AUTOMATION OF HYDROGRAPHIC SOURCE DATA

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I am not here to tell you that all hydrographers can now be replaced by computers or that nautical charts can be discarded in favor of punched cards. But automation can take some of the drudgery out of our work and can certainly increase the speed with which we can accomplish many parts of our task of providing accurate information to the navigators of the world.

Since the 8th International Conference five years ago, vast changes in the science of hydrography have occurred. At the U.S. Naval Oceanographic Office, recent innovations in the field of automation of hydrography have included :

(*a*) The development of a punched paper tape system for storing each separate page of each volume of our Sailing Directions information and the subsequent use of these tapes to automatically generate reproduction copy for New Editions and Changes *.

(*b*) The installation of our first automatic cartographic plotter, capable of producing navigational system lattices, both hyperbolic and circular, for charts and plotting sheets constructed on the Mercator, Transverse Mercator, and Lambert Conformal conic projections. This plotter, now in operation 24 hours per day, is also used to plot survey ships' tracks, submerged cables, and isogonic lines of the earth's magnetic field. Two more similar plotters are already on order.

(*c*) Final hydrographic sheets are now produced on an automatic flat-bed plotter from observed data entered on punched cards. Normally, the time, depth, and position data are punched on cards aboard the survey ship, returned to the Office, fed through a computer for application of tidal and calibration corrections, computation of position, line adjustment, and

* See IH Review, July 1966, page 173, article by F.W. BOWDEN. — Ed.

generation of a tape to drive the plotter. Blank plotting sheets showing grid or projection and with positioning system lattices are also drawn on this plotter when only a few copies are needed.

(*d*) The processing of magnetic, gravity, and bathymetric data is also performed by similar methods.

(*e*) The automation of nautical chart source data, and particularly the Oceanographic Office Nautical Chart Library.

My presentation today will concentrate on the last of these — the Automated Nautical Chart Library. This discussion will include :

(*a*) A description of our Nautical Chart Library and the development steps required for its automation.

(*b*) A description of the various catalogs and accession lists we are now generating periodically from the automated system.

(*c*) The capabilities we possess to have our computer conduct a search of areas designated by geographic coordinates or to answer questions concerning information contained on any grouping of nautical charts.

(*d*) The maintenance procedures used to keep the automated chart file current and updated.

(*e*) Our plans for extending the services and capabilities of automated nautical chart source data systems.

The need for a centralized library of all available nautical charts to be used as sources of information for producing additional charts is a recognized and obvious function of any hydrographic office. In July 1964, our Department of Defense formally assigned to the Naval Oceanographic Office the responsibility for maintaining and operating a centralized data library of standard nautical charts and special naval charts, United States and foreign produced, for the common use of all elements of the Department of Defense.

The volume of charts held in our Library has steadily increased until today there are approximately 60 000 charts in the files. Of this total, approximately 25 000 represent unique items. In content they vary from the multi-purpose standard nautical charts to such individually user-oriented products as fishing charts. In total, the products of 63 nations are included in our holdings, plus the products of other U. S. chart producers such as the Coast and Geodetic Survey and the U. S. Army Lake Survey. [See tables 1(a) and 1(b)]. Our past experiences with automatic data processing techniques and our knowledge of associated automated equipments suggested to us that automated techniques could be applied to the Nautical Chart Library.

Late in 1965, we began a detailed analysis of the Library to determine the feasibility of developing an automated search and retrieval system. The analysis was divided into three phases : (1) a determination of the requirements of the Library, (2) analysis of the products and functions of the Library, and (3) analysis of the sources of data input to the Library. To define the Library requirements, we had to investigate and determine Library user requirements. The analysis of the products and functions of

TABLE 1a

IHB countries producing nautical charts held by NavOceanO

1. Argentina
2. Australia
3. Brazil
4. Burma
5. Canada
6. Chile
7. China
8. Cuba
9. Denmark
10. Dominican Republic
11. Finland
12. France
13. Germany (West)
14. Greece
15. Guatemala
16. Iceland
17. India
18. Indonesia
19. Iran
20. Italy
21. Japan
22. Korea
23. Monaco
24. Netherlands
25. New Zealand
26. Norway
27. Pakistan
28. Paraguay
29. Philippines
30. Poland
31. Portugal
32. South Africa
33. Spain
34. Sweden
35. Thailand
36. Turkey
37. United Arab Republic
38. United Kingdom
39. United States of America
40. Venezuela
41. Yugoslavia

TABLE 1b

Other countries producing nautical charts held by NavOceanO

1. Belgium
2. Cambodia
3. China
4. Colombia
5. Congo
6. Ecuador
7. Estonia
8. Germany (East)
9. Haïti
10. Israel
11. Latvia
12. Mexico
13. Nigeria
14. Panama
15. Peru
16. Rhodesia
17. Surinam
18. Syria
19. Union of Socialist Soviet Republics
20. Uruguay
21. Vietnam (North)
22. Vietnam (South)

the Library involved analyzing our own office's products and functions and also the products and functions of other agencies. For each of these agency users, the products and functions were analyzed according to user, format, and frequency. Analysis of the sources of data was performed on each Office file which contributed data to the Library. All contributing sources were investigated so that the analysis would consider the complete spectrum. For each file which was found to be a data source, information was compiled

as to source, purpose, relationship, characteristics, etc. The completed analysis indicated that an automated source index file of our Nautical Chart Library should be built so that the Library could more efficiently and responsively serve its many customers.

In February of 1966, we began to design the automated system. The primary criteria used in the design were the outputs and services required by the various users of the system. With the basic output requirements in mind, the design concept was developed on the basis of inputs available, conversion requirements, maintenance requirements, and compatibility with other data systems. At this point in our endeavors, a significant event occurred. Analysis of the Bathymetry data library and the Geomagnetic data library, which had been proceeding in parallel with the design work in the Nautical Chart Library, indicated marked similarity of data element content. Evaluation suggested the probability of designing complementary systems. We realized that the advantages of developing complementary systems would be quite significant in terms of overall resources, for we would be able to generally standardize file conversion procedures, use the same computer programs in each library area with only minor modifications, and present our outputs from the computer in nearly standardized formats. We continued to develop the design formats simultaneously in all three library areas and by March of 1966 had solidified similar system designs for all three libraries.

The basic unit used in the design of the automated Nautical Chart Library was the chart logical record. All the data relating to one chart comprises a logical record. The individual data items included in the chart logical record are shown in table 2. The overall design recognized the

TABLE 2

Chart logical record

Chart Identification	Upper Right Latitude and Longitude of Neat Line
Chart Title	Type Copy
Chart Price	Projection
Chart Scale	Countries or Water Areas Covered
Publication or Edition Number and Date	Basic Survey Date
Revision or Correction Date	Facsimile Chart Number
Producer	Overprint Code
Product Code	Special Code
Plan or Insert Title	Classification
Plan or Insert	Downgrading Code
Sequence Number	Handling Code
Plan or Insert Scale	Language Indicator
Lower Left Latitude and Longitude of Neat Line	

necessity for developing an evolutionary system and was engineered to incorporate additional data items, such as inventory information and chart evaluation criteria, into the chart logical record as they became available.

The monotonous and tedious file conversion phase of automating the library extended from March through September 1966. Four normal 80-column data cards were used to describe each chart and were designed in such a manner that the conversion efforts necessary to transcribe the data were minimized. The chart information contained on cards designated as cards 01, 02, and 03 was converted directly from information shown in chart catalogs. The 04 input card information was obtained directly from the charts themselves, written on transcription sheets, and then key-punched. During transcription, the accuracy of the entries fell in the range of 92-95 percent, and editing procedures further improved the accuracy to over 98 percent. After the data were edited and verified, they were transferred to magnetic tape. Listings of the data were obtained from our IBM 7074/1401 computers for additional editing. An immediate benefit resulted. The design format had required that certain information for an individual chart be taken directly from catalogs and additionally had required that the remaining information for the same chart be abstracted directly from the chart. A simple match operation in the computer of the four cards representing each chart immediately indicated : (1) those charts existing in our library which were not contained in the catalogs and (2) those charts appearing in catalogs for which we did not have a copy in the library. We had in effect developed, because of our system design, an inventory system. We used this information both to eliminate obsolete charts and to order charts which we did not possess.

The necessary computer programming had been directed at two major areas. We wished to be able to supply the library users with those services that would satisfy their requirements. The second major programming requirement was to develop computer routines necessary to keep the file updated and current.

The user outputs from the automated system were divided into two types : (1) those outputs which would be generated at periodic intervals and distributed to the library customers, and (2) outputs which would satisfy user interrogations to the library for answers to specific questions which could not be found in the periodic outputs.

The basic initial output from our work was an automated printed listing of the entire holdings of the Library in producer sequence. All information obtained from the conversion of the individual chart catalog data and the analysis of each individual chart was combined into a single product. The data were formatted by country and within each country by chart identification number sequence. This initial catalog was computer produced in October 1966. Our analysis had indicated that a complete regeneration of the catalog should occur each six months. However, as basic production criteria for regenerating the catalog was based on the number of accessions, the catalog would be produced prior to the scheduled date in the event of a large number of changes or corrections occurring. Figure 1 depicts a typical page from this catalog.

HO 04502 R PORT OF SOUTHAMPTON $1.05 SC 7500 ED 001 MAR 1965 COR JAN 1966
LL 50 52 ION 001 28 44W UR 50 54 43N 001 21 OOW T L PROJ 31 C UK SYR 1961 FNR BA 02041 CLAS U XB PROD AB PRDR HO L E

HO 04505 APPRS TO SPITHEAD S COAST OF ENGLAND $2.30 SC 25000 ED 009 MAY 1950 COR SEP 1963
LL 50 38 OON 001 20 OOW UR 50 48 OON 000 55 40W T L PROJ 03 C UK SYR 1948 FNR CLAS U XX PROD AA PRDR HO L E

UNIQUE CODE IDENTIFIER | CHART NUMBER | SPECIAL CODE | CHART TITLE | PRICE | SCALE (1:) | EDITION NUMBER | EDITION DATE MONTH YEAR | CORRECTION DATE MONTH YEAR

HO 04514 R EASTERN APPRS TO THE SOLENT NAB TOWER TO SPITHEAD $1.40 SC 20000 ED 001 SEP 1965 COR

R - REPRODUCED FROM ANOTHER CHART
M - REPRODUCED FROM ANOTHER CHART WITH PLANS, INSETS
I - INSET, PLANS WITHIN CHART LIMITS
P - PLANS, INSETS OUTSIDE CHART LIMITS

LOWER LEFT COORDINATES LAT. ° ' " LONG. ° ' " | UPPER RIGHT COORDINATES LAT. ° ' " LONG. ° ' " | TYPE COPY | PROJECTION | COUNTRIES COVERED | BASIC SURVEY DATE | FACSIMILE CHART NUMBER | CLASSIFICATION | HANDLING CODE | PRODUCT CODE | PRODUCT LANGUAGE

LL 50 38 06N 001 07 13W UR 50 48 36N 000 56 18 W T L PROJ 31 C UK SYR 1958 FNR BA 02050 CLAS U XB PROD AB PRDR HO L E

L - LITHOGRAPHIC
O - ORIGINAL COPY
P - PHOTO COPY

31 - GNOMONIC
01 - UNKNOWN
03 - MERCATOR
04 - TRANSVERSE MERCATOR
09 - POLYCONIC
18 - POLAR STEREOGRAPHIC

AB - FOREIGN REPRODUCTIONS
AA - STANDARD NAUTICAL
AE - SPECIAL
AF - PLOTTING SHEETS
AH - ANCHORAGE
AR - NAUTICAL BASE LORAN

E - ENGLISH
C - ENGLISH AND NATIVE
N - NATIVE
D - NATIVE AND/OR FOREIGN

HO 04513 R WESTERN APPRS TO THE SOLENT INCL NEEDLES CHANNEL $1.05 SC 20000 ED 001 MAR 1965 COR
LL 50 38 OON 001 46 38W UR 50 45 OON 001 30 10W T L PROJ 31 C UK SYR 1951 FNR BA 02219 CLAS U XB PROD AB PRDR HO L E

HO 04515 R THE SOLENT EASTERN PART INCL SPITHEAD $1 40 SC 20000 ED 001 NOV 1965 COR
LL 50 42 18N 001 21 30W UR 50 49 12N 001 02 48W T L PROJ 31 C UK SYR 1959 FNR BA 00394 CLAS U XB PROD AB PRDR HO L E

Fig. 1

The second major product outputs were accession listings. These computer print-outs were planned to be produced on a bi-weekly basis in two parts : (1) additions, changes, or deletions for the previous two-week period, and (2) a cumulative listing of all changes to the initial total list, up to and including the latest accessions. These accession listings not only maintain the catalog on a current basis, but also provide a historical data file of actions, revisions, new editions, or deletions which affect the master file. The listings were programmed in the same format as the basic catalog except that they were grouped by the type of changes by country. The first automated accession listing was produced and distributed in June 1966 and since that time the two week schedule has been maintained.

Although the basic nautical chart catalog is arranged by country and within each country by chart number sequence, our analysis indicated a user need for additional types of catalogs that could be arranged by other chart parameters. The computer programming was therefore directed towards insuring that additional catalogs could be produced using any of the following chart parameters as prime categories — geographic area (latitude-longitude limits), date of production or revision, type of chart, producing agency, or scale. The computer programs to produce catalogs by any of these categories were operationally tested and complete catalogs by scale and geographic area were produced and are in use at our office today.

The major purpose of our automatic data processing activities has always been to constantly and continually support the production requirements of the U.S. Naval Oceanographic Office. It was axiomatic, therefore, that the Nautical Chart Library Automation System be capable of supplying to the library's users specific information that could not be obtained from the periodic outputs. Relying heavily on the detailed analysis which had sampled a cross-section of all types of information the library was asked to provide, we determined that the capability to respond quickly and accurately to production requirements required a range of computer programs which would answer all types of interrogations levied on the library. A more comprehensive analysis of user requirements indicated that the categories of information the library must respond to consisted of two general types : (1) those requests which could be reduced to a geographic area, and (2) those requests that required multiple grouping information such as scale, edition date, and producer. Within each of these two general areas, definitive requirements were expanded in detail and a system design necessary to satisfy all required information requirements was determined.

For those requests which could be reduced to area search queries, we determined that any type of requirement would fall within three general geometric area patterns. These were a polygon, a route or corridor, and a point plus circle radius search area. We developed the necessary computer programs to enable us to query the master record file in any of these three basic ways.

The polygon search routine requires that as few as three and as many as eight points be established to define the outer limits of the area to be searched. The route or corridor search requires that the route be specified

by start and stop coordinates, which may include the type of track or corridor which has bends or changes in direction. After the route or corridor has been determined, a specified distance on either side of the centerline of the route or corridor is defined — e.g. 50 nautical miles or 100 nautical miles. For the point-radius circular search, the user may specify the coordinates of any point on the earth's surface and request a search within any specified radius around that point. Figure 2 depicts the three basic search patterns.

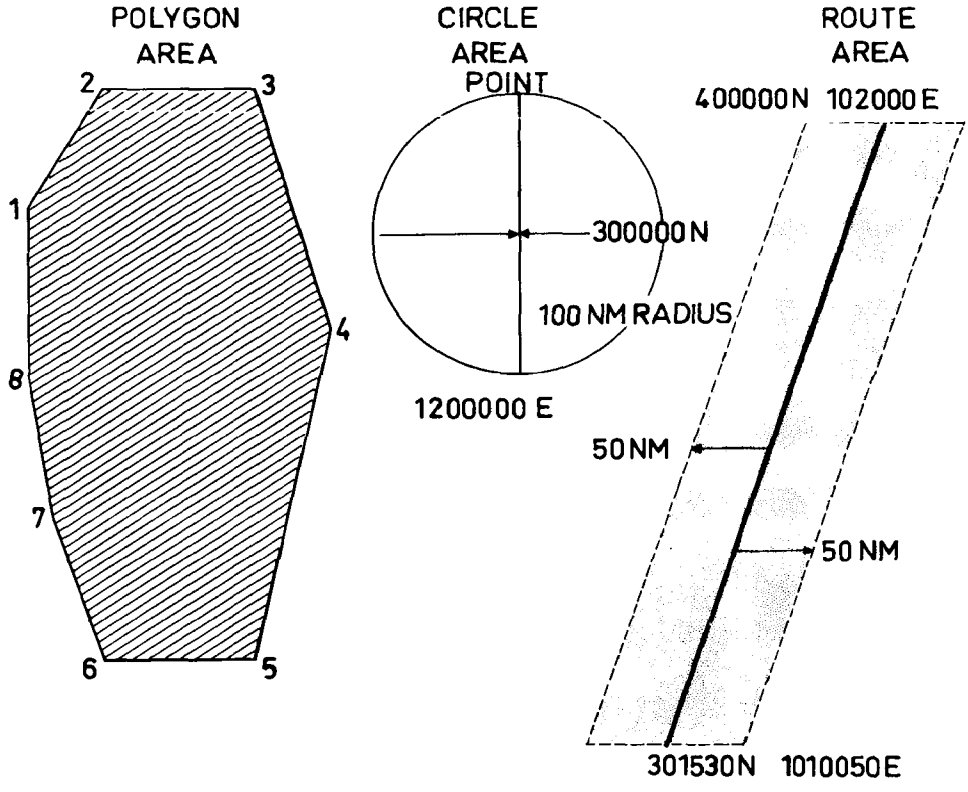

FIG. 2

We continually kept in mind the costs of computer operations in designing this system. Our computer complex used for the Nautical Chart Library automation is an IBM 7074/1401. The cost to run one individual query on this system is about $ 45.00. If our programs were written so that we could " batch " requests, that is, handle more than one request at the same time, the individual query cost would be correspondingly reduced. Moreover, if we could combine different types of geographic coordinate type requests in one run of the tape through the computer, we could make still further savings on a cost per query basis. With these facts in mind, we developed our computer programming so that we could run up to 100 separate polygon search, route search, or circular search queries at the same time. Even more important, we could combine queries of these three

different types in combinations that totalled to 100. If we run 100 requests at one time, the cost per query is reduced to 45 cents.

Though the area retrieval programs gave our hydrographers, cartographers, geodesists, bathymetrists, and geophysicists a dramatic new tool to be used to speed up and improve the quality of the products they produced, there remained the problem of being able to quickly and efficiently extract data from the master record which involved multiple chart characteristics. For example, a particular library customer might request all of the standard nautical charts that were produced by the British Admiralty between 1955 and 1965 which covered Spain and were at a scale of 1/25 000 or larger. Though the information was available, it could not be extracted directly from the computer. Instead, punched card decks had to be manipulated in various card handling machines and some manual sorting and collating was necessary to obtain the required information. As all requests of this nature would involve similar processing, we decided to build the necessary computer programs to enable the computer to perform these types of tasks. Also, to obtain maximum use from these programs, we decided to build them in such a manner that the already developed area retrieval programs could be used in conjunction with these logical retrieval programs. This would enable us to generate, within the computer, the answers to questions that involved not only geographic coordinates, but also questions pertaining to scale, edition number, projection, language, etc. See figure 3.

All the query type programs were planned, written, compiled, operationally tested, and became available for use in twelve months. The area retrieval programs were completed in October of 1966 and the logical retrieval programs became available in March of 1967. Though we have responded to numerous external requests from various activities, the major users of the automated system have been our own production people. We are very pleased that the majority of the queries to the system have originated within our office for it is a definite indication that the fundamental concept used in designing the system — to insure that it is oriented to support our own production process — has to a large extent been attained.

The second major group of computer programs to be developed were those concerned with maintaining the entire nautical chart library system. The Nautical Chart Catalog contained approximately 1 900 pages. Each individual chart required two complete lines of printed data and an average of 15 charts was contained on each page. In addition, port plans which fell beyond the neat lines of the chart on which they appeared were coded separately. Thus, the total number of items, including plans, contained in the catalog approximated 30 000. The continuing maintenance of the millions of characters of information which constituted the master record was recognized as a formidable task.

File maintenance encompasses all steps necessary to keep the file updated and current. Specifically, maintenance involves the addition of new records, the deletion of old records, and changing items within a record. The input sources from which maintenance information is obtained include foreign and U.S. produced chart catalogs, foreign and U.S. produced

ANCIP REQUEST
NAVOCEANO-5508/11 (8-67) *(Submit in duplicate)*

TO	CLASSIFICATION	DATE	REQUEST SUSPENSE DATE
Code 5530	UNCLASSIFIED	17 Feb 1967	24 Feb 1967
REQUESTER		**CODE**	**EXT.**
Mr. Joseph Lermond		5510	501
PROJECT			
Proficiency Trip W. Coast U.S. & S. America: Special Requests			
NO. OF COPIES	**PRIORITY**	**APPROVED**	
2		KMB	

ANCIP REQUEST SPECIFICATIONS

REQUEST #1

Logic Retrieval for the following countries:

CHILE PARAGUAY
ECUADOR PERU

OUTPUT

Catalog Listing with all pertinent data.

REQUEST #2

Logic Area Retrieval on China, Scale 0-1:500,000 coordinates.

17 00 00N	108 00 00E	30 00 00N	108 00 00E
42 00 00N	120 00 00E	40 00 00N	124 30 00E
28 00 00N	124 00 00E	20 00 00N	115 00 00E

OUTPUT

Area Retrieval Format.

REQUEST #3

Special Listing

All charts produced by Denmark without direct reproductions.

OUTPUT

Catalog Listing with all pertinent data.

REQUEST #4

OUTPUT

ACTION COMPLETED, INITIALS (Requester)	DATE REC'D BY CODE 5530	DATE SUBMITTED TO CODE 12	DATE COMPLETED
JL	17 Feb 1967	18 Feb 1967	3 Mar 1967

SUMMARY

REQUEST #1

COUNTRY	CODE	NUMBER OF CHARTS HELD IN LIBRARY
CHILE	(CI)	167
ECUADOR	(EC)	4
MEXICO	(MX)	24
PARAGUAY	(PA)	5
PERU	(PE)	47

REQUEST #2

COUNTRY	CODE	NUMBER OF CHARTS HELD IN LIBRARY
BRITISH ADMIRALTY	(BA)	106
FRANCE	(FR)	84
GERMANY (WEST)	(GY)	12
NAVAL OCEANOGRAPHIC	(HO)	175
INDONESIA	(ID)	1
JAPAN	(JA)	181
KOREA (SOUTH)	(KS)	7
PORTUGAL	(PT)	1
NETHERLANDS	(NE)	1
PHILIPPINES	(PI)	1
SPAIN	(SP)	3
CHINA (REPUBLIC OF)	(TW)	191
UNION OF SOVIET SOCIALIST REPUBLICS	(UR)	25

REQUEST #3

DENMARK - 124 CHARTS HELD IN LIBRARY WHICH ARE NOT DIRECT REPRODUCTIONS.

FIG. 3

nautical charts, and various Naval Oceanographic Office production schedules and distribution bulletins. All these sources are channelled to the chart library where they are analyzed and those changes which affect the master tape are extracted. These changes are then systematically processed through the necessary operational steps and result in changes to the master record.

I have continually referred to the master file record as if it were a single magnetic tape. In reality it is not — rather it is a series of three magnetic tapes. I have established and made responsible to me an automation staff which plans and monitors the development and operation of automated systems such as the automated Nautical Chart Library. The system of magnetic tapes which are used in the Library was developed by this staff and their explanation to me of how it works is worthy of verbatim repetition. " Captain, we have developed a grandfather, father, son magnetic tape update system in which the father becomes a grandfather, the son becomes a father, and the grandfather becomes a son. However, in no case will the father become involved in the normal update cycle. " The last statement seemed to have been added simply to assure me that all was well, but the fact that a father was not involved in the normal update cycle simply did not agree with all I'd ever learned relative to biological regeneration. In reality, however, the system was quite simple.

In October 1966 when the initial library catalog was generated, three new magnetic tapes had been set aside. All of the chart record data had been placed on one of these tapes. Two weeks later, when the first accession list was generated, these accession list changes were combined with the original master record onto the second clean magnetic tape. This latter tape then became the " son " and the original master became the " father. " Two weeks later, when the second accession list was generated, the same process occurred and the third clean tape became the " son ", the second tape the " father ", and the original tape the " grandfather. " Two weeks later, the " son " tape plus the maintenance changes that had occurred during the two week period were run through a computer program, and the results output directly on the " grandfather " tape. The " grandfather " tape then became the " son " and the whole process began again. The constant rotation of these three tapes maintains three versions of the master file — one current and two backup tapes.

There can be little doubt that today we are in the midst of a computer revolution. New professions with titles such as computer programmers, computer systems analysts, computer operators, and the like have appeared, been accepted, and are growing rapidly. There is constant pressure on us all to discard manual systems and manual procedures that we have learned so laboriously over long periods of time in favor of glamorous new machine operated systems. Our experiences to date with automated techniques have been both frustrating and rewarding. In the analysis of both our failures and our successes we have found that the single factor contributing most to the results we have or have not attained has been the adequacy of our basic planning. We have recognized that system planning must consider not only present requirements, and those which will concern us in the immediate future, but that we must also be

able to visualize and provide for those requirements that we must satisfy three, four, and five years from now. Only in this way can we hope to amortize the tremendous expenses in both manpower and equipments that are required to develop automated systems. I would now like to outline for you some of the future developments we are currently planning.

The Nautical Chart Library automated system that I have described to you results in the production of textual computer outputs. We are currently planning to develop these same outputs in graphical form. We would then be able to deliver to our compiling cartographers computer products which list all existing charts and other source materials relating to an area of interest and graphically relate these charts to this area of interest. Additionally, this capability will enable us through the use of other automated equipments to computer generate all of our own chart catalogs. Remembering that our accession programming is held to a two-week cycle, any of our chart catalogs could be generated at anytime, and the information they contain would not be more than fourteen days old.

The production of a new chart involves a great deal of time-consuming searching for information and data to acquire the necessary chart building blocks. Our automated endeavors in the Nautical Chart Library have simplified this process. Figure 4 depicts some of the chart information sources Cartographers utilized in the past to obtain information relative to specific chart characteristics. Although all chart reference data can quickly be obtained through the computer system, textual information such as is contained in the Notices to Mariners is not so readily available.

We plan to develop a Notice to Mariners index file which will present to the requester, not only a listing of Notices that have been printed which affect a certain chart since it was published, but also we intend to abstract enough of the pertinent information from the Notice so that there will be no necessity to locate the Notice itself.

I commented briefly on the significance we attached to the development of similar format designs in our Nautical Chart, Bathymetry, and Geomagnetics Libraries. We have capitalized on these parallel designs to such an extent that automated systems for both the Bathymetry Library and the Geomagnetics Library, which will have the same capabilities as those currently available in the Nautical Chart Library, will be operational in July of this year. The graphical portrayal systems for all three libraries will now be developed in unison and will be operational by July 1968.

We have not overlooked all the other source data repositories that support the production of our products. For example, we are planning the same type of automated systems in such areas as geodesy and gravity. Collectively, our current planning indicates that by 1972 we should be able to free the compiling cartographer from any of the source material search and retrieval aspects of his work and forward to him all information he needs in order for him to select those materials he requires to make a chart.

I have outlined to you the steps we at the U.S. Naval Oceanographic Office utilized in determining the necessity for automating our Nautical Chart Library and have also detailed the procedures we employed in

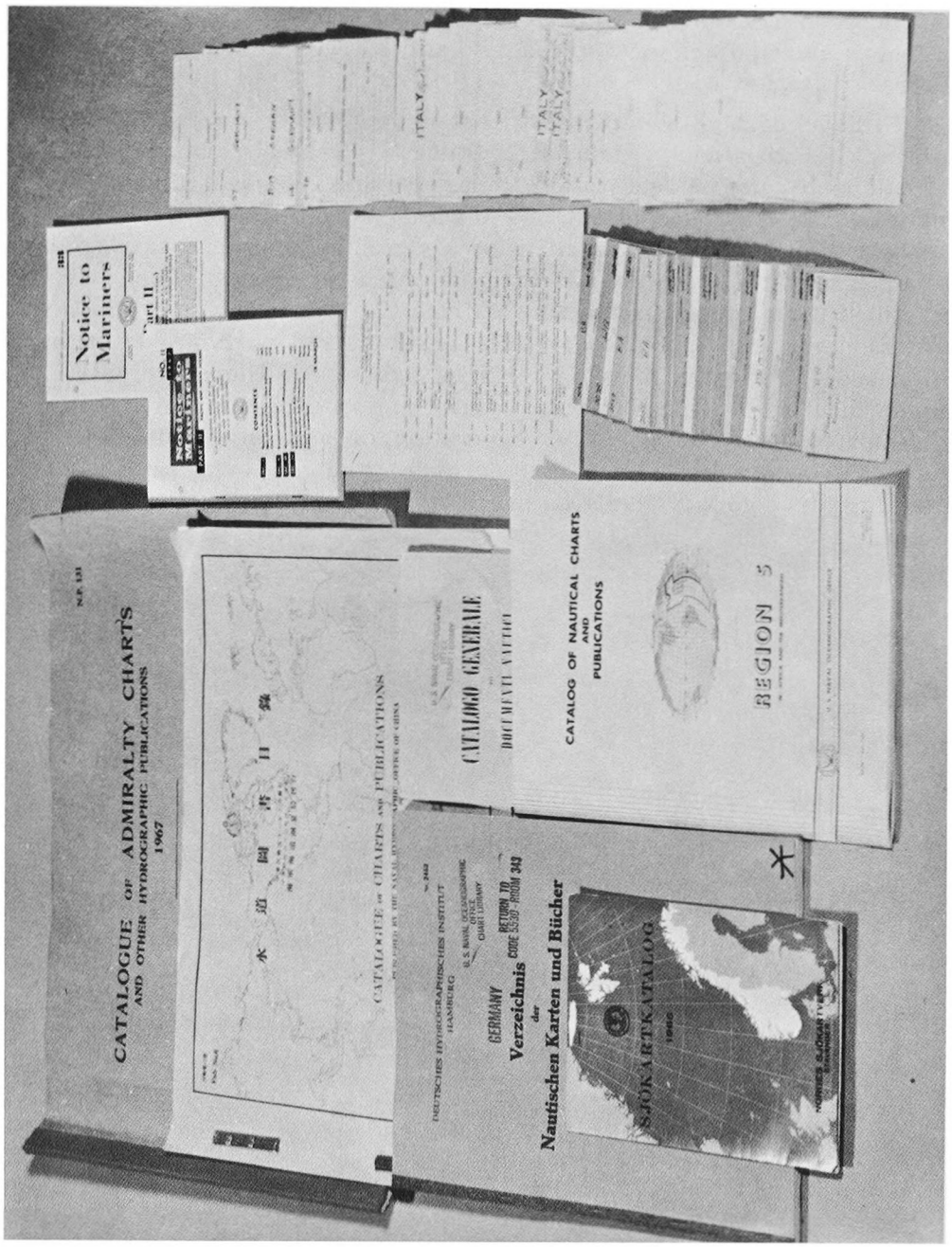
CATALOGUE OF ADMIRALTY CHARTS
AND OTHER HYDROGRAPHIC PUBLICATIONS
1967
Notice to Mariners
Part II
CATALOGUE of CHARTS and PUBLICATIONS
DEUTSCHES HYDROGRAPHISCHES INSTITUT
HAMBURG
GERMANY
Verzeichnis
der
Nautischen Karten und Bücher
CATALOGO GENERALE
CATALOG OF NAUTICAL CHARTS
AND
PUBLICATIONS
REGION 5
SJOKARTKATALOG
1960
ITALY

FIG. 4

implementing the designed system. I have noted the system capabilities in terms of the recurring products we produce, such as automated catalogs and accession lists. In addition, I have detailed the individual query capabilities our hydrographers, cartographers, geodesists, bathymetrists, and geophysicists currently enjoy through the use of the geographic area and logical retrieval programs. I have discussed the system maintenance problems and maintenance procedures, and I have outlined our anticipated future automated activities.

In conclusion, I would like to repeat one of the major objectives of the IHB — specifically, item 8c of the Statutes which states that " the Bureau shall also collect catalogues and index charts published by all countries. " As an aid in moving toward this objective, the U.S. Naval Oceanographic Office is pleased to present to the Bureau a catalog listing of all charts produced by all the IHB Member States which we have generated from our Automated Nautical Chart Library. In addition to providing immediate assistance, this catalog will, we hope, serve in the Bureau's longer range developments as a base for the coordination and standardization of nautical chart information presentation among the Bureau's Member States. Any cooperation or assistance which the U.S. Naval Oceanographic Office can furnish from its own experiences in attaining this goal will gladly be provided to the Bureau and to its Member States.