensor during the fall of 1973, marred an otherwise perfect performance record of 504 days operation.

Tentative agreement was reached with the National Science Foundation and the Office of Naval Research for NDBO to manage the North Pacific Experiment (NORPAX) moored buoy program including development of required buoy systems.

The NDBO developed and tested six prototype buoy transmit terminals (BTT) and subsequently contracted for 75 production BTT units. These terminals are intended for use with the NIMBUS-F Satellite System. Five data collection platform radio sets (DCPRS) for use with the GOES satellite system were acquired during FY 74. The DCPRS will be used for the planned conversion of operational buoys to UHF communications in FY 76. Tests linking up several units with the GOES satellite system were successful.

Major sensor efforts during FY 74 included the award of contracts for the development of a no-moving-parts anemometer, the development and test of low-cost electromagnetic current meters, a prototype water quality indicator system, and the development of a wave height measurement system.

Continued development is required to measure and report wave spectra information. An oceanographic sensor suite was tested at the NOIC Gulf Coast Regional Calibration Center and from the USCGC ACUSHNET.

A ferro-cement 40-foot discus buoy was outfitted with power supplies and a data acquisition system for use as a subsystem engineering test platform. The buoy will be moored near Gulfport, Mississippi.

The initial test phase of the Limited Capability Buoy (LCB) Program consisting of 10 engineering model drifting and moored LCB's was completed in October. Tests demonstrated that their future use must be limited to moderate environments and short term applications. The buoys are currently being modified and reconfigured in support of scientific experiments.

A highly accurate Measurement Comparison System (MCS) incorporating a 60-foot spar buoy was developed to monitor the accuracy of environmental data measured from data buoys and to provide assurance that the data is meeting prescribed standards.

The NDBO played a major role in the design and integration of the Shipboard Data System and produced 29 radar marker buoy systems for use in the GARP Atmospheric Tropical Experiment. NDBO participation in the GATE International Sea Trials in August, included the provisioning and installation of basic instrument systems on the RESEARCHER and the operation of data acquisition systems. Between March 25 and April 5, 105 personnel were trained on the equipment and operation of the GATE Shipboard Data System.

Three quarterly issues of the Data Buoy Technical Bulletin were published. NDBO has received many favorable comments on their contents and on the need for such a publication. OMT has also received similar comments. We have also received articles for publication from individuals in the United States and some foreign countries.

Oceanographic Instrumentation

In FY 74 NOIC had expanded activity in all of its important programs. This is especially true when you consider the extensive progress made in three particular areas of immediate concern. These were: (1) expansion of interest in international programs, (2) stabilization of operations at the regional centers which were initiated last year and (3) development of a stronger water quality measuring program.

In international activity, the delivery of mechanical bathythermographs to underdeveloped countries was increased. These "BTs", declared surplus by the U.S. Navy and delivered to NOIC, are now being calibrated at the Southwest Regional Calibration Center (SRCC) before they are transferred to other groups such as the countries that make up the Intergovernmental Oceanographic Commission (IOC). Also during this year, discussions were held with a representative of the Centre Oceanologique de Bretagne (COB) Brest, France, about the establishment of a joint computerized data retrieval

and exchange system which would contain worldwide oceanographic instrument information. As an example, data from the NOAA/NOIC FAI Log reliability project could become an essential part of the program. Liaison with the Secretary of the Navy seems to indicate that a similar cooperative program with the U.S. and Russia is also a distinct possibility.

In conjunction with the reorganization of NOIC, January 20, 1974, the Calibration Branch of the Technical Services Division was transferred to the Gulf Coast Regional Calibration Center (GRCC) in Bay St. Louis, Mississippi. This major step was part of the work stabilization program at the regional centers which was a major part of FY 74 activity. The three centers, SRCC, GRCC and NRCC (Northwest Regional Calibration Center in Seattle, Washington) are now operational and conducting an increasing number of oceanographic instrument calibrations. NRCC reports for example that the reimbursable services performed by that Center rose to approximately \$40,000 of which more than 50 percent resulted in new money to NOAA (derived from sources such as the National Science Foundation (NFS), Office of Naval Research (ONR), Navy, Environment Protection Agency (EPA), etc.) and more than 12 percent resulted in new money to the U.S. Government (derived from Canada and industry). Forty calibration tasks were performed for 15 distinct client groups since its establishment.

NOIC's role as a National Center dedicated to improving oceanographic instruments made it imperative that a program of testing and evaluating water quality measuring instruments be enhanced. In response to the increasing needs of this project, expanded laboratory space and new equipment was provided at the main center in Washington, D.C. These additional resources and facilities provides NOIC with the capability to analyze water samples for all of their major constituents.

The Technical Services Division of NOIC continued to provide extensive support for the MESA program in the form of a manned portable calibration van located at MESA's dockside site of Floyd Bennett Field, Long Island, New York. Another major project completed in FY 74 was the procurement and installation of a new STD Test facility in NOIC's Washington laboratory. This facility will be operational and ready for use in early FY 75. In the coming fiscal year work will continue to equip the regional centers with the facilities that are required to support a proficient calibration program in these communities needing oceanographic instrument support.

In processing manuscripts for publication through the editing, printing and distribution stages, the Documentation Branch of the Technical Services Division kept pace in FY 74 with the accelerated production of instrument Fact Sheets, Technical Bulletins, papers, articles, reports and calibration procedures generated by other organizations of NOIC. A special effort is now being made to reduce the processing time for Instrument Fact Sheet publications to no more than 10 weeks from receipt of the final manuscript in the Documentation Branch to the mail out phase of their distribution.

Initiation of pilot efforts in interlaboratory calibrations was highlighted by the Metrology Division, concentrating on salinity, temperature and pressure measurements exchange with NOIC's regional centers, other government activities and private organizations. Salinity standards were provided to GATE participants and reciprocated with Canada for instrumental measurement validation. Metrology research investigations focused on ocean dynamic influences to current meter measurements and the development of selected laboratory standards by National Bureau of Standards and Woods Hole Oceanographic Institution.

The Analysis Branch of the Testing Division, in addition to managing the Failure Analysis Initiation Log (FAILog) program, broadened its activities to include conducting preliminary studies of the effects of shipboard vibration of electronic and oceanographic instrumentation systems. One of the goals of the project is to develop a vibration test specification for all oceanographic instruments stored and/or operated onboard oceanographic vessels and to form a joint program with NOIC and the French Centre Oceanologique de Bretagne.

The Evaluation Branch of the the Testing Division tested and evaluated oceanographic instruments which were classified in the following categories: Current Meters, C/STDs, Water Quality, Acoustics, and Wave Measuring Instrumentation. Approximately 75 percent of the test and evaluation work is dedicated to Navy requirements submitted yearly by the Oceanographer of the Navy under a DOD/Commerce agreement. The results of the Test and Evaluation Program are provided to Navy and the general oceanographic community through the Instrument Fact Sheets, Technical Bulletins, Technical Memos, technical papers, special reports and magazine articles.

OFFICE OF FLEET OPERATIONS

The Office of Fleet Operations (OFO) has provided ship support for NOAA programs and exercised management of the NOAA Fleet.

During FY 74, OFO has managed the operation and utilization of 21 ships which have provided 3,257 days at sea in support of NOAA programs. 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.

The Operations Division engaged in the development of data bases reflecting expenditures associated with ship operations for projects under seven modes of operation. Data bases were developed utilizing both the automated and manual methods.

Project instructions were written for a Cable Route Survey (Oahu to Guam beginning October 1, 1973) and NOAA/USGS Cooperative Survey of the Baltimore Canyon Trough. Liaison was maintained with special project offices, such as GARP (Global Atmospheric Research Program) Atmospheric Tropical Experiment (GATE) and the Marine Ecosystems Analysis Program (MESA).

Significant achievements were realized in communications through the coordination and assignment of call signs, telecommunications/hardware modifications for GATE, facsimile testing between ship and shore stations and participation with interdepartmental planners concerned with continuity of communications on a global scale. Test evaluation and documentation was completed on the application of silicone to ship antenna shields.

Operational and cost information was provided on various proposals offered by the seven maritime unions representing the NOAA Fleet.

The Operations Division maintained liaison with several organizations regarding diplomatic clearances for NOAA ships entering foreign waters, University-National Oceanographic Laboratory System, Automatic Merchant Vessel Report System, Safety of Life at Sea, and the Defense Fuel Supply Center.

"Guide for NOAA Vessels Visiting Foreign Ports" was rewritten and a new reporting form (NOAA 12-8d, Monthly Ship Accomplishment Report-B10) was revised.

Responsibilities of the Marine Engineering Division have increased under the Office of Fleet Operations. In order to meet them with minimal staff build-up, care has been exercised to fill new positions with top quality professionals. The addition of four new positions on the electronic

support staff for FY 75 will bring the Division approximately to the level originally conceived as adequate. Little or no further difficulty in coordinating fleet electronic support functions is anticipated.

Significant progress has been made in the Field Electronic Support Program. A comprehensive electronics support program plan was written. Electronic Divisions were created at the Atlantic and Pacific Marine Centers and staffing is well under way. Plans for upgrading shipboard technical personnel have been made but most of these require personnel or budgetary resources not yet available. Some training sessions have to be accomplished in specific areas. A comprehensive update of the electronic equipment inventory has been started and is targeted for completion in FY 75. An equipment failure reporting system was established and is working satisfactorily. A Preventive Maintenance Program was started and is targeted for completion in FY 75. An initial critical spare parts and equipment plan was made. Routine equipment replacement plans are under way and should be completed in FY 75. Budget procedures to identify electronic expenditures were developed. Communications media in the form of OFO Instructions was established.

The Marine Engineering Division has also made significant progress in the Fleet Maintenance Program. Approximately 107 collateral engineering assignments and tasks were completed, e.g., MESA ship modifications and specifications, GATE specifications and supervising management of contractor work, resolution of engineering problems, cost estimates, etc.

Fleet Maintenance and Repair Instructions have been developed and a Casualty Reporting System has been promulgated. Administrative Procedures for Maintenance and Repair of NOAA Ships has been completed. Other instructions are planned and will be on a continuing basis. Standard shipyard work items have been completed and will be issued to the Marine Centers shortly. A consultant has offered a proposal to have a 3-day seminar in teaching the standardization of writing specifications. Standards for cost estimating have been compiled; however, much work is needed to review only applicable data for Marine Engineering Division use. Reliability, Maintainability, Availability/Failure, Mode, Analysis (RMA/FMA) data plan has been started with preliminary effort for year-to-date equipment hours scheduled by the winter inport period. Proposals have been received to validate shipboard equipment from several consulting firms; however, due to funding limitations at this time this task has been delayed. A Casualty Reporting System has been completed and promulgated to the Fleet. Ship alteration procedures have been completed and included with the maintenance and repair procedures. Preliminary work has been started with the present spare parts procedures and, upon completion of the study, proposals will be made. Several courses, specifically in cost estimating, are planned by the Chief, Ship Systems Staff, to be given in FY 76 to the engineering personnel. A tentative Inactive Ship Repair Information Booklet has been written and is under review. A comprehensive pollution abatement program is under way and will be implemented aboard ship beginning in FY 75.

Additionally, OFO has made significant progress in the following areas during FY 74: Eleven commissioned officers of the NOAA Corps have completed a fisheries training course at the University of Rhode Island for familiarization of techniques employed aboard NOAA ships which support NMFS programs. An Inactive Ship Plan was placed in operation during the winter inport period as a means of reducing cost of operations. Plans for AMC Base Expansion have been updated and cost figures revised. Budgetary requests have been made for the reactivation of NOAA Ships TOWNSEND CROMWELL, DISCOVERER, SURVEYOR and MILLER FREEMAN, and for the construction of one general purpose coastal oceanographic research ship. A budget request was made for plans and specifications to replace NOAA Ship OREGON. The NOAA Fleet Inspection Program is being implemented to improve the material condition of the NOAA Fleet. This program has been very successful and helps to insure the maximum operational capability of the Fleet. The Management by Objectives concept was implemented. Three new Type I hydrographic survey launches were delivered in February-March 1974. Labor relations have been improved through the renegotiation of union contracts and new work rules. OFO personnel have contributed to the completion of two studies on Review of the NOAA Fleet. Repairs to the dock facility at Sandy Hook, N. J., are being implemented. This facility supports the NMFS Middle Atlantic Coastal Fisheries Center and NOAA Ship DELAWARE II. The first female crew member was recruited and assigned to a NOAA ship.

THE NOAA FLEET

<u>Class</u>	<u>Ship</u>	<u>Overall Length (Feet)</u>	<u>Home Port/Remarks</u>
I	OCEANOGRAPHER	303	Seattle
I	DISCOVERER	303	Miami (Inactive)
I	RESEARCHER	278	Miami
I	SURVEYOR	292	Seattle (Inactive)
II	FAIRWEATHER	231	Seattle
II	RAINIER	231	Seattle
II	MT. MITCHELL	231	Norfolk
II	MILLER FREEMAN	214	Seattle (Inactive)
III	WHITING	163	Norfolk
III	PEIRCE	163	Norfolk
III	McARTHUR	175	Seattle
III	DAVIDSON	175	Seattle
III	OREGON II	170	Pascagoula
IV	FERREL	133	Norfolk
IV	DAVID STARR JORDAN	171	San Diego
IV	TOWNSEND CROMWELL	158	Seattle (Inactive)
IV	DELAWARE II	155	Sandy Hook
IV	ALBATROSS IV	187	Woods Hole
V	OREGON	100	Kodiak
V	JOHN N. COBB	94	Seattle
V	RUDE	90	Norfolk
V	HECK	90	Norfolk
VI	MURRE II	86	Juneau
VI	GEORGE M. BOWERS	73	Miami
IV	GEORGE B. KELEZ	176	Seattle (On loan to USGS)

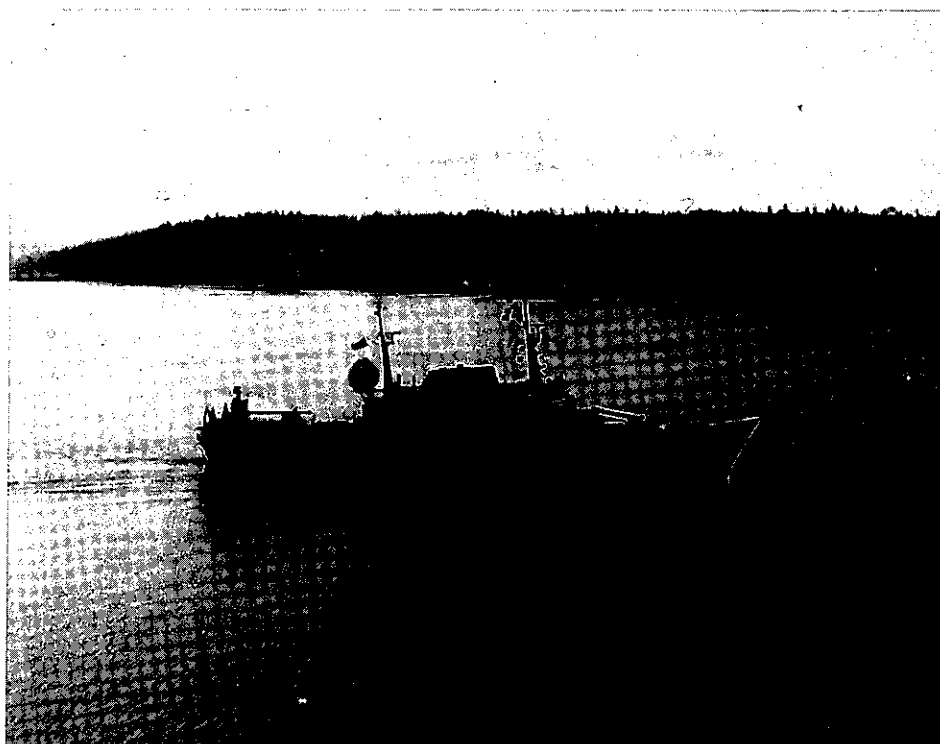


Figure 13. NOAA Ship OCEANOGRAPHER - Class I.

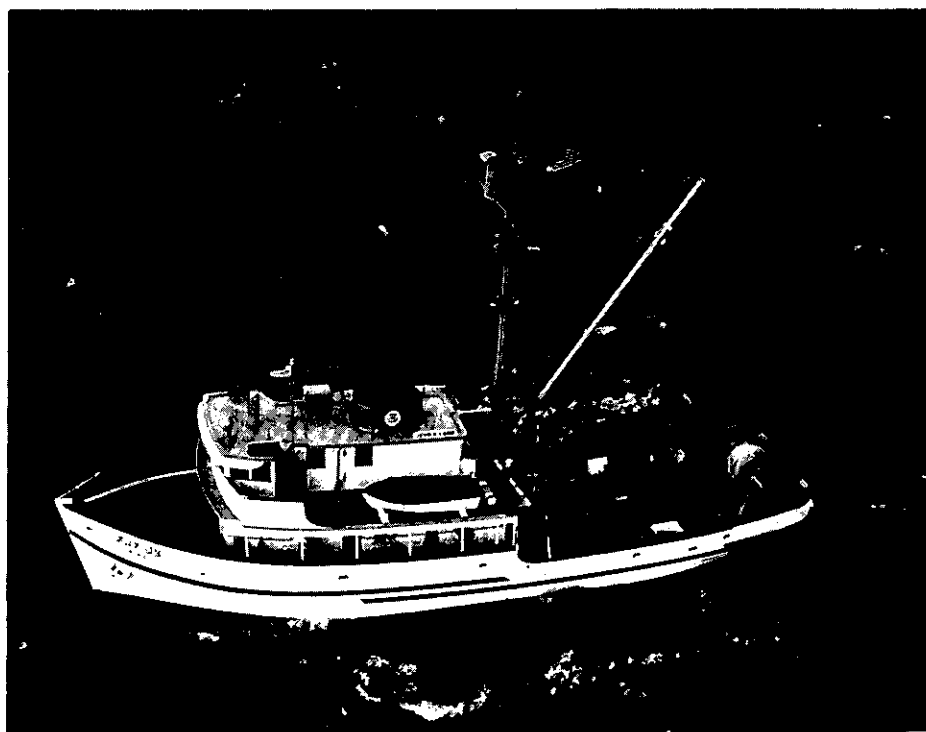


Figure 14. NOAA Ship JOHN N. COBB - Class V.

ATLANTIC MARINE CENTER



The Atlantic Marine Center (AMC) experienced a demanding, productive year characterized by the expanded participation in various activities representing the NOAA/NOS in a continuing effort to promote its products and services. The Atlantic Marine Center initiated a National Ocean Survey-U.S. Power Squadrons Cooperative Charting Seminar which was held at the Atlantic Marine Center for U.S. Power Squadrons, Districts 5 and 27 on the weekends of November 3 and 10, 1973. This seminar proved to be highly successful as judged by the quality of reports received.

The Public Affairs Office processed 12,661 Corps of Engineers Permits from 12 Districts and 5 Coast Guard Districts. Of these, 2,684 follow-up questionnaires were sent out with a return of 71 percent. There were 1,657 chartable items forwarded to Headquarters. The over-the-counter sales of nautical and aeronautical charts as a public service has greatly increased the work load. However, the response has indicated that this service was much needed in the area. Captain Gerard E. Haraden assumed duties as Deputy Director, AMC, replacing Captain Hubert W. Keith, Jr., who retired on May 30.

Electronic Engineering

The Electronic Engineering Division was established August 24, 1973, to provide technical support for NOAA vessels, AMC divisions and field parties. The expansion of office and lab space area improved considerably with the increase in bench space and the addition of the new teletype and tide gage lab and storage space became available. The Division also expanded in personnel. Three rotating electronic technicians were hired and are now on ships involved on the GARP (Global Atmospheric Research Program) Atmospheric Tropical Experiment (GATE) Project. The first HYDROPLOT System was installed on Launch 1261 for the Hydrographic Field Party. It was equipped with Del Norte navigation and a Raytheon 723D depth sounder. Three other systems were installed, all within a 4-month period from January to April. The NOAA Ship PEIRCE received a HYDROPLOT System which was installed in the ship's plotting room and two other HYDROPLOT Systems, along with the necessary communications equipment, were put on Hydrographic Field Party's Launch 1255 and Launch 1277 using the existing Ross fathometer and Raydist equipment and is now capable of doing automated ship hydrography. The number of HYDROPLOT Systems and peripheral equipment AMC is supporting increased from five to eight units. Eight Del Norte Systems were received and are presently issued to various ships and field parties. Raydist support (repair, alignment, installation) was given to the RUDE & HECK, PEIRCE and Hydrographic Field Party. To accommodate for these and other new systems, extensive training was received by the Division. Lectures and demonstrations on electronic horizontal positioning and digital echo sounding systems were given to the hydrographic training class. An educational video tape library was started which now contains 16 Hewlett-Packard Electronic tapes, 34 DEC PDP 8/E Hardware tapes, 12 DEC Software tapes, and 7 Del Norte tapes to help the Division's new employees or other interested persons to be familiar with the systems used by the National Ocean Survey. As part of the Fleet Inspection Program, a digital to analog converter was built for the RESEARCHER's ship's speed output, and modifications were made to VHF/AM aircraft transceivers for communications between NOAA ships and aircraft in supporting the GATE Project. The Teletype and Tide Gage section repaired, modified, or overhauled 35 teletypes, and repaired, calibrated, and put back in operation 29 Bubbler and 113 Analog-to-Digital Recording (ADR) tide gages.

Operations

The Operations Division provided logistics, technical, and operational support as well as program coordination to vessels and field parties assigned to AMC. The reorganization of hydrographic field parties was finalized in July. New responsibilities added to the Operations Division include handling of ships' and AMC's mail, and local radio communications. Ground survey support for the Atlantic Hydrographic Party (AHP) and the Marine Ecosystems Analysis Program (MESA) was provided throughout the year. The major program oriented activity centered on a between-seasons evaluation of Project SCOPE (Southern Coast Plains Expedition). Meetings were held with vessel, Marine Center, and Marine Surveys and Maps personnel to discuss the past to improve the future.

The Miami Ship and Ocean Engineering Facility began participating in a Maritime Administration research project by providing a site for an instrument tower which will measure maximum wind velocity during a hurricane. The tower was erected in May in the southwest corner of the base property. A Code A Phone was installed in March to receive messages when the office is closed. In May, the base was the primary staging area for the GATE ships. Three of the GATE ships, RESEARCHER, OCEANOGRAPHER, and the USNS GILLISS, were alongside in the slip at the ship base, and the USCGC DALLAS was moored on the north side of Dodge Island.

The ALBATROSS IV spent most of the reporting period at sea on a very busy cruise schedule. Nine weeks were spent in shipyards during July, January, and June. A MESA cruise was conducted by ALBATROSS IV and DELAWARE II in May. All cruise requirements were completed as scheduled. The expenses for repairs to the ALBATROSS IV between cruises continue to run high. Woods Hole is isolated from suppliers, company field engineers, and yard workers that are called to make repairs. Cost of labor includes travel time of from one to two hours travel, one way, to reach Woods Hole from New Bedford or Newport. The ALBATROSS IV complement of 19 has remained full with almost no turnover of personnel. Replacements for men on scheduled and emergency leave have been found with some difficulty at times. The graduates from the Massachusetts Maritime Academy in Buzzards Bay have been a prime source for relief for licensed officers.

The DELAWARE II was delivered to the Newport Shipyard, Newport, Rhode Island, on March 5 for repairs in preparation for being reactivated. The DELAWARE II arrived at Sandy Hook on April 12, made preparations to begin operations, and departed on April 22 for her first cruise of this year. The main trawl winch on the DELAWARE II was damaged during the MESA cruise in May. A report on the damage was forwarded to AMC.

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, which is a cooperative program with the State of Florida on a 50-50 funding basis. The party edited ten manuscripts on this project. During the months of October and November, the party premarked horizontal control for Job CM-7201, Big Pine Key to Key West, Florida, and assisted Party 65 with the installation and removal of tide gages in that area. The party moved to Wilmington, North Carolina, in March and assisted with tide-controlled photography for Job CM-7305, Cape Hatteras to Cape Lookout, North Carolina; field edited six manuscripts in Job PH-7019 for Project Scope; and established control and calibration sites along the North Carolina coast in conjunction with Project SCOPE. Party 61 provided support for Atlantic Hydrographic Party Launch 1260 and field edit operations; field edited 25 manuscripts; and established 47 control stations, 58 photo-hydro signals, and 7 Del Norte Sites. Party 62 established control in support of SCOPE for the NOAA Ships MT. MITCHELL, WHITING, and PEIRCE; premarked horizontal control; conducted field edit operations; and established 252 traverse stations, 11 Radist stations, 4 Sea Fix stations and 45 calibration stations for ship

use. A total of 126 horizontal control stations were premarked for aerial photography, and ground support was provided for 3 tide controlled photography projects. Party 63 performed field surveys required for the compilation of Storm Evacuation Maps for the Emergency Warning Branch of the National Weather Service. Field Surveys were completed for 16 manuscripts which included Norfolk, Virginia, and vicinities; New Orleans to the Mississippi Delta and a part of the Houma to New Iberia, Louisiana, area. Party 64 provided the basic field surveys and intelligence for the compilation for maps outlining flood inundation limits for specific occurrence frequencies. The maps are prepared for the Department of Housing and Urban Development for the purpose of establishing federal insurance premium rates in flood prone areas. Party 65 established and maintained the network of tide gages required to determine the precise tidal datum planes for the Florida Seaward Boundary Mapping Program, which included installing 77 Analog-to-Digital Recording (ADR) tide gages; removing 67; collecting 398 monthly tide records; establishing 213 tidal bench marks; and assisting with tide-controlled photography on Job CM-7201 and the Meander Line survey in Estero Bay, Florida.

Aero Parties completed surveys for 150 airports and located 6 Long Range Radars. The Photogrammetric Branch compiled 76 airport charts; 582 sq. mi., shoreline; 5 sq. mi., photobathymetry; 714 sq. mi., final review; and 424 sq. mi., field edit application. The first production-line photobathymetric project was successfully completed of coastal waters in the Virgin Islands. The relief from scribing and stick-up of manuscripts, prior to archiving, was responsible for a notable improvement in the flow of projects. However, the advent of photobathymetry will aggravate the problem. Photobathymetric projects, unlike scribing and stick-up functions, have field-related schedules and cannot be shelved for completion as opportunity offers. The Tide Branch served as the focal point for tide gage installations for all tidal projects worked through the Atlantic Marine Center, and the Branch serviced 121 tide stations; installed 38 temporary tide stations; established 2 control tide stations; recovered and leveled 486 Tidal Bench Marks; and established 186 new Tidal Bench Marks. Reimbursable Projects included: (1) U.S. Corps of Engineers (Chesapeake Bay and Morehead City, North Carolina); (2) U.S. Department of Fisheries (Bayville, New York); (3) U.S. Department of Justice (Virgin Islands); (4) City of East Rutherford (Rutherford, New Jersey); and (5) National Weather Service (Puerto Rico). Special Projects were: 4 temporary gages in Galveston Bay, Texas; 7 gages in Wando River, Charleston, South Carolina; and 3 gages for the South Carolina Water Resource Commission.

Processing

The Processing Division had a successful year in the reduction, plotting, listing, and verification of survey data. Realignment of priorities placed more emphasis on production as the computer system was developed fully. Thirty-five verified surveys were processed by the computer system at AMC, a significant increase over the 12 of FY 73. Processing time has been pre-empted by higher-priority hydrographic surveys. Smooth sheets are now being plotted on a translucent white

mylar film. Evaluations have been favorable. Final format specifications for a magnetic tape containing verified hydrographic survey data were received from Rockville. The program to create the tape has been written and is in its final testing stages. The magnetic tape drive system proved to be unreliable and the disk system capacity proved to be too small, so a new peripheral system was procured. The new system has a 600-lines per minute drum printer, two 9-track magnetic tape drives, and a 20 megabyte disk. Installation of the equipment commenced at the close of this fiscal year. An in-house course on programming the PDP-8 minicomputer was offered to base and ship personnel.

The verification Branch has gradually grown through the introduction of the rotating cartographic technician program to its present complement of 16. With emphasis placed on training and engaging in actual field operations, employees are assigned to the computer-plotter branch to gain experience and a better understanding needed to give them the whole operation concerning hydrography, automation, verification, and cartography which are required to be effective in verification. This has proven to be a working program with 23 Project SCOPE surveys completed this year, and all SCOPE surveys received during 1974 are in some stage of verification. It is expected that the verification of this project will be completed during January of 1975. The Branch furnished cartographic assistance to the Ship SURVEYOR for the American Telephone and Telegraph Company (AT&T) cable survey. The flow of work from the Electronic Data Processing Branch has been very good, and it is anticipated that the volume of work will continue to increase as the system approaches full production with two or more shifts which will result in a corresponding increase in the number of verified surveys that will be completed. The Branch has continued giving incoming surveys a preliminary verification to find and correct errors or omissions in the field work before it is entered in the data bank, and giving the field units an immediate feedback. This system is helping to avoid many mistakes which in the past have resulted in problem surveys. This preliminary verification indicates the general quality of the field work is good and that it is steadily improving.

Marine Engineering

The Marine Engineering Division (MED) experienced an extremely active year characterized by reorganization and addition of personnel. The DISCOVERER was berthed at AMC in an inactive status for the entire year. The DELAWARE II was at AMC in the same status from October until March when Marine Engineering Division personnel and ship's personnel delivered her to Newport, Rhode Island, for repairs and reactivation. Major work was performed on ships by outside contractors. The RESEARCHER had extensive stack work performed which consisted of replacement of deteriorated mufflers and rearrangement of generator and main engine exhaust lines. Additional repairs included complete overhaul of both main propulsion engines. The MT. MITCHELL was drydocked in Jacksonville

for biannual overhaul. Routine painting and cleaning, shaft inspections and repairs to the bow thruster were performed. Alongside repairs to the PEIRCE and WHITING consisted of Controllable Pitch Propellor (CPP) system repairs and installation of after masts. The FERREL had extensive modifications to equip her for MESA operations. Winches and A-frames were added for this purpose. Other work included drydocking and replacement of wheels. Repairs to the RUDE & HECK consisted of minor alongside repairs, most of which were handled by the ships' force. The ALBATROSS IV and OREGON II were drydocked for annual overhauls. Work consisted of routine painting, cleaning shaft inspections, etc. Repairs to the DELAWARE II after reactivation consisted principally of underwater work and overhaul of the main engine. The GEORGE M. BOWERS was drydocked for routine painting and cleaning. Also, an American Bureau of Shipping survey was conducted in August 1973.

Launch repairs consisted of the overhaul of all main engines and drive trains on Launches 1202 through 1208, overhaul of Launch 1261, and miscellaneous repairs to Launches 1259, 1260, 1255, 1256 and 1257. The new Jet Boat, Launch 1277, was delivered and outfitted with a HYDROPLLOT system. The new wire drag tenders were delivered and placed on the RUDE & HECK in new cradles. Extensive work was done writing operators, maintenance, and trouble-shooting instructions for all launches. Other items of significance performed by the Division consisted of establishing a Lubrication Oil Analysis Program and orienting personnel at National Marine Fisheries Service facilities and the Miami Ship and Ocean Engineering Facility with MED procedures concerning repair specifications and procedures.

SUMMARY OF SHIP AND FIELD PARTIES ACTIVITIES

RESEARCHER

Days at Sea:	195	July 1973
		RP-1-RE-73, Project MODE, Atlantic Ocean
		August 1973 - November 1973
		RP-4-RE--3, Project TAG, Atlantic Ocean
		December 1973 - February 1974
		Dockside, Miami, Florida - MESA Preparation
		March 1974 - May 1974
		MESA/COMSED
		June 1974
		GATE Project

MT. MITCHELL

Days at Sea: 170

July 1973 - October 1973
OPR-436, SCOPEAugust 1973 - September 1973
SP-AMC-12-MI-73, Deep Sea Tide Gage &
Temperature & Salinity
MeasurementsNovember 1973 - December 1973
Jacksonville Shipyard, FloridaDecember 1973 - February 1974
Alongside AMC, Norfolk, VirginiaFebruary 1974 - June 1974
OPR-436, SCOPE, Southeast Atlantic CoastMarch 1974
SP-AMC-12-MI-73, Deep Sea Tide Gage &
Temperature & Salinity
Measurements (SE Atlantic Coast)May 1974
SP-AMC-3-MI-74, Baltimore Canyon Operative SurveyPEIRCE

Days at Sea: 156

July 1973 - November 1973
OPR-437-PE-73, Cape Fear, North CarolinaAugust 1973
RP-3-PE-74, New York BightDecember 1973 - March 1974
Alongside AMC, Norfolk, VirginiaApril 1974 - June 1974
OPR-437-PE-74, North Carolina CoastWHITING

Days at Sea: 158

July 1973 - October 1973
OPR-436-WH-73, SCOPE, Coasts of South Carolina
and GeorgiaNovember 1973 - February 1974
Alongside AMC, Norfolk, VirginiaMarch 1974 - June 1974
OPR-436-WH-74, SCOPE, Georgia Coast

FERREL

Days at Sea: 188

July 1973 - January 1974
MESA, New York Bight

February 1974
Alongside AMC, Norfolk, Virginia

March 1974 - June 1974
MESA, New York Bight

RUDE/HECK

Days at Sea: 181

July 1973 - October 1973
OPR-479-R/H-73, Wire Drag, Safety Fairways,
Gulf of Mexico, SE Texas

November 1973
SP-AMC-1-R/H-73, East Coast of Florida

December 1973
Alongside AMC, Norfolk, Virginia

January 1974 - March 1974
SP-AMC-1-R/H-74, Nautilus Shoals,
Chesapeake Bay

April 1974 - June 1974
OPR-479-R/H-74, Wire Drag Safety Fairways,
Gulf of Mexico

AHP

Launches 1255, 57 & 61

July 1973 - June 1974
OPR-436-AHP-74, SCOPE, East Coast of Florida

Launch 1260

July 1973 - August 1973
OPR-409, Potomac River

September 1973 - November 1973
OPR-436, SCOPE, Wando River, South Carolina

December 1973 - January 1974
OPR-437-, Cape Fear, North Carolina

January 1974 - May 1974
OPR-436, SCOPE, Port Royal Sound,
South Carolina

May 1974 - June 1974
OPR-510-AHP-74, Gunpowder River, Maryland

AHP (Cont.)
Launch 1270

*August 1973 - September 1973
OPR-506, Chart Discrepancy

November 1973
OPR-505, Chart Discrepancy

*All data not available

Launch 1277

April 1974 - June 1974
OPR-513-AHP-74, Beaufort Inlet, North Carolina

GEORGE M. BOWERS
Days at Sea: 140

July 1973 - August 1973
Cruise 117, Shadowgraph

September 1973
Cruise 118, "RUFAS" and Cruise 119

October 1973 - November 1973
Cruise 120, Scallop Assessment

December 1973 - February 1974
Inport, Miami, Florida

March 1974 - April 1974
Cruise 121, Coast Resource Survey
Cruise 122, Scallop Exploration

May 1974
Cruise 122, Scallop Exploration

June 1974
Cruise 123

OREGON II
Days at Sea: 216

July 1973 - August 1973
Cruise 46, Shadowgraph

September 1973 - October 1973
Cruise 47, Electric Midwater Trawl Study

October 1973
MESA, Brooklyn, New York

November 1973
Cruise 48, Assessment Ground Fish Stock

December 1973
Inport

OREGON II (Cont.)

January 1974 - February 1974
Cruise 49, Shrimp Survey

March 1974
MESA, Brooklyn, New York

April 1974
Cruise 50, Oceanic Resource Assessment

May 1974
Cruise 51, Assessment Groundfish Stock

June 1974
Shipyard, Tampa, Florida

ALBATROSS IV

Days at Sea: 197

July 1973 - December 1973
Cruises 73-3, 73-4, 73-5, 73-6, 73-7, 73-8,
Part I, II, & III, 73-9

January 1974 - June 1974
Cruises 74-1, 74-2, 74-3, 74-4, 74-5

May 1974
Shipyard, Newport, Rhode Island

DELAWARE II

Days at Sea: 16*

July 1973 - March 1974
Shipyard, Newport, Rhode Island

April 1974 - June 1974
Cruises D-74-1, D-74-2, D-74-3

*All data not available

SUMMARY OF ACCOMPLISHMENTS DURING FISCAL YEAR 1974

Automated Hydrographic Surveys Verified	33
Tagline Surveys Plotted and Verified	1
Asheville Logged Hydrographic Surveys Verified	2
Wire Drag Surveys Processed and Smooth Plotted	1
Wire Drag Surveys Verified	1
Surveys Given Preliminary Inspection Prior to Automation	37
Wire Drag Surveys Given Preliminary Inspection	10

UNVERIFIED SURVEYS ON HAND
BEGINNING OF FISCAL YEAR 1974

Automated Hydrographic Surveys	99
Backlog, Manually Plotted Surveys	10
Wire Drag Surveys	5

SURVEYS RECEIVED DURING FISCAL YEAR 1974

Automated Hydrographic Surveys	33
Wire Drag Surveys	10

UNVERIFIED SURVEYS TRANSFERRED TO ROCKVILLE

Wire Drag Surveys	7
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UNVERIFIED SURVEYS ON HAND END OF
FISCAL YEAR 1974

Automated Hydrographic Surveys	96
Backlog, Manually Plotted Surveys	10
Wire Drag Surveys	7

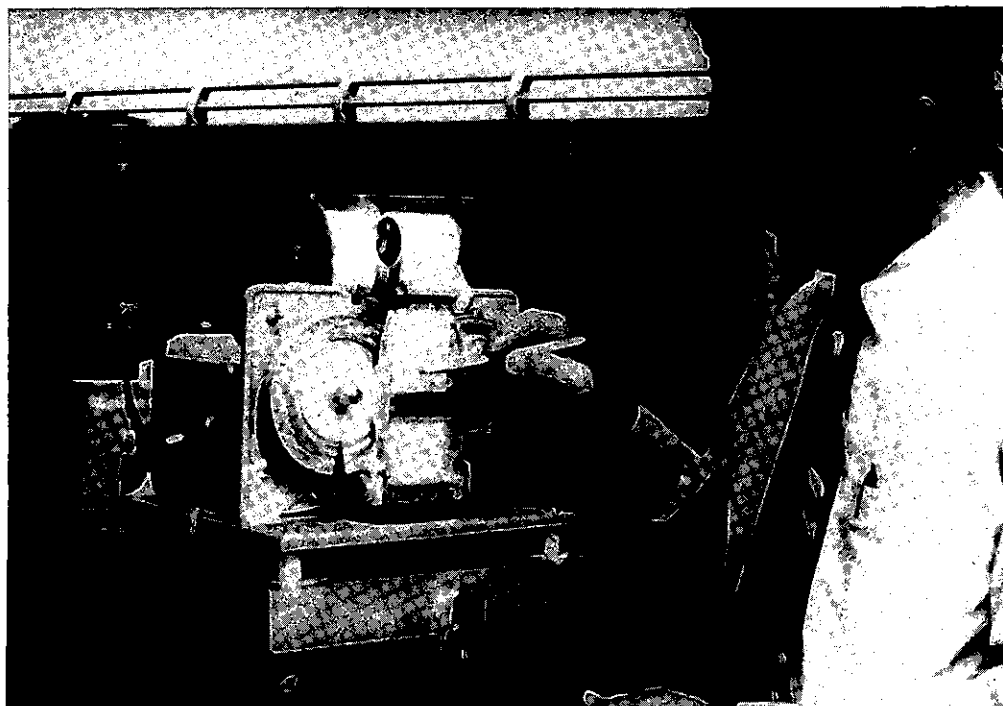


Figure 15. Automatic Analog-to-Digital Tide Recorder (ADR).



Figure 16. X and Y coordinate plotter.

PACIFIC MARINE CENTER



This report describes the activities of the Pacific Marine Center, located on the waterfront of Lake Union, Seattle, Washington. The main purpose of the Pacific Marine Center, hereinafter referred to as PMC, is the operational direction and logistic support of the ships operated by the National Ocean Survey on the West Coast.

The year began with three fishery vessels being transferred from the operational control of the National Marine Fisheries Service (NMFS) to the National Ocean Survey, bringing the total of fishery vessels operating under PMC control to seven. A new Director was installed at PMC, and the relocation of the Pacific Tide Party from Honolulu, Hawaii, to PMC was completed.

The SURVEYOR was reactivated to accomplish a cable route survey for the American Telephone and Telegraph Company and then returned to inactive status. The GEORGE B. KELEZ was loaned to the Department of Interior. At the end of the fiscal year, the KELEZ was being returned to PMC and plans were being made to reactivate the inactive Ships SURVEYOR, MILLER FREEMAN, and TOWNSEND CROMWELL.

Operations

The Operations Division of PMC has the main responsibility for the coordination of operations and the support activity of PMC-based ships. It issues project instructions in compliance with the policies of the National Ocean Survey and the National Marine Fisheries Service, monitors their progress, and provides the logistical support for following through on the instructions. As part of this support, a base radio station provides daily contact with the ships during periods of deployment. To support the survey vessels and to provide miscellaneous services, a geodetic and photogrammetric field party is based at PMC.

Survey Vessels. At the beginning of July 1973, the following survey ships were based at PMC: Class I - OCEANOGRAPHER and SURVEYOR (inactive); Class II - FAIRWEATHER and RAINIER; and Class III - DAVIDSON and McARTHUR. The active Class I ship was engaged in oceanographic and ocean survey work, while the Class II ships and Class III DAVIDSON were engaged in combined operations, corridor and navigable area surveys. The McARTHUR was utilized in tide and current studies. Combined operations consisted of the following: (1) shoreside geodetic and photogrammetric support work; (2) visual and electronically controlled hydrography by the ships and their launches; (3) other associated activities necessary for charting; and (4) also other scientific tasks such as radionuclide water sampling, bottom sampling, and marine mammal surveillance. Corridor and navigable area surveys, a new concept, are essentially the same as a basic survey with the time consuming shore development and field edit requirements deleted. Tide and current studies consist of the installation, tending, and maintenance of numerous tide gages to establish tidal datum; deploying, retrieving, and servicing current meters; and taking salinity, temperature, and density oceanographic casts. The electronic control systems utilized were the MOTOROLA MINIRANGER for short-range requirements and the Hastings-Raydist system for extended distances. The electronic navigation systems installed in the launches of FAIRWEATHER, RAINIER, and DAVIDSON were given a fully operational test and calibrated at the newly established Sandpoint Range prior to the beginning of the field season. The Class II vessels are equipped with Digital PDP-8 computers and the HYDROLOT/HYDROLOG system for plotting directly on-line ship hydrography and processing of launch work. The Class III ship is presently equipped with data logging systems and digital recording fathometers for producing data in a paper tape format. All the survey ships are staffed with NOAA Commissioned Officers and Wage Marine crew members. The accomplishments of the ships are described below.

The OCEANOGRAPHER began the year with four cruises covering the period from July through mid-September. These cruises dealt with studying the roll of internal waves in the oceanic energy balance, the tidal wave progression from the deep ocean and across the continental margin, and coastal upwelling off the coasts of Oregon, Washington, and Vancouver Island, Canada. The projects utilized the deployment of a deep-sea tide gage and current meter, moored instrumented buoys and various ocean casts for gathering the data required to further these studies. Navigational control was maintained by

utilization of Loran A and SATNAV (U.S. Navy Satellite Navigation System). The ship remained at PMC for repairs and a dead ship period until February 5 when she departed for the Atlantic Ocean via the Panama Canal and participation in the Joint One, Coastal Upwelling Ecosystems Analysis studies off the coast of Africa. While enroute, she conducted the NOAA Trans-Atlantic Geotraverse. Upon completion of the above projects, she participated in the GARP (Global Atmospheric Research Program) Atmospheric Tropical Experiment (GATE) which was an international cooperative mission consisting of 34 ships from 11 countries which conducted atmospheric research on a regional basis on the tropical Atlantic Ocean. These projects took the ship to areas of the Atlantic off the coast of Africa and south to tropical waters. The ship made port calls at Panama, Miami, Mayport, Las Palmas, and Dakar. The OCEANOGRAPHER is scheduled to return to PMC on October 17, 1974.

The SURVEYOR remained at PMC in inactive status throughout the year with the exception of a cable route survey from Oahu to Guam in October and November. The National Ocean Survey was reimbursed for the work on this project by the American Telephone and Telegraph Company (AT&T).

The FAIRWEATHER began the fiscal year by continuing hydrographic operations in Lower Cook Inlet, Alaska. These operations continued until the end of August, when she returned to PMC to prepare for the next project. After a 2-week repair and upkeep period, she departed for Southeast Alaska to continue hydrographic surveys in Glacier Bay. In November she returned to PMC from the winter inport period. After an extended winter inport caused by the fuel shortage, she sailed for the Strait of Juan De Fuca project on February 25. This project was completed, and the FAIRWEATHER returned to PMC on April 26. After a short preparatory period, she sailed for Lower Cook Inlet where operations continued through the summer.

During the first part of the year, the RAINIER was in Shelikof Strait, between Kodiak Island and the mainland of Alaska. In August she was at PMC for 2 weeks and then returned to Alaska to complete the field season surveying Clarence Strait. After returning to PMC for the extended winter season, routine drydocking, and the dead ship period, she departed on April 25 to survey the inner portion of the Strait of Juan De Fuca. Upon completion of the project, she returned to PMC for a brief preparatory period prior to sailing for Alaska. She departed PMC on April 8 for surveys in Upper Cook Inlet for the remainder of the fiscal year.

The DAVIDSON started the year by continuing corridor surveys in Prince William Sound. During the project, she surveyed the Hinchinbrook Entrance area including a fine grained survey of Seal Rocks, the corridor to Valdez as far as the Rocky Point area of Valdez Arm and a development of Bligh Reef. She returned to PMC in August for maintenance and preparation for surveys in Southeast Alaska. After departing PMC in early September, she completed the field season in Tracy and Endicott Arms near Juneau and a special project at Klawock, Alaska. During these last projects, she evaluated a side scan sonar to determine if this instrument can be utilized as an effective tool during hydrographic surveys. The winter inport was spent in drydocking and maintenance, and the dead ship period. The

DAVIDSON departed PMC after the extended winter season on March 25 for surveys in Tacoma Harbor and Commencement Bay. During this project, she evaluated the new MOTOROLA MINIRANGER III short range navigation system for its effectiveness in controlling a 1:5,000 hydrographic survey. After a brief inport period at PMC, April 26 - May 8, she proceeded to Prince William Sound, Alaska, to complete the fiscal year conducting surveys in the Valdez Arm Corridor and the tanker anchorage areas of Orca Inlet.

The McARTHUR started the fiscal year conducting tide and current surveys in Cook Inlet continuing until September. This project saw the successful operational test of a new current mooring system designed for the Cook Inlet environment. After returning to PMC for repairs, the remainder of the field season was spent doing a reconnaissance survey of tides and currents in Rosario and Haro Straits, Puget Sound, Washington. The winter inport period was spent at PMC in repair and maintenance, dead ship period, and preparing for the summer projects. She departed PMC in late January for the spring phase of tide and current surveys in Rosario Strait. A number of cooperative projects were undertaken during the spring circulation work with Pacific Marine Environment Laboratory, University of Washington, and the Canadian Hydrographic Office. After a preparatory period at PMC, she departed in early May for Upper Cook Inlet (Anchor Point to the Forelands) to complete the fiscal year conducting tide and current surveys. These estuary circulation projects generally consist of deployment of 6 to 8 current meter stations, the installation of 8 to 17 tide gages and both areal and time series salinity, temperature, and density casts taken over a tidal cycle.

Pacific Tide Party

The Pacific Tide Party has shifted its base of operations from Hawaiian Sea Frontier, Honolulu, to PMC. The party continues to provide supervision and maintenance of 60 control tide stations in Alaska, the Pacific Ocean, and along the West Coast (23 of which are also serving the Tsunami Warning Stations at the request of the National Weather Service). It also maintains 10 semi-permanent tide stations in Puget Sound and advises and assists the PMC-based ships in solving problems encountered in acquiring tidal data. The present complement of the Pacific Tide Party is three Commissioned Officers and one civilian. It is headed by a Commissioned Officer.

Fisheries Vessels

On July 1, 1973, three additional fisheries vessels were assigned to PMC: the DAVID STARR JORDAN, TOWNSEND CROMWELL, and MURRE II. These ships, along with the four that were transferred the year before, were previously under the jurisdiction of the National Marine Fisheries Services and were transferred to the National Ocean Survey, her sister service within NOAA, in order to consolidate vessel management. The four original vessels are JOHN N. COBB, GEORGE B. KELEZ, OREGON, and MILLER FREEMAN. In contrast to the survey ships, these ships have no Commissioned Officers aboard and, thus, operate with an entire Wage Marine crew.

The DAVID STARR JORDAN returned to San Diego in the early part of July after completing an Albacore Oceanographic Research Project in the eastern Pacific and departed for the Hawaiian Archipelago in the latter part of July. During August and most of September, a Hawaiian Skipjack Resource Survey was conducted from Oahu to Midway Island. In early October, she carried out a study on Larval Fish in the Channel Island area of California. In the latter part of October, the JORDAN went into the shipyard for her annual repairs. She carried out an Anchovy Survey in the Los Angeles Bight area in November and a Sonar Evaluation cruise in December. In early January and February, a Porpoise Assessment Program was carried out in the Eastern Tropical Pacific. She returned to San Diego in early March and entered the shipyard for emergency repairs to one of her shafts. A bio-acoustical research project was carried out in Southern California waters during the latter part of March and early part of April, and she was alongside her new berth at Scripps Institute of Oceanography Facilities in San Diego during the latter part of April and most of May. The JORDAN was at sea again in June working on the Albacore Assessment Program.

In July 1973, the OREGON was at sea in the Bering Sea, continuing a Crab-Bottomfish Assessment Survey. She returned to Kodiak Island in August for a brief stay and then proceeded to a shrimp survey in the Shumagin Island area off the Alaska Peninsula through the month of September and October. The OREGON was converted to crab-pot fishing and was used in a tanner crab tagging study in November, returning to PMC late in the month. The annual repair work was completed while the OREGON was in Seattle during January, February, and March. She returned to Alaska in April where she conducted a shrimp survey in the Kodiak Island area until May. She then departed for the Bering Sea for a crab-bottomfish survey in June 1974.

The JOHN N. COBB sailed in the latter part of July on a Pollock Assessment Survey in the vicinity of Kodiak Island, Alaska. Upon completion of the survey in October, she returned to PMC. In November 1973, and again in January-February 1974, Trawl Mensuration Experiments were conducted in Puget Sound and the coastal waters of Washington. Scuba divers and a new experimental acoustical instrument were used in measuring the nets. The COBB completed her annual repair work in the latter part of February and early part of March. During April and May, she operated in central and southern California on a Hake Assessment Survey. Tests on selectivity of trawls were conducted in June.

On July 1, 1973, the MURRE II was in Juneau, Alaska, undergoing her annual repairs. In the latter part of July, she started work for the year consisting of short trips out of Juneau lasting from 5 to 15 days. Through the latter part of July, August, and September, the MURRE II was engaged in surveying Auke Bay, Stephens Passage, and Lynn Canal for herring schools. During October, she hauled freight to Little Port Walter, a NMFS field station. During the early part of November, support was given to a program to evaluate effects of log rafting and dumping in estuaries. During the latter part of November, she returned to herring research with cruises in December, January, February, March and April. Log rafting reconnaissance

was again conducted in March and May, and freight hauling to Little Port Walter in April, May, and June. Herring research was again started in June just prior to the MURRE II's annual shipyard repair period.

The MILLER FREEMAN remained at PMC in her deactivated status for the entire reporting period. The TOWNSEND CROMWELL was deactivated in her home port of Honolulu, Hawaii, in March 1973. The vessel was moved to PMC in Seattle in June 1973, enabling it to be moored in a highly desirable area during FY 74. In May and June, plans were being developed for the CROMWELL's expected activation in FY 75.

For the entire FY 74, the GEORGE B. KELEZ was on loan to the U.S. Geological Survey. At the end of the fiscal year, the Geological Survey was planning to return the vessel to PMC.

Processing Division

The Processing Division at PMC is responsible for the plotting and verification of hydrographic surveys received from the Class II and III survey ships. The Electronic Data Branch plots the digital data on automated plotters, and the Verification Branch then verifies the data for correctness and completeness. After verification, survey data are submitted to Rockville for inclusion in the revisions and updating of nautical charts.

The Electronic Data Processing Branch capital equipment was substantially upgraded this year by the implementation of a Datacraft 6024/5 computer, tape and disk data storage system, and a Xynetic Plotter. The system, when fully operational in FY 75 for smooth sheet plotting of data, will allow for improved smooth sheet production.

The Division received 46 surveys accomplished by PMC vessels, verified a total of 70 surveys that were sent to headquarters for nautical chart compilation (72 percent production increase over FY 73), and at the end of the fiscal year, PMC Processing had a backlog of 70 surveys (30 backlog decrease from FY 73) in need of verification.

Continued improvements in processing production are expected in FY 75, due to the full training of new employees who were introduced to the division's staff in FY 74 and implementation of new data processing equipment. Training of all processing personnel to increase understanding of field survey methods and production quality control is a goal for FY 75 in order to improve quality as well as quantity of production.

Marine Engineering

During the fiscal year, responsibilities of the Facilities Division were realigned; the Marine Engineering Division and Electronic Engineering were formed. The Marine Engineering Division provides engineering support for the fleet and shore facilities in maintenance and modifications.

In FY 74, routine drydocking and repairs were accomplished on the OCEANOGRAPHER, RAINIER, DAVIDSON, DAVID STARR JORDAN, OREGON, JOHN N. COBB, and MURRE II. Dockside repairs at PMC were also accomplished on the FAIRWEATHER and McARTHUR. Of particular interest were the topside weight removal of the OCEANOGRAPHER and the installation of an instrumentation system for GATE. Crew's quarters were modified to provide separate head and shower facilities for female crew members. Due to operational casualty, the RAINIER and DAVID STARR JORDAN required emergency drydocking to repair propellers and shafting.

A hydro launch replacement program was initiated with the delivery of three 29 foot aluminum hydro launches. The boat handling and stowage arrangements were modified on the DAVIDSON and FAIRWEATHER to accept these new launches.

Electronic Engineering

The Electronic Engineering Division was formed in August and assumed its responsibility for the keeping of electronic equipment on board the PMC ships and at the base. Inroads were made into the establishment of a concise electronic equipment inventory, a preventive maintenance program, and a cadre of well-trained technicians based at PMC. Major activities and accomplishments included: (1) the installation of MINIRANGER III systems aboard the RAINIER, FAIRWEATHER, and DAVIDSON; (2) the complete assembly, installation, and successful operation of a Computerized Engine Room Control (CERC) logging system aboard FAIRWEATHER and preparation of similar systems for RAINIER and MT. MITCHELL; (3) installation of GATE instrumentation and Data Acquisition System (DAS) equipment aboard the OCEANOGRAPHER; and (4) instrumentation of three new aluminum hydrographic launches.

STATISTICAL SUMMARY

	<u>Sounding Line Electronic</u>	<u>Sounding Line Visual</u>	<u>Bottom Samples</u>	<u>Tide Gages Utilized</u>	<u>Current Meter (Hrs/Observed)</u>
	<u>Linear/Square Nautical Miles</u>	<u>Linear/Square Nautical Miles</u>			
FAIRWEATHER	9910.2/1826.3	180.6/8.8	157	14	1,529.9
RAINIER	4024.2/440.9	870.7/45.9	205	13	4,676
McARTHUR	0/0	0/0		45	74,732
DAVIDSON	5608.3/354.7	562.2/55.8	281	16	-0-

STATISTICAL SUMMARY

	<u>Days at Sea</u>				<u>Days in Port</u>	
	<u>Production</u>	<u>Launch Only</u>	<u>Survey Support</u>	<u>Total Days At Sea</u>	<u>Work Days</u>	<u>Observed</u>
OCEANOGRAPHER	178	0	0	178	118	69
**SURVEYOR	47	0	9	56	25	10
FAIRWEATHER	112	58	18	188	98	79
RAINIER	97	61	13	171	98	96
McARTHUR	173	1	30	204	78	83
DAVIDSON	92	71	16	179	105	81

Statistics

	<u>Gravity</u>	<u>Magnetics</u>	<u>Bathymetry</u>	<u>STD & Water Samples</u>
OCEANOGRAPHER	7,209.3	7,206.7	7,190.7	5,837
**SURVEYOR			9,420.5	

** Active September 9 - November 30 for reimbursable project for AT&T.

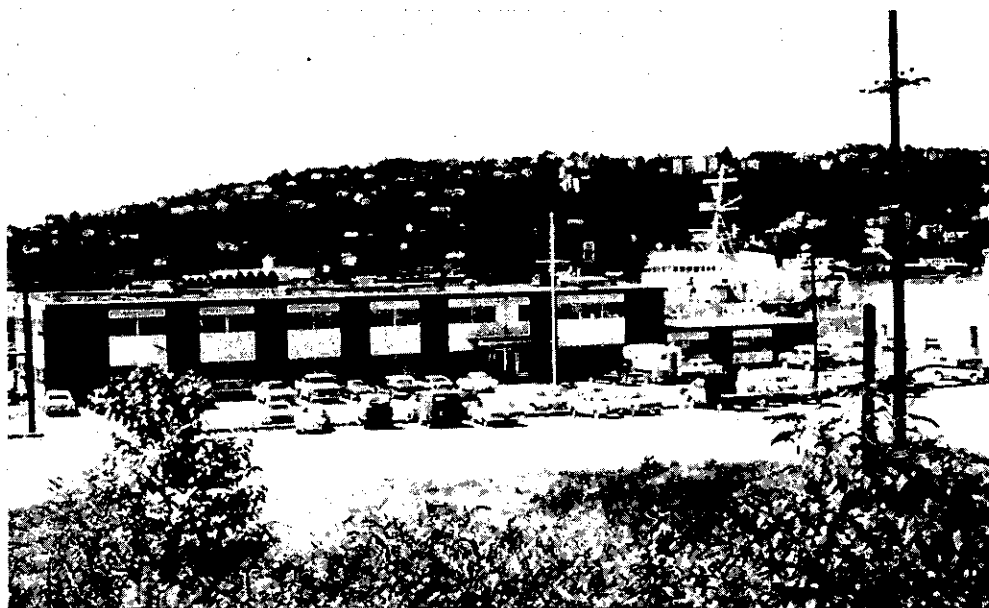


Figure 17. PMC office building.

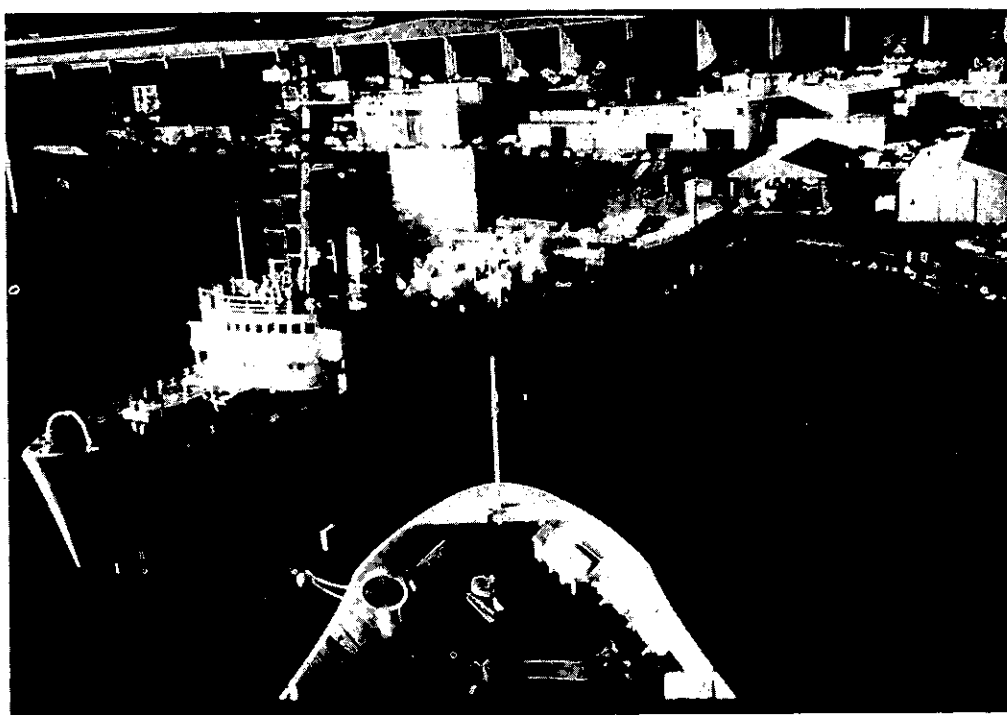


Figure 18. View of the NOAA Ship McARTHUR docked at PMC.

LAKE SURVEY CENTER

The Lake Survey Center (LSC) prepares and publishes navigation charts and related publications for the Great Lakes, their outflow rivers, Lake Champlain, the naturally navigable waters of the New York State Barge Canal System, and a portion of the Minnesota-Ontario Border Lakes; carries out the necessary hydrographic and associated surveys and maintenance operations to accomplish the charting mission; makes studies of all matters affecting the hydraulics and hydrology of the Great Lakes, including the recording of the levels of the Lakes and their outflow rivers; and performs limnological studies pertinent to the development and improved use of the water resources of the nearly 100,000 square miles of water surface of the Great Lakes system. It is currently deeply involved in NOAA's intensive study of these waters in connection with the International Field Year for the Great Lakes (IFYGL). The LSC compiles, prints, and distributes nautical charts and related material, such as the Great Lakes Pilot; collects and provides data on Great Lakes water levels, including the Monthly Bulletin of Lake Levels; and provides limnological survey reports and data to investigators, educational facilities, and the general public. (NOTE: Some of the operations of LSC have changed. In April 1974, the Environmental Research Laboratories (ERL) took over limnological operations; beginning July 1, 1974, the printing and publication of Great Lakes charts will be done by the NOS Reproduction Division.)

Hydrography

Nautical charts - Navigational Charts and Publications. During FY 74, the Marine Mapping and Charting Division published a new edition of the Great Lakes Pilot and prepared six monthly supplements thereto. Fifty-seven new editions and additional prints of Lake Survey Center's charts were compiled and printed. A Monthly Bulletin of Lake Levels was prepared and published each month. In May 1974, a volume containing tabulations of the daily and monthly average water levels as recorded at permanent gages was published for the year 1973. The Chart Catalog, a navigators' training chart, and the Hydrograph of Great Lakes Levels were printed. Several Cooperative Charting Reports received from the U.S. Power Squadrons and the Coast Guard Auxiliary were processed.

Various items under reimbursable work (e.g., water resources maps, flood plain reports, Upper Mississippi River - Nine-foot Channel Brochure, marine weather service charts, weather plotting charts, project maps, items for the International Great Lakes Levels Board's Main Report) were prepared and printed for the Corps of Engineers and National Weather Service.

Nautical charts - Hydrographic Surveys. Revisory surveys were made at 61 harbors on the St. Lawrence River, Lake Champlain, the New York State Barge Canal System, Lakes Ontario and Erie, the St. Clair-Detroit River, and Lake Michigan. Hydrographic and horizontal control surveys were carried out along the south-central shore of Lake Erie. A test sponsored by the Maritime Administration of a navigation system to be used during winter navigation

was conducted on the St. Marys River. Assignments were completed in the Canadian Hydrographic Service (CHS) - Lake Survey Center Technical Exchange Program, a four-month exchange of technical expertise which began in June 1973, by Messrs. Ed Thompson of CHS Peter A. Heltunen of LSC, in a continuation of the Program.

Coastal Zone Mapping and Services - Estuarine and Lake Investigations.

A total of 51 permanent and 86 temporary and seasonal water level gages were operated and maintained during the year along the Great Lakes and connecting channels to provide water level elevations. 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 Lake Ontario, Lake Erie, Lake Huron, Lake St. Clair, and Lake Superior to assist shippers during the navigation season. In support of the Vertical Control - Water Levels Subcommittee of the Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data, a crustal movement study of the Great Lakes area is being conducted to determine trends in shift of the earth's crust.

Geodesy and Photogrammetry

A total of 70 kilometers of precise leveling was completed on the Inland Route and Lake Huron as part of the long-range program of updating the International Great Lakes Datum (1955).

Stereocompilation of the planimetry of parts of Duluth-Superior Harbor, Wilson Harbor, New York, and the St. Clair River was accomplished, representing a total of 15 stereo models. Aerotriangulation of Erie, Pennsylvania, was completed.

Support was provided to the Corps of Engineers in interpretation of photography near Whitefish Island (St. Marys River) for delineation of the shoreline under varying flow conditions.

Limnology

Current flow through the Straits of Mackinac was measured during the summer and fall in order to determine the volume and distribution of discharge from Lake Michigan to Lake Huron. Moored, continuously-recording current meters were placed on a Straits cross-section to achieve these measurements. Four waverider buoys recorded wave heights and periods during the ice-free season. Two were located on Lake Superior and two on Lake Michigan.

Net exchange of water, its dissolved constituents and suspended materials, and the factors responsible for the exchange to determine the impact of Lake Michigan water on the water quality of Lake Huron was instigated as part of the International Joint Commission (IJC) Upper Lakes Reference. Studies commenced in southern Lake Huron, Lake St. Clair, and St. Clair and Detroit Rivers to investigate vertical and lateral distribution with respect to time of the input from the upper Great Lakes to

the lower lakes. A study of the bottom sediment dynamics and sediment water interactions was made in Lake Michigan. Nineteen automatic water temperature monitoring stations were in operation throughout the Great Lakes and upper St. Lawrence River. Telemetry service at three St. Lawrence stations was provided to the St. Lawrence Seaway Development Corp. in connection with studies to extend the winter navigation season. The Analyses of IFYGL data for energy budget and harbor flushing studies continued.

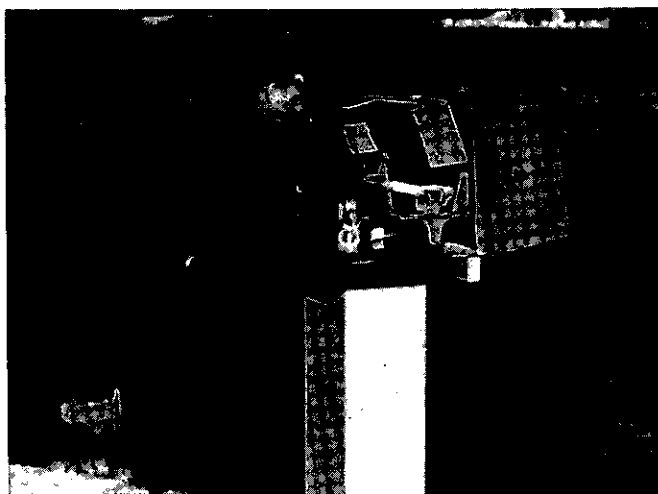


Figure 19. Technician recording the water level in a lake.

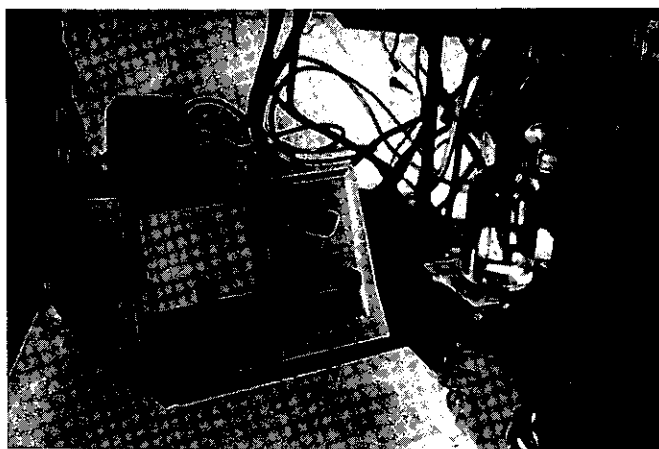
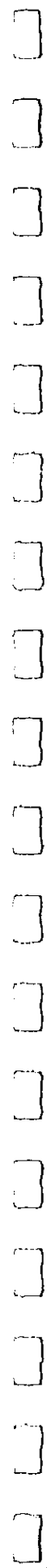


Figure 20. Water sample being tested for electrical conductivity.



APPENDIX A
PUBLICATIONS ISSUED

Annual

Coast Pilot 1, Atlantic Coast, Eastport to Cape Cod;
Tenth (1973) Edition

Coast Pilot 2, Atlantic Coast, Cape Cod to Sandy Hook;
Ninth (1974) Edition

Coast Pilot 3, Atlantic Coast Sandy Hook to Cape Henry;
Eleventh (1973) Edition

Sixth Supplement to Coast Pilot 7, Pacific Coast, California, Oregon,
Washington, and Hawaii; Tenth (1968) Edition

Ninth Supplement to Coast Pilot 9, Pacific and Arctic Coasts, Alaska,
Cape Spencer to Beaufort Sea; Seventh (1964) Edition

Fifth Supplement to Coast Pilot 8, Alaska, Dixon Entrance to Cape
Spencer; Twelfth (1969) Edition

Great Lake Pilot, 1974

Tide Tables. Europe and West Coast of Africa, 1974

Tide Tables. Central and Western Pacific Ocean and Indian Ocean, 1974

Current Tables. Atlantic Coast of North America, 1974

Current Tables. Pacific Coast, North America and Asia, 1974

Miscellaneous

NOAA Technical Report NOS 58, Telemetering Hydrographic Tide Gage

NOAA Technical Report NOS 59, Gravity Gradients at Satellite Altitudes

NOAA Technical Report NOS 60, The Reduction of Photographic Plate
Measurements for Satellite Triangulation

NOAA Technical Report NOS 62, Earth's Gravity Field and Station
Coordinates from Doppler Data, Satellite Triangulation, and Gravity
Anomalies

NOAA Technical Memorandum NOS 13. Trends and Variability of Yearly Mean Sea Level, 1893-1972

NOAA Technical Memorandum NOS 14. Some Features of the Dynamic Structure of a Deep Estuary

NOAA Technical Memorandum NOS GDR-2. West Coast Continental Shelf Bottom Gravity Measurements, Cape Flattery to Santa Cruz, 1971; NOAA Ship McARTHUR

Supplemental Tidal Predictions, Anchorage Alaska, 1974

Distances Between United States Ports; Fifth (1973) Edition

Reprints of Reports on Geodetic Measurements of Crustal Movement, 1906-1971

Publication 31-1, Surface Water Temperature and Density, Atlantic Coast, North and South America; Fourth Edition

APPENDIX B

PAPERS PRESENTED AT MEETINGS

International Symposium on Computational Methods in Geometrical Geodesy,
Oxford, United Kingdom (September 1973)

Pope, Allen J. - The Use of the "Solution Space" in the
Analysis of Geodetic Network Adjustments

Dracup, Joseph F.; and Gergen, John G. - The Least Squares
Adjustments of Large Geodetic Networks

ASP/ACSM Fall National Convention, Orlando, Florida (October 1973)

Hull, Wesley V.; Fitzgerald, I. Y.; Thurlow, C. I.; and Brewer, R. K.,
Remote Sensing for Demarcating and Mapping Obscured Tidal Boundaries

Fitzgerald, I. Y.; and Muirhead, R. C. - Airborne Remote Sensing
Calibration and Correlation Data; Some Experiences and Some
Recommendations

Fritz, Lawrence W. - An Operational Camera Calibration by the Stellar
Method at NOAA/NOS

Kelley, Carl F. - Specifications Provide Uniformity

Baker, L. S. - National Horizontal Network Adjustment in Southern
Florida as it Affects the User

Seventh U. N. Regional Cartographic Conference for Asia and Far East,
Tokyo, Japan (October 1973)

Orlin, Hyman - Marine Boundaries and Positions

Upham, C. D. - The Automation of Large-Scale Coastal Hydrography

New Hampshire Professional Land Surveyors, Manchester, New Hampshire
(December 1973)

Tomlinson, Raymond W. - Workshop of Electronic Distance Measuring
Devices

American Geophysical Union Fall Meeting, San Francisco, California
(December 1973)

Chovitz, Bernard J. - Geoid Improvement from GEOS-C Altimetry

Morrison, Foster - Potential of a Simple Density Layer at Zero and
Other Low Altitudes

Rice, Donald A. - Frame of Reference for the New Adjustment of the
North American Datum

Fifth Conference of Southern African Surveyors, Salisbury, Rhodesia
(February 1974)

Schmid, Hellmut - The Potential of Satellite Geodesy for the
Investigation of the Solid Earth

Thirteenth Annual Canadian Hydrographic Conference, Hamilton, Ontario,
Canada (March 1974)

Munson, Robert C. - New Ways of Doing Business

ACSM-ASP Spring National Convention, St. Louis, Missouri (March/April 1974)

Puhl, Ray - An Approach to Micro-Publication of Geodetic Data
Utilizing the Computer, Microfilm, and Standard Printing
Techniques

Lill, Gordon - A Sampling of New Objectives and Programs of the
National Ocean Survey

Baker, L. S. - NGS Questions, the User

Williamson, Roy O. - Report on Surveys by State Agencies

Dracup, Joseph F. - The New Adjustment of the North American Datum

American Geophysical Union Spring Meeting, Washington, D. C. (April 1974)

Devine, Michael - Real-Time Gravitational Circulation in a Partially
Mixed Estuary

Morrison, Foster - The Use of Spline Functions to Computer Satellite
Orbit Perturbations

Chovitz, Bernard J. - Geodetic Prospects from the EOPAP Program

Conference on Physical Oceanography of the Continental Shelf, U. S. Naval
Academy, Annapolis, Maryland (April 1974)

Devine, Michael - The NOS Hydrographic and Tide Gage Program on
the Continental Shelf

Seventh International Conference on Cartography, ICA, Madrid, Spain
(May 1974)

Travis, Friason F. - Airway Fix File: A File of Airway Descriptions
in Digital Format

International Symposium on Problems Related to the Redefinition of North American Geodetic Networks, Fredericton, New Brunswick, Canada (May 1974)

Gergen, John G. - The Importance of Ordering Systems of Geodetic Normal Equations

Baker, L. S. - Geodetic Networks in the United States

Chovitz, Bernard - Three-Dimensional Model Based on Hotine's "Mathematical Geodesy"

Holdahl, Sanford R. - Time and Heights

Dracup, Joseph F. - The Impact of the Redefinition of the Surveying Community

Meade, B. K. - Doppler Data Versus Results from High Precision Traverse

Pope, Allen J. - Modern Trends in Adjustment Calculus

COSPAR Meeting, Sao Paulo, Brazil (June 1974)

Morrison, Foster - Achievements in the Use of the Density Layer Concept in Physical Satellite Geodesy

International Symposium on Applications of Marine Geodesy, Columbus, Ohio (June 1974)

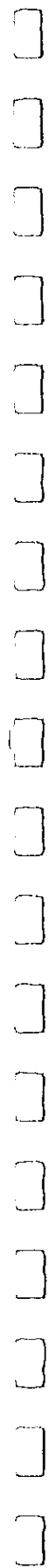
Collins, James - NOAA Programs and Requirements

Wexler, James A. - Determination of Marine Boundaries at Sea and Their Geodetic Implication

Morrison, Foster - The Application of GEOS-C Data to Marine Geodesy by Means of the Simple-Density Layer Concept

Fifty-third Annual WASHO Conference, Portland, Oregon (June 1974)

Baker, L. S. - Monumentation of Geodetic Control as a Participating Project with Each of the States



APPENDIX C

PAPERS PUBLISHED

Chappell, Robert C. - The Programmable Calculator and the Geodesist;
Preprinted for the International Association of Geodesy Symposium
on Geodesy in Africa; January 1974

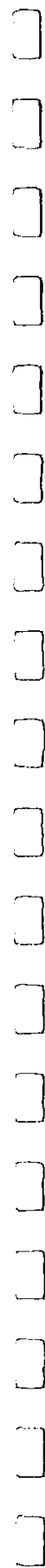
Fritz, Lawrence W. - A Complete Comparator Calibration Program;
PHOTOGRAMMETRIA; July 1973

Fritz, Lawrence W. - Stellar Calibration of the Orbicon Lens;
Photogrammetric Engineering; January 1974

Graber, Dr. Michael A. - A Technique to Measure with VLBI and Laser
Ranging the Effect on Polar Motion of the Poincare Resonance of
the Liquid Core; Journal of Geophysical Research; April 1974

Straub, Dr. Harald W. - Computation of Magnitude of Vertical
Refraction; Canadian Surveyor; December 1973

Wallace, Lt. Cdr. Jack L. - The National Ocean Survey's 31-foot
Automated Hydrographic Launch; Proceedings of Corps of Engineers
Hydrographic Survey Conference; Fall of 1973



APPENDIX D
AWARDS PRESENTED

Silver Medals were presented to:

Commander R. Lawrence Swanson for distinguished leadership and outstanding science administration in establishing national estuarine oceanographic programs.

Jerry E. Randall for long and meritorious service to the Coast and Geodetic Survey and the National Ocean Survey. For development of new systems and methods for shipboard handling and development of research and deep-sea instruments and equipment, and for deploying a wide variety of types and styles of oceanographic data gathering equipment used by NOAA scientists.

Robert H. Hanson and Chester C. Slama for extraordinary contributions through outstanding capabilities in the field of complex geodetic operations, especially in the world-wide geometric satellite triangulation program.

Bronze Medals were presented to:

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

Demetrio A. Dinardi in recognition of his originality and creativeness in the development of the unique publication - Tidal Diagrams.

Lawrence W. Fritz for outstanding contributions to the precision calibration of photogrammetric cameras and comparators used in the sciences of Geodesy and Cartography.

William O. Halluin in recognition of more than 30 years' dedication to duty and numerous notable contributions to the field of Cartography.

Lt. Cdr. Merritt N. Walter in recognition of demonstrated competence in organizing and managing the NOAA Fleet Inspection Service.

Unit Citations were presented to:

NOAA Ship FERREL

Program Management Staff, NOAA Data Buoy Office.

Radar Video Development Team, Office of Aeronautical Charting
and Cartography

Pacific Tide Party, Pacific Marine Center

Level Party G-36 and G-37, National Geodetic Survey

Area Team 4 and Area Team 8 of the Nautical Chart Branch,
Marine Chart Division, Office of Marine Surveys and Maps

Vertical Branch, National Geodetic Survey Information
Center, National Geodetic Survey

APPENDIX E

VISITS OF DIGNITARIES TO NOS

Colonel Vira Suvannus, Assistant Director, Royal Thai Survey Department, Colonel Samnao Phuangpho, Topographic Engineer, RTSD, and Colonel Rian Hirunbumroong, RTSD, met with the Director on July 13, 1973, and toured the marine charting and geodesy areas.

During the period July 23-28, 1973, Mr. Takao Uchino, Deputy Director, Surveying Division, Hydrographic Department, Maritime Safety Agency, Tokyo, Japan, visited NOS to be briefed on the automatic data processing system and to obtain information concerning hydrographic survey instruments. His itinerary also included a visit to the Atlantic Marine Center.

Four officials from Afghanistan toured the Coastal Mapping and Marine Chart Divisions during July.

Mr. A. Adamec, Senior Lecturer in Photogrammetry, Royal Melbourne Institute of Technology, Melbourne, Australia, visited the Coastal Mapping Division in October 1973.

During February 1974, Lt. Colonel C. N. Thompson RE, United Kingdom Assistant Director of Survey and Major Henry, his assistant, made a courtesy call to the Director and visited the National Geodetic Survey to discuss the doppler system and obtain background information on the Geodetic Satellite Program.

Brigadier George Hardy, United Kingdom Ordnance Survey, accompanied by Lt. Colonel C. N. Thompson RE, toured NOS during March for the purpose of general orientation.

Messrs. Gerald N. Ewing, Dominion Hydrographer, and Tom D. W. McCulloch, Director Central Region of Canada, toured the marine areas of NOS during April 1974.

One of the Assistant Directors of the Division of National Mapping, Department of Minerals and Energy, Canberra, Australia, Mr. L. G. Turner, visited NOS in May for the purpose of discussing methods and equipment for bathymetric surveys and problems of coastline mapping for territorial boundary determination. His schedule also included a trip to the Atlantic Marine Center.