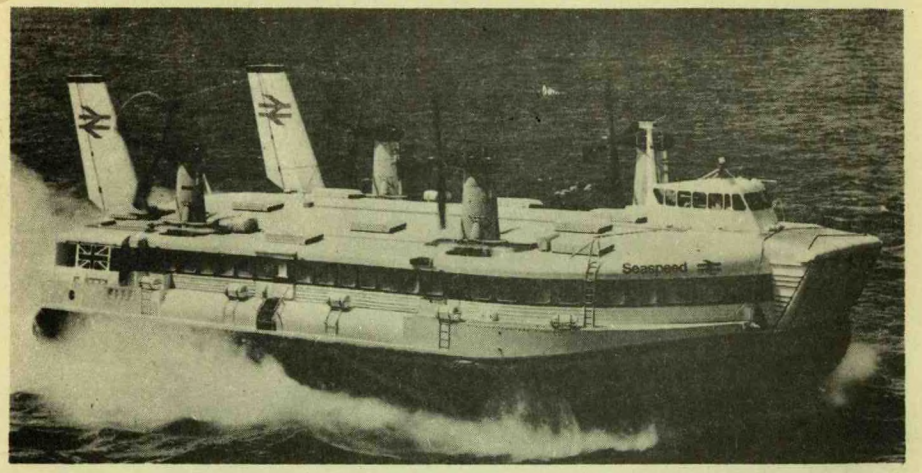
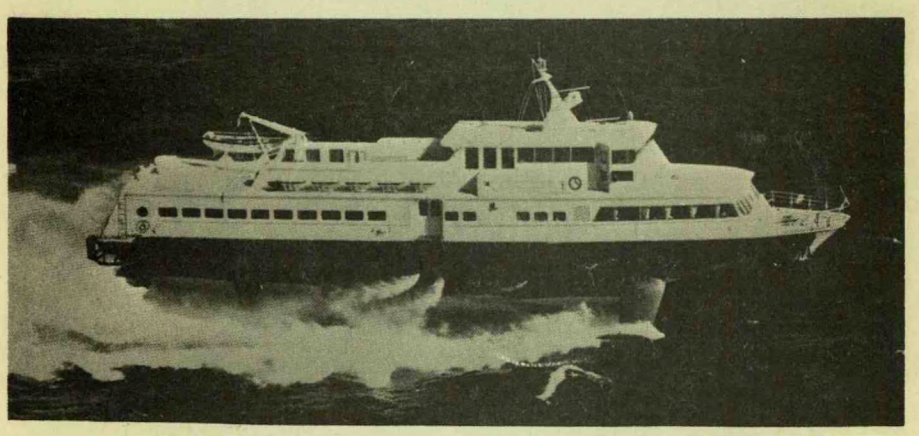
U. S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

AN ANALYSIS OF THE NAUTICAL CHARTING PROGRAM





PREPARED FOR DIRECTOR

NATIONAL OCEAN SURVEY

February 1973

U. S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL OCEAN SURVEY

INTERIM REPORT

ON

ANALYSIS OF THE

NAUTICAL CHARTING PROGRAM

PREPARED FOR DIRECTOR

NATIONAL OCEAN SURVEY

February 1973

James E. Gearhart
George E. Moore
LCDR John O. Rolland
Dr. Richard K. Wolford, Chairman

PREFACE

In order to insure the production of a safe, efficient, and comprehensive suite of marine navigational aids, it is essential that the National Ocean Survey (NOS) periodically review and evaluate all aspects of its nautical charting program, including user reaction to the various end products. Changing user requirements, chart layout and coverage, cartographic innovations and development, as well as advanced reproduction technology, are examples of the elements that create change which should force management to continually subject the nautical chart production system to critical examination.

On September 13, 1972, Admiral Allen L. Powell, Director of NOS, designated a four-man task group to investigate and provide recommendations for carrying out the nautical charting program in a more efficient and expeditious manner. The task group was composed of James E. Gearhart, George E. Moore, LCDR John O. Rolland, and Dr. Richard K. Wolford, Chairman. Mr. Eric Frey joined the group in November to provide assistance with the graphics associated with the study.

In FY 1972, the last year for which complete budget figures are available, the Nautical Charting Program was allocated $16 million to carry out ship and field operations,

data processing and handling, and chart production and distribution activities. A comparison of all NOS program funding levels is as follows:

NOS - FY 1972 BUDGET ($K)

Data Buoy	$17,105
Nautical Charting	15,598
Aeronautical Charting	8,859
Geodesy	8,323
Marine Geophysics	7,600
Coastal Mapping, Oceanography, and Great Lakes Research	4,813
Oceanographic Instrumentation	2,698
Ship Bases and Program Support	2,208
TOTAL	$67,204

A total of $1,680,000 was used to finance the operations of the Marine Chart Division. This does not include an allotment of $1,362,400 for FY 1972 made to the Office of Aeronautical Charting and Cartography for the preparation and printing of nautical charts. Approximately 90 percent of the Division's costs are used for salaries; therefore, in order to achieve economies, it becomes necessary to make more efficient use of available manpower and improve operational procedures. Ways and means of accomplishing this are discussed herein. This report covers a study made

of the Marine Chart Division but not the charting activities of the Lake Survey Center, nor automation processes.

EXECUTIVE SUMMARY

In September 1972, the Director of the National Ocean Survey, NOS, established a task group to investigate the policies, procedures, and products of the Nautical Charting Program. This is an interim report on the first phase of the study which concentrates on some of the activities of NOS's Marine Chart Division. Lake Survey Center operations and automation processes are not covered.

The objectives of this study were to: (1) identify users of NOS charting products; (2) investigate present mechanisms for determining user requirements and maintaining favorable public relations; (3) determine the adequacy of the charting product and how it could be improved; (4) review present management policies; and (5) investigate operational procedures involving duplicative area coverage, overlapping chart scales, frequency of issuing new editions, and more economical chart formats in order to find ways of improving system efficiency and to uncover savings that can be applied to product improvement.

The results of the study are presented in two parts under the following titles: (1) The User and the Charting Product; and (2) Management, Policies, and Procedures.

In part (1) the task group reviewed the findings and recommendations of past user studies (A. D. Little (1970),

Battelle (1966), and Reed Research (1962-3)); interviewed in-house chart users and individuals having broad experience in maintaining user contacts and determining user requirements; and evaluated the questionnaires obtained by the recent Federal mapping study conducted by the Office of Management and Budget.

For part (2) the task group interviewed Marine Chart Division managers concerning operational procedures and policies; analyzed chart sales records to determine the statistical distribution of demand among the 829 NOS coastal charts on issue; made a chart-by-chart analysis of the chart coverage for selected areas; and developed more economical alternative chart formats.

THE USER AND THE CHARTING PRODUCT

Major findings of the task group are as follows:

1. Some of the recommendations of past user studies conducted by private firms under contract have been ignored by NOS and its predecessors, especially in the area of public relations, product promotion, and market analyses. Other than the existence of the Cooperative Charting Program and participation in occasional boat shows, NOS has no formal mechanism for maintaining direct contact with users, nor for determining user needs and reaction to NOS products.
2. Although NOS is meeting the needs of the user regarding the technical quality of its charting products, improvements

can be made in format, area coverage, and the updating frequency of all chartable data.

3. Recreational boating users far out number commercial users, but the latter make a greater contribution to the GNP. The number of Small-craft Charts, which are designed specifically for the recreational boater, comprise less than 10 percent of the total number of charts on issue.

The task group makes the following recommendations based on these findings and other considerations:

1. Always give first priority to maintaining the high standards in the engineering quality of the charting product, that is, the positional accuracy of chartable data.

2. Product improvements in format, area coverage, and other of the less critical chart characteristics are important. However, financial support to effect these improvements should come from savings in operational procedures rather than at the expense of a degradation in engineering quality of the charting product.

3. Improve the method of determining user requirements, making marketing analyses, and inspecting chart agent performance by taking the following actions in the sequence given as financial support becomes available:

a. Devise a simple and economical questionnaire

to be distributed with each chart as it is sold in order to identify the buyer and give NOS other vital information for planning purposes.

b. Expand the Coast Pilot inspection team responsibilities.

c. Assign three to four individuals--civilian and/or Commissioned Officers--full time, as roving "men-in-the field," covering all coastal states.

d. Open permanently based "advisory centers" in all coastal states.

4. Improve public relations by assigning a PR function to the Director's staff.

5. Give increased attention to the recreational boating user. Drop the name "Small-craft" Chart because this tends to imply a product of limited use. Rather, use the symbol +SC after the chart number to indicate that the given chart contains added information for the recreational boating user.

MANAGEMENT, POLICIES, AND PROCEDURES

The task group found several examples where a reorientation of effort and a reemphasis of goals could be carried out that would increase management effectiveness and operational efficiency.

Whereas the Nautical Charting Program has made significant progress in the automation of the mechanics

of chart production, the Marine Chart Division has been handicapped by limitations in staff personnel in the modernization and streamlining of its operations and procedures concerning more efficient chart coverage, more economical chart formats, and improved cartographic techniques. More specifically, major findings of the task group are as follows:

1. The lack of uniformly complete, detailed, and readily accessible policy guidelines cause inefficiencies in the utilization of manpower.
2. No comprehensive manual exists that reflects up-to-date, detailed charting procedures and cartographic specifications. This, too, results in inefficient use of manpower.
3. There is inadequate research concentration to improve cartographic techniques and to devise the most useful displays of marine navigational data. Although research and development activities have been carried out by the Marine Chart Division, they have been done by means of diverse assignments to many individuals, all of whom have had to perform their normal assigned duties concurrently.
4. The Marine Chart Division operates with only limited and informal communication between staff and production areas.

5. Planning for chart layouts, coverage, content, and maintenance is fragmented and ineffective. There is a pressing need for monitoring the NOS product set from the point of view of demand and original justification. The current set of charts on issue has grown into a maze which, in many cases, satisfied unique user requirements that may no longer exist.

6. All of the 829 charts on issue are scheduled for new editions on fixed cycles that vary from 6 months to 4 years with the average being 2-1/2 years. Priorities within a fixed cycle are determined by the historical accumulation rate of corrections. The cycle of any chart can be modified by an unexpected quantity of Notice to Mariners' corrections, receipt of new data on changes that significantly affect the chart, and any unexpected depletion of stock.

7. About 40 percent of all NOS Conventional Charts on issue distributed less than 1,000 copies per year over the period 1970 to 1972. Twenty-five charts covering Alaskan areas distributed under 200 copies per year in each year from 1970 to 1972. One hundred thirty-six charts distributed under 200 copies per year in two of the years in the 1970 to 1972 span.

8. The task group uncovered several areas where opportunities for savings existed in the product set. It was not the goal of the task group to make a chart-by-chart analysis of all charts on issue. The following table

gives a sample, in summary form, of the magnitude of the savings that could be realized by a systematic chart-by-chart analysis of the complete product set.

Example (Selected Area)	Nature of Problem	Possible Reduction of Charts	Cost Avoidance 4-Year Period	Cost Avoidance 10-Year Period
Stephens Passage (Southeast Alaska)	Unnecessary duplicative cover in future plans	5 to 2 or 3	$56K[1]	$63K[1]
Florida Keys and Bay	Unnecessary duplicative cover at present	12 to 5	$51K[2]	$237K[2]
Small-craft Area Charts	Exact duplication of corresponding Conventional Charts	42 to 21	$214K[2]	$600K[2]
Sailing Chart 1001	Low accumulation rate of corrections. Maintenance cycle too frequent	N.A.	$13K[1] $ 9K[3]	$33K[1] $22K[3]
Small-craft Chart Covers	Could be eliminated by putting cover data on the chart	N.A.	$232K[4] $148K[5]	$580K[4] $370K[5]

NOTES:

[1]Assume 4-year maintenance cycle. Decreasing the ~~length~~ *frequency* of the cycle, increases the amount of cost avoidance.

[2]Assume 1-year maintenance cycle.

[3]Assume 2-year maintenance cycle.

[4]Includes covers for Area and Route Charts.

[5]Includes covers for Route Charts only. Area covers eliminated in the third example of this table.

The task group makes the following recommendations based on these findings and other considerations:

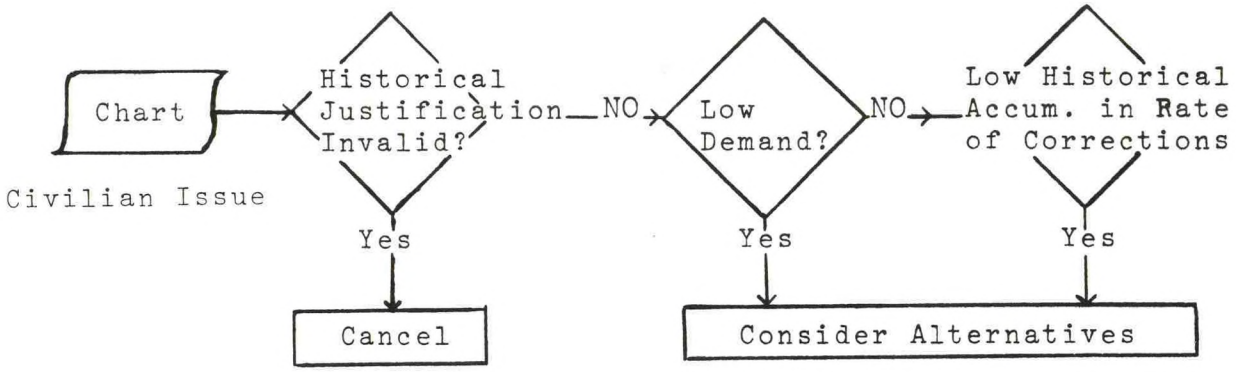
1. Compile a marine charting policy document that covers areas of charting responsibility, handling of user requests, functions and duties of a "Planning and Review Board," priority guidelines, chart maintenance criteria, and basic chart content. Compile a marine charting cartographic procedures and specifications manual. Assign a present Division staff member, full time, to carry out these tasks.

2. Establish a new research position on the Marine Chart Division staff thereby giving a more unified and concerted effort to the research effort. This individual would be responsible for translating user requirements into graphic portrayals and developing and evaluating new cartographic materials, techniques, and concepts.

3. Schedule regular meetings between the staff and operational areas to improve communications and insure high morale of Division personnel.

4. Create a new staff position called the "chart planner." This individual would be responsible for making a chart-by-chart analysis of present and proposed chart coverage and maintenance cycles. User demand as expressed by distribution records should be one of the prime measures in judging the merits of a chart's existence, as well as the historical accumulation rate of corrections, the extent of needless duplication, and the validity of the chart's

original justification. The following systematic analysis procedure presented below in simplified form should be followed by the chart planner:



- Adjust maintenance cycle
- Print large quantity (low demand, low accumulation rate)
- Reformat (insets, back-to-back printing, etc.)
- Distribute list of critical corrections for charts on extended maintenance cycles

5. Establish a "Chart Planning and Review Board" to review and advise on the proposals of the chart planner, to examine those charts designed specifically for military requirements, and to propose NOS charting policy.

TABLE OF CONTENTS

INTRODUCTION

The objectives of this study are to investigate the management policies, operational procedures, and products of the Nautical Charting Program in order to recommend improvements and savings in the chart production system.

Problems concerning the automation of data processing, storage, and retrieval, and data application to charts were not considered at this time because these have been under study by the Marine Data Systems Project. Their objective is to facilitate the flow of data through the system by using automated, computer-assisted data handling and chart compilation techniques.

A brief background of the Nautical Charting Program is presented first.

Nautical Charting Program

The objective of the Nautical Charting Program is to carry out NOS responsibilities of providing nautical charts that are adequate for the safety of navigation of those waters used in U. S. marine commerce, industry, and recreation. The program involves hydrographic surveys by ships, launches, and mobile hydrographic field parties; wire-drag surveys of the approaches to ports and harbors; data processing and verification of NOS field survey data; cartographic review and application of chartable data from NOS and non-NOS

sources; chart reproduction; and finally, the dissemination of the nautical chart and related products to the user. Descriptions of the nautical charting products considered in this phase of the study are presented in Appendix A.

Program Goals

Recently NOS published a plan to serve as a guide for the Nautical Charting Program.* The goals of this plan that apply to this phase of the study are as follows:

1. Produce 114 additional new Small-craft Charts for navigable rivers, waterways, and the Great Lakes, and 77 new and 28 reconstructed Conventional Charts for harbors and coastal areas by 1980.

2. Decrease the time interval in the average maintenance cycle from 2.7 years to 1 year by 1980.

3. Produce a new product specifically geared to the needs of the fishing industry and fisheries research by 1975.

Past Studies

During the past decade, many contract studies have been conducted dealing with the Nautical Charting Program. Some intended to make the operational system more efficient while others were devoted to an assessment of user requirements and economic benefits. Recommendations from these studies are summarized in a subsequent section of this report.

*NOAA PLAN FOR NAUTICAL CHARTING, January 1972.

SYSTEM DEFINITION AND IDENTIFICATION OF PROBLEM AREAS

The system which the task group investigated in this study is depicted in the accompanying diagram. The diagram shows the relationship of marine data inputs, user request inputs, Division organization, and system output.

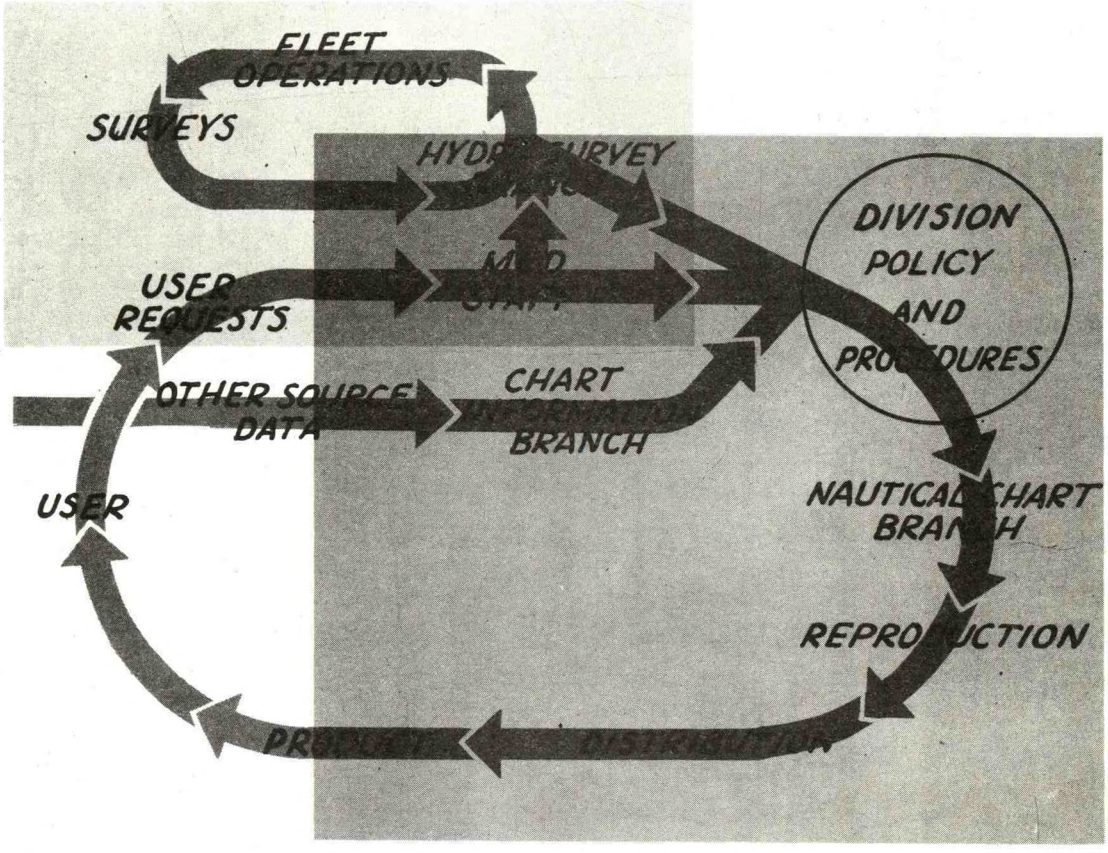


DIAGRAM DEPICTING SYSTEM DEFINITION

User requests are received by the Marine Chart Division where their validity as a requirement are determined. Division policy governs what, how, and how often marine data are applied to charts to satisfy approved requirements. This policy is promulgated through instructions and procedures which govern the cartographer in compiling the chart.

The following major areas in the system were isolated to be studied in detail:

1. User Requirements
2. Product Quality and Sales Promotion
3. Management Policy
4. Chart Content and Maintenance

HOW STUDY CARRIED OUT

The study was carried out by assigning specified tasks to each of the task group members. These tasks were as follows:

1. Market Survey
2. Market Analysis
3. In-house Analysis
4. Demand Analysis
5. Maintenance Analysis

The market survey involved a review and summarization of the findings and recommendations of those past studies that dealt with user needs and economic analyses of the nautical chart program.

Because of limited time, the task group could not conduct a person-to-person interview survey of users in the field nor poll users in any manner. Therefore, the necessary prerequisites to such a field survey, e.g., design of questionnaire and planning the survey sampling procedures have not been carried out either.

As part of the market analysis task, the questionnaires from the recent federal mapping and charting study conducted by the Office of Management and Budget were reviewed. From this review and past contract opinion poll studies, the following questions were considered:

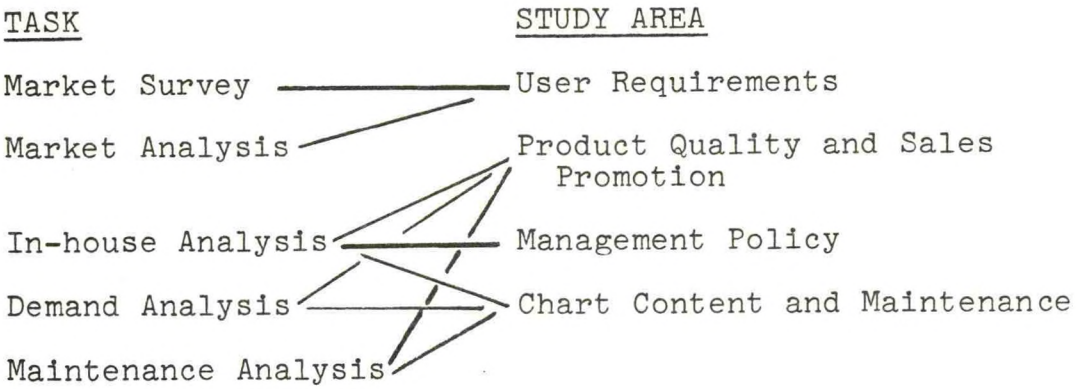
- Who are the users of NOS charts?
- How adequate does the user consider this service to be?
- What kind of product does the user want as to scale, resolution, detail, timeliness, and other characteristics?

For the in-house analysis, the task group interviewed Marine Chart Division managers concerning operational procedures and management policies on chart applications and maintenance cycles, and where improvements, increased efficiency, and savings in chart application, content, and coverage could be made.

A statistical analysis of chart distribution records was carried out in the demand analysis task in order to determine the low demand charting products. In addition, the task group investigated pricing policies and new promotional techniques.

Finally, in the maintenance analysis, examples of low demand charts were investigated to determine the impact of either cancelling the chart, or extending the length of its maintenance cycle, or combining the chart with other charts in the area.

A one-to-one correlation does not exist between these tasks and the aforementioned study areas. Rather, a given task usually contributed to the analysis of one or more areas as illustrated below:


TASK
STUDY AREA
Market Survey
User Requirements
Market Analysis
Product Quality and Sales Promotion
In-house Analysis
Management Policy
Demand Analysis
Chart Content and Maintenance
Maintenance Analysis

THE USER AND THE CHARTING PRODUCT

This section covers the task group's analysis of the major areas of user needs, product improvement, and sales promotion. Findings of the task group are as follows: (1) although NOS is meeting the needs of the user regarding the engineering quality of its products, improvements can still be made in format, coverage, and chart updating frequency; (2) the Cooperative Charting Program with the U.S. Power Squadrons and Coast Guard Auxiliaries is the major formal mechanism undertaken by NOS to maintain direct contact with users.

The task group considered the following questions:

1. Who are the users of NOS products?

2. How have NOS and predecessor agencies responded to recommendations of past studies?

3. Is the present mechanism for determining user requirements adequate?

4. Is NOS adequately meeting user needs?

5. What should the product be?

Users of NOS Charting Products

The task group obtained an idea of who actually buys NOS charts from the sales statistics of the Distribution Division. The average percentage sales distribution among user categories over the past 3 years is presented in the following table:

DISTRIBUTION OF OCEANIC CHARTS AMONG USERS

User	Approximate Percentage of Total Distribution
Sales Agents	44.4
U. S. Navy	37.0* +
Public	8.7
Office of Emergency Planning	4.0
NOS	1.4
Other Federal Agencies	1.2
Libraries	1.0
Foreign Governments	1.0
U. S. Coast Guard	0.7*
Congress	0.3
State and Local Governments	0.3

* Most of the Coast Guard procurement of NOS charts is through the Navy. The Navy estimates that 95 percent of their Small-craft order, 80 percent of their Harbor, and 50 percent of their Coastal, General, and Sailing Chart orders go to the Coast Guard. Thus, the true Navy and Coast Guard users would be more like 14 percent and 24 percent, respectively.

+ Each naval ship is assigned a chart allotment covering broad geographical areas. These charts must be maintained whether or not the ship ever operates in this area.

The preceding table does not tell the whole story because the sales agent category is not broken down into user categories. Fortunately, the results of a recent very limited sampling survey of sales agents conducted by the Office of Marine Surveys and Maps is available. The following table summarizes the results of this poll:*

*Taken from NOAA Program Memorandum, FY 1974, September 1972, p. 50

PERCENTAGE DISTRIBUTION OF OCEANIC CHARTS SOLD BY SALES AGENTS AMONG VARIOUS USER CATEGORIES

User	NOS Chart* 1	2	3	4	5
Marine Transportation	51	43	34	30	3
Tug, Barge, Pilot Operations	11	13	13	12	6
Commercial Fisheries	6	8	6	9	2
Recreation	28	33	39	39	83
Offshore Mineral Industry	1	2	2	1	--
Research	2	1	3	3	4
Other	--	--	3	6	2

* 1 = Sailing, 2 = General, 3 = Coastal, 4 = Harbor, 5 - Small-craft

Recommendations from Past Studies

In attacking the questions on the nature and adequacy of products and the implementation of past recommendations, the task group reviewed past reports and studies and interviewed NOS personnel.

During the past decade, three major user need studies have been carried out under contract for the predecessor agencies of NOS by private organizations.

The most recent study was carried out by the Arthur D. Little Company.*

* Weighing Alternative Directions for ESSA's Continental Shelf Activities in the 1970's, Arthur D. Little, Inc., 1970.

They compared user needs for marine navigational, geophysical mapping, and other oceanographic programs of NOS (then C&GS). From their analysis, it was hoped that this agency could better allocate its resources (that is, set priorities) among these marine programs. To obtain data for their study, A. D. Little's analysts conducted: (1) a field survey of user opinion to determine the dependency of various users for these marine services; and (2) an economic analysis of the user's offshore economic activity. By combining user dependency with user economic activity they were able to quantitatively rank the various marine services according to economic benefit criteria.

A major finding was that all user groups expressed a higher degree of dependence on navigational services than on other NOS marine services. Furthermore, the A. D. Little analysts concluded that the mariners aids fully satisfied the needs of the users for which they were designed and were found to be very useful to a wide variety of secondary users.

The U. S. Coast Guard boating statistics indicated that over the past several years fewer than 10 deaths or injuries per year might have been partially attributed to inadequate nautical charts, meaning that they might be a contributing factor in no more than 0.3 percent of all boating accidents in which injury or loss of life occurs.

A. D. Little's analysts concluded that the marine community could carry on its business at a very acceptable level of risk when using present charting products. Any improvement in the quality of these products would not appreciably reduce these risks in areas where coverage is adequate, although it might facilitate shipping operations in well-developed areas by allowing faster navigation closer in-shore. On the other hand, raising the quality of charting to the best standard in undeveloped areas would promote area development by allowing operations to be expanded without increased risk.

The study uncovered evidence of a lack of communication between NOS and those it seeks to serve. Many present and potential users were ignorant of available products and services. It was concluded that NOS's dissemination procedures were badly in need of improvement. The study report suggested that even when a public service is essentially free, money spent on promotion is well worth while if it assures that the availability of the service is known to potential users.

The study reported that the present catalogs of NOS products were considered to be dull, formal, nondescriptive, and not widely disseminated. The report suggested that interagency collaboration to produce a fully descriptive combined catalog would be very desirable, and unified

dissemination would enhance its effectiveness. In addition, A. D. Little recommended that NOS make its information dissemination more efficient by: (1) seeking better understanding of its clientele; (2) exploring better methods of displaying its wares; (3) streamlining its distribution system; and (4) seeking to use assistance from other government agencies with a high degree of public contact (e.g., the Coast Guard). As a first step toward improving its client relations, it was suggested that NOS conduct a thorough review of its information dissemination function. Once this had been completed, NOS would have the groundwork laid for a complete examination of the market and could gear up to provide that market with a highly specialized and effective product line. Continued personal contact with user representatives could be much more effective than questionnaires in anticipating needs as they form. Cooperation between NOS and other agencies (such as the Coast Guard) that have offices widely distributed over the country and have more daily contact with users would also be very helpful. A program of drawing attention to NOS's newer products could combine market research with promotion to attain wide dissemination of well-adapted products.

Several years before this study, the Battelle Memorial

Institute* determined: (1) the gross economic activity in the U. S. continental shelf regions; (2) the dependency of that activity upon NOS (then C&GS) products and services; and (3) the uses of and present needs for additional NOS products and services relating to the U. S. continental shelf regions. Results were based on information obtained from interviews of private firms, state and local organizations, federal organizations, and universities.

They concluded that NOS products and services were providing a significant and substantial base for much of the economic activity in the U. S. continental shelf regions. The level of this economic activity in 1964 was estimated at $21.4 billion dollars. Within the definition of dependency adopted by the Battelle investigators, $13.3 billion of this activity in the U. S. continental shelf regions depended on the use of NOS products and services in an essential manner. For the rest, the dependency was either advantageous, convenient, or nonessential.

The Battelle analysts recommended that NOS could improve its present service by:

1. Expanding the continuing customer analysis of NOS products.

2. Presentation of data in forms to better meet user requirements.

3. Utilizing more effectively present NOS field

*Development Potential of U. S. Continental Shelves, U. S. Department of Commerce, April 1966.

representatives to update information on user requirements, and to provide timely information to NOS management on how products should be changed and improved to meet changing conditions. It was recognized that this opportunity is particularly pressing in coastal regions with a high intensity of present economic activity (e.g., Gulf Coast and New York), and areas where economic developments of increasing importance are possible (e.g., the New England region, Alaska, California, and Florida).

One of the first major studies of the agency's charting requirements was carried out over 10 years ago by Reed Research, Inc., (later merged into the American Scientific Corporation).*

They conducted extensive field surveys on representative samples of users on the east, gulf, and west coasts on what these users thought of nautical charts and how they could be improved. The reports listed many recommendations concerning details that should be added or deleted from the chart, and improvements in colors, symbols, sizes, scales, and formats. Some of thse recommendations, where practical, have been implemented by the NOS over the ensuing years.

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*1. "Nautical Charts, A Survey of the Needs of the User." Phase I - Present Needs, Reed Research, Inc., June 1962.

2. "Nautical Charts, A Survey of the Needs of the User." Phase II - Future Needs, Reed Research, Inc., October 1962.

3. "Nautical Charts, A Survey of the Needs of the User on the West Coast of the United States." American Scientific Corporation, May 1963.

Implementation of Past Recommendations

The following table summarizes the general findings and what actions, if any, were taken by NOS and its predecessor agencies in implementing the recommendations of the studies:

NOS Activity	Recommendation	Implementation
Communication	Better understand clientele, conduct market analysis (A.D. Little).	None
	Use personal, direct contact with users rather than questionnaire or other indirect method (A.D. Little). Make more effective use of NOS field representatives to update information on user requirements, and how products should be improved (Battelle).	Good contact via NOS-Cooperative Charting Program. Some contact through trade shows. Negative response by closing NOS field offices.
	Cooperate with other government agencies having high degree of public contact to encourage promotion of NOS products, e.g., U.S.C.G. (A.D. Little).	Although good contact with some U.S.C.G. units, no comprehensive program initiated.
Dissemination	Improve, streamline distribution (A.D. Little).	Only improvement made in distribution through agents was to circulate advanced notice of printings of charts to agents for advanced ordering. This speeds up, somewhat, the dissemination process.
Promotional	Improve catalogs; make better product display (A.D. Little).	No improvement in display through agents or advertisements.
Chart Content	Many recommendations on hydrographic, cultural details, colors, symbols, scales, formats (Reed).	Some recommendations acted on, especially improved formats for recreational boaters.

In general, it can be said that NOS and predecessors made positive efforts to act on some of the recommendations. Actions requiring specific budget increases were usually rejected. The one negative response by NOS was the closing of field offices in Boston, New York, Los Angeles, San Francisco, and other cities. Another important recommendation, emphasized in all the study reports, but usually ignored by NOS and predecessors, was the need for a systematic and continual market analysis mechanism. One exception to this conclusion is provided by a copy of the Director's memorandum of August 13, 1962.

U. S. DEPARTMENT OF COMMERCE
Coast and Geodetic Survey
Washington 25, D.C.

August 13, 1962

Reference: Interim Report on Nautical Charts - Reed Research Inc., dtd. 6-15-62

TO: District Officers

FROM: Director

SUBJECT: Chart Information

The reference report, previously forwarded to you, indicates a requirement for a positive and continuing effort to determine chart users' opinions of our nautical charts.

District Officers shall immediately intensify and expand their efforts to obtain from chart users a comprehensive cross section of opinion on needed improvements to nautical charts. Favorable, as well as unfavorable, comments are of value in determining user reaction. Specific items of improvement suggested by any one user should be discussed with other similar type users to obtain a composite picture.

The more routine type information obtained in this continuing investigation may be reported annually in the annual report. Reports on items of greater importance should be submitted at more frequent intervals. Significant information obtained should be reported as it is developed.

H. Arnold Karo

Analysis of OMB Study

A Federal Mapping Task Force was formed in 1972 by the Office of Management and Budget (OMB) to review federal, civilian, mapping and charting procedures. This included an analysis of how well user requirements were being fulfilled by Federal mapping and charting agencies. The Marine Chart Division contributed to this study by summarizing what they considered to be valid requirements, based on experience gained from user contacts over the years and from analysis of the large volume of requests received by the Division. A summary of the Division's self-appraisal is presented in Appendix B.

The OMB task force also conducted a market survey by polling users in face-to-face interviews concerning the adequacy of NOS nautical charts. Because of the limited time available and the small number of interviewers employed, the sample size was relatively small. Furthermore, the sample was not necessarily representative because of the inordinate number of users contacted in the Great Lakes area as compared to other geographical areas. Thus, for the purposes of this study, the original OMB questionnaires were analyzed again, and only those pertaining to NOS oceanic charts were considered. In the questionnaire, the user was asked to rate the adequacy of 20 characteristics of the five types of NOS charts (Small-craft, Harbor, Coastal, General, and Sailing Charts) by simply checking an appropriate box under headings

titled inadequate, adequate, or more than adequate.

Very few of the NOS oceanic chart users polled marked the "more than adequate" box. The questionnaire was designed so that the users' actual requirement could be written out specifically in "remarks." The characteristics considered were as follows:

Format

Geographic Area Coverage

NOS Distribution (or Dissemination) System

Cultural Data (Content, Positional Accuracy, Updating)

Natural Features (Content, Positional Accuracy, Updating)

Relief Portrayal (Accuracy, Presentation)

Coastal Zone (Shoreline, Wetlands)

Navigational Data (Accuracy, Completeness, Presentation, Updating)

Depth Information (Completeness, Accuracy, Updating)

From the analysis of the field survey questionnaires several trends are noticeable. A considerable number from all user classes express dissatisfaction with the present format. Inadequacies of geographic area coverage are more of a concern to the Coast Guard than to users. Considerable dissatisfaction with the NOS distribution system was expressed.

Updating of cultural and natural feature information is more important to recreational users than to others. Relief portrayal is more important to State resource and

public works agencies, the U. S. Corps of Engineers, and commercial mariners than to the Coast Guard or recreational users. As one might expect, charting inadequacies relating to the shoreline and wetlands characteristics are more of a concern to State resource and public works agencies and the U. S. Army Corps of Engineers than it is to other users. All users expressed dissatisfaction with updating navigational data on all types of charts and the presentation and completeness of such information on Harbor and Coastal Charts.

Marine Chart Division's Appraisal of User Needs

In Appendix B, the task group compares the Division's understanding of user needs with those expressed directly

by users in the OMB questionnaires. In a majority of cases, the results from analysis of the questionnaires strongly support the Divison's self-appraisal of user needs.

It should be mentioned that the Marine Chart Division recently conducted an extensive user evaluation poll for their prototype orthophoto nautical chart. Over 80 percent of the respondees were in favor of the new product over the existing chart that depicted topographic information by conventional rather than by photographic methods. Information relating to other improvements in marine charts was received.

Is NOS Meeting User Requirements?

After reading the Reed, Battelle, and A. D. Little reports, one receives the impression that the technical quality of NOS charts is unsurpassed. Inadequacies are ones of detail and convenience which, despite their existence, do not necessarily make the chart intrinsically an unsafe navigational instrument. Practically all interviewees of the contract studies feel that NOS chart quality is excellent and use them with unquestioning faith. NOS charts have also earned an international reputation for clarity, accuracy, reliability, and adequacy. The public's criticism of various aspects of charts is invariably blown out of proportion, and minor criticisms assume the guise of major complaints.

The A. D. Little report stated that the fact that less than 0.3 percent of all boating accidents in which injury or loss of life occurs are chart related (not chart caused) would indicate that the government is producing charts that are much more accurate than may be needed. This would infer, in turn, that money is being wasted as a result of the degree of sophistication to which present charts are being compiled. This brings us to the question of "how safe is safe enough." This is a difficult one to answer. Private enterprise must be willing to accept certain risks in its maritime operations.

> The task group feels that a solution to the "how safe is safe enough" problem would be very worthwhile to NOS management.

But because no one has yet decided how many deaths, degree of injurys, or amount of property damage constitute an acceptable risk level, it is not possible for this task group to answer the question, "how safe is safe enough." As a result, the NOS will continue to publish charts as accurately and inexpensively as the state-of-the-art permits.

Chart characteristics which this task group believes to be the most critical to the safety of navigation are given in the following list:

1. Accuracy of depth information
2. Charting of obstructions and dangers

3. Positional accuracy of cultural and natural features and navigational aids.

4. Updating frequencies of cultural and natural features, navigational aids, bathymetric data, and dangers to navigation.

This report has already presented the results of user opinions on the adequacy of these characteristics for NOS oceanic charts as obtained from the OMB questionnaires. Only a relatively small percentage of users rate the first and second characteristics as inadequate; almost no dissatisfaction has been expressed on the positional accuracy displayed on NOS charts for cultural and natural features and navigational aids; but a considerable fraction of users polled feel that the updating frequencies of cultural and natural features, navigational aids, and bathymetric data are inadequate.

A large percentage of users expressed dissatisfaction with chart formats, coverage, and distribution procedures. Users also expressed dissatisfaction with chart updating facilities for critical information, especially since Notice to Mariners are not readily available.

The task group concludes that NOS is initially meeting user needs according to safety of navigation and engineering accuracy criteria with the publication of a new chart, but

is not when judged by continued updating convenience and usefulness criteria. The task group assumes that NOS is not completely a public service organization and must operate more like a business in a competitive environment.

> Therefore, it is recommended that first priority always be given to navigational and engineering accuracy of the charting product.

NOS must protect itself from potential liability in cases where culpable negligence in chart production could be proven. NOS must maintain its historical reputation of adhering to high standards of accuracy as exemplified by the use of charts as evidence in lawsuits. After these obligations have been fulfilled, then NOS should apply its limited resources to the less critical charting demands such as improved formats and extended coverage. Any improvements that benefit a given user class or a given geographical area should be justified on economic grounds and the expectation of an increased demand for the improved product. The task group does not feel that the less critical chart characteristics such as format, area coverage, and others are unimportant.

> We strongly recommend continuing efforts be made to not only improve the product itself, but also the methods by which it is disseminated, and the relationships with the public through which it is promoted.

This will require additional financial support. In the Management, Policies, and Procedures section we show where savings can be found in operational chart production procedures. These savings should then be used to supply the required financial support.

Determining User Requirements - Present Mechanism

A user request, which involves a change in product, new chart or survey and originates with any individual, group, organization, state, or federal agency, is not necessarily a requirement. It becomes a requirement only after analysis of its validity in the light of economic criteria and NOS resource capabilities. In estimating the nature and magnitude of the benefit involved, the Division staff determines the impact of NOS satisfying the request on the geographic region involved or the contribution to national security.

At the present time, letters of request come to the Marine Chart Division where the Requirements Analyst on the staff determines if a request is a valid requirement and if meeting the requirement is practical in view of available NOS resources. The requirement is then reviewed by the Chief of the Marine Chart Division and the Associate Director, Marine Surveys and Maps, and/or the Director, NOS, when considerable resources must be committed. The Chief of the Marine Chart Division then determines what

priority the given requirement has in comparison with other requirements. In making his judgment, he considers the number of requests, the age of previous surveys, expected future economic activity in the geographic area involved, and other factors. A reply is then made to the requestor, when work will be scheduled to fulfill the requirement. If the requirement involves a charting change or a new chart, it is forwarded to the Chief of the Nautical Charting Branch who schedules the necessary work. If the requirement involves field work or a new survey, it is submitted to the Requirements Section of the Hydrographic Survey Branch.

In order for a survey requirement to be fulfilled, it must overcome additional hurdles. First, the Office of Marine Surveys and Maps submits the requirement to NOS's Office of Fleet Operations where it must compete with other NOS programs for ship time. Then NOS submits it to the Fleet Allocation Council where it must then compete with other NOAA requirements for ship time. If the requirement passes all these tests, the survey is scheduled, implemented, and the resulting survey data goes to the Marine Chart Division where it is verified, logged, and applied to the nautical chart.

Considering the number of competitive steps a given requirement must face in the sequence of events presented

above and the ever-present situation of having to operate under financial constraints, budget limitations, and re-programming actions, it should come as no surprise to learn that NOS has not in the past, is not at present, and will not in the future be able to meet all user requirements. That is to say, those user requirements as interpreted under the present public service conceptual criteria will never be completely fulfilled. If user requirements were determined in an atmosphere where more emphasis was placed on economic and demand criteria then NOS would be able to fulfill more valid requirements.

Determination of User Requirements - Proposed Mechanism

> As before, requests for charting changes and surveys would come to the Marine Chart Division staff.

It is important to distinguish between a request and a requirement. A request becomes a requirement only after it has been justified on economic grounds. In addition, the survey or cartographic work required to satisfy the request must be practical to accomplish within NOS resource constraints.

If NOS is considered to be completely a public service organization--meeting the needs of all users, no matter how important economically or for what reason--then nearly all requests would become requirements. But if this is not the case and NOS is to act more like a business organization--

where all charting products give a rate of return commensurate with the cost of producing that product--then many requests could not be considered as requirements.

The Requirements Analyst would rank the incoming requirements according to economic criteria and agency resource capability. Economic criteria would be derived from micro-economic theory and relevant OMB guidelines. This analysis would be submitted to the Chart Planning and Review Board (proposed in Management, Policies, and Procedures section) for review and approval. It is necessary that user needs be monitored by NOS representatives in the field who would be in daily contact with all user classes.

> The task group recommends that regional advisory centers be established.

Inasmuch as budget and personnel ceilings might prevent the establishment of regional advisory centers, a first step in solving the problem would be to expand the Coast Pilot inspection team responsibilities. Then the next step could be to employ several roving navigation specialists who would continually monitor the charting market of the United States east and west coasts. It would be the responsibility of these men to carry out a continuing study of customer needs and chart usage in order that the NOS might tailor its products to better suit user requirements. In addition to developing an up-to-date marketing system, these analysts would carry out collateral

duties such as the inspection of chart sales agencies, acquainting the agent with recommended chart handling procedures, the investigation of applications for appointment as a chart agent, etc. Other duties, such as preserving contacts with U. S. Power Squadrons, U. S. Coast Guard Auxiliary, Coast Pilot inspections, enhancing public relations with local news media, etc., could also be profitably detailed for administration by these employees. Closer ties with fishermen's unions, small boat associations, and similar organizations would be highly desirable and would lead to lasting benefits for all. These "men-in-the-field" would make periodic reports to the Marine Chart Division.

A major difficulty at present in conducting a meaningful market analysis is that NOS does not know who buys NOS charts. That is to say, the only breakdown by chart sales available from agents and other NOS distribution points is by the two broad categories of federal agencies and the general public. Many user categories are included in this public category, i.e., commercial shippers, pilots, tug and barge operators, commercial fishermen, recreational boaters, offshore mineral developers, and research users. Without this breakdown, no objective analysis based on economic criteria can be made of chart sales and demand statistics.

> Because of this deficiency, the task group recommends that a simple and economical questionnaire be designed for distribution with each chart sold. This would identify the buyer of the chart and give NOS other vital information for planning purposes.

Pricing Policy

Pricing policy for an organization's output, or product set, is an important tool for that organization to use in planning optimum allocation of its limited resources. Pricing policy, demand and market analysis, and public service considerations are all related problems. However, NOS has no control over pricing policy since this has been established by legislation. Therefore, the task group investigated this problem only superficially and can make no recommendations. See Appendix C.

Public Relations

Undoubtedly one of the most serious criticisms that can be leveled at the NOS is the inept attempts it has made in publicizing itself and its products. This insufficiency has been emphasized and reemphasized in each of the various public opinion reports prepared under contract by: (1) Reed Associates in 1962; (2) American Scientific Corporation in 1963; (3) the Battelle Memorial Institute in 1966; and (4) Arthur D. Little, Inc., in 1967.

To further compound the problem, and contrary to major recommendations of the reports, namely that of making greater

use of bureau field representatives for publicity purposes, all district and regional field offices were permanently closed in 1969 and 1972. This effectively terminated any grassroots opportunity to publicize the NOS through a network of highly motivated personnel, dealing with local media. Now NOS's Cooperative Charting Program with the Power Squadrons and Coast Guard Auxiliaries and boatshow participation comprise our only formal, continuous contact with the public for the purpose of determining user reaction to charts and related products and for passing on information of interest to the mariner.

Routine efforts to glamorize or popularize NOS activities and products continue to meet with only a limited measure of success. This fact is clearly evident from a comparison of the publicity given to the photogrammetric survey of Charleston Harbor, South Carolina, in March 1971 and that of Boston Harbor, Massachusetts, in October 1971. In the former case the lack of special releases, personal follow-ups, etc., resulted in extremely bad publicity causing delays and opposition to the Charleston survey, whereas maximum cooperation with the Boston news media produced wide-spread, favorable coverage in newspapers, radio, and TV.

A crash program aimed at reversing the present unsatisfactory condition should be initiated without delay.

A maximum effort would include the immediate opening of regional advisory centers, making better use of civilian and officer employees as market analysts, and improving the public relations mechanism for NOS with responsibility delegated to the Director's staff. Spot radio and TV announcements, film clips for use by boating associations, announcements and advertisements in marine trade journals boating publications, NOS guest lecturers trained to cooperate with U. S. Power Squadrons and U. S. Coast Guard Auxiliary instructors in teaching interpretation and use of charts, still photos and feature articles prepared especially for use by select magazines and nespapers, etc., are only a few of the steps that could be taken to rectify the situation.

In this connection, it should be pointed out that charts lying in a storage cabinet drawer are of no use to a mariner if he's unaware of their existence or is unable to procure copies readily. A tremendous amount of "missionary" work is still needed to popularize our products and acquaint the marine public with their existence.

One method that could be utilized to popularize NOS products and services would be to enlist the cooperation of the Coast Guard and the various state registrars of motor boats in the promotion of NOS charts and their use. A list of small craft registrars could be secured and a copy of the revised catalog of charts could be mailed to

each new licensee. This should be a continuing effort and not be a "one-shot" undertaking.

Recreational Charts

A recreational boater may be defined as any individual who uses the waterways of the U. S. for pleasure or non-commercial purposes. In 1972, it was estimated that approximately 9 million boats were used for pleasure purposes and that 45 million Americans engaged in this form of pastime.

Although small craft operators comprise the largest group of nonmilitary chart users, it is only since 1959 that charts tailored to partially meet their particular needs have been published. Even today only 84 small craft charts are on issue and a majority of recreational boatmen must still rely on Conventional Charts in navigating coastal waters. Even though 114 Small-craft Charts are planned for future construction, it would appear that NOS efforts are primarily aimed at satisfying the needs of commercial mariners rather than those of recreational boatmen. Instead of trying to please the numerically greater number of recreational users, we still favor the smaller number of commercial users. However, economic criteria (the contribution to the GNP from commercial maritime activities is about three to five times as great as that for recreational activities*) may furnish a better guide for chart production planning than absolute numbers alone.

*See "Weighing Alternative Directions for ESSA's Continental Shelf Activities in the 1970's," Arthur D. Little Inc., 1970, and "Development Potential of U.S. Continental Shelves," U. S. Department of Commerce, April 1966.

Using either standard, the task group recommends that NOS pay more attention to the recreational user.

The use to which charts are put by the merchant marine and by the recreational sector differs widely inasmuch as large vessels depend on channels and deep water in order to safely move from place to place, whereas most small craft operators have scant need for a detailed knowledge of soundings over one or possibly two fathoms. Because recreational-type craft draw only a few feet of water, a lack of free board, dangerous sea conditions, and meteorological disturbances, represent a much greater threat to the safety of such craft than does the possibility of a grounding.

In most instances, charts having a 1:80,000 base scale would adequately meet the requirements of a large number of small craft operators, if harbors of refuge or anchorages were included as insets at a larger scale. At present, some operators utilize road maps, quad sheets, place mats, or equally poor substitutes, as piloting aids.

To date, the vast majority of inland lakes, navigable rivers, and reservoirs, where millions of people enjoy themselves in recreational boating pursuits, remain uncharted. It is estimated that a minimum of 36 special charts are urgently needed to immediately satisfy the growing popularity of inland lakes recreational boating. If the NOS fails to

address itself to the problem, a strong probability exists that some other government agency might assume charting responsibility by default.

Because the bottoms of most lakes are stable and remain relatively unchanged for long periods of time, there would be little or no need for other than an original hydrographic survey and publication of the chart. Not only would the public be helped by this, but officials of inland states would become better acquainted with our activities, facilitating the development of better public relations.

Chart Agents

Restrictions on the appointment of nautical chart sales agents were dropped several years ago and now practically any business applicant can become an agent by simply submitting a letter of request to the Distribution Division. Without an on-site investigation or periodic inspection of chart agents, the operation of many chart agencies have deteriorated badly and complaints regarding the availability and condition of charts are being received from mariners.

> The task group recommends that NOS make these needed on-site inspections of chart agents.

It should be recognized that most sales agents stock charts as a "come-on" in order to attract customers to their place of business in the hope they will browse and purchase

additional general merchandise. But because of the small profit realized from the sale of charts, they have almost no personal concern or interest in the safety of chart users. Accordingly, the responsibility for obtaining corrections and chart updating is placed squarely on the shoulders of the mariner himself. Ways and means of giving the customer as much help as possible must be devised.

Deep Draft Pilot Charts

An exact knowledge of the amount of water beneath the keel of a merchant vessel, the location and height of obstructions in or adjacent to deep water channels, any any other data that might affect the safety of shipping while entering and leaving harbors is of vital concern to harbor pilots. Frequently, Notice to Mariner items cite channel depths over obstructions that are less than the project depth, but whose exact location is not given.

This is of grave concern to the pilot for his livelihood depends on whether or not he brings the ship to its berth without damage. The environmental impact of an oil spill resulting from a grounding could also be blamed on poor piloting and result in costly litigation.

Marine Atlas

At the present time, private printing firms are producing a usable product for recreational users which the Federal Government does not produce.

> The Marine Chart Division should consider the development of a series of Chart Atlases covering U. S. waters.

This particular chart format is accepted and popular as is evident from the number of atlases offered for sale and the number of private firms competitively producing them.

Book-Type Harbor Charts

As has already been indicated, small craft mariners deserve greater consideration than has been their lot to date. Atlases and other special publications have been published by private printing firms to supply recreational boatmen with data in a much handier, compact, and more useful package than current NOS products afford.

> The Marine Chart Division should consider the creation of an easily updated looseleaf subscription-type book that would contain both Coast Pilot information and chart sections that delineate harbor areas.

Multi-Purpose Charts

Offshore navigation by the new breed of leviathan super tankers, today's nuclear-powered submarines and commercial fishermen would be better served by charts showing bathymetric contours, bottom sediment characteristics, and only a minimum of soundings. Recognizing this need, the Office of Marine Surveys and Maps has proposed a new chart design that shows all soundings in a maintained channel.

The Marine Chart Division has been planning and developing special charts for commercial fishermen. Fishermen use an extremely limited number of charts and make the ones they do use last for a very long period of time. In addition to a heavy dependency on Loran A for position, they desire underwater contours to show valleys and depressions where fish feed and to set their nets. The bathymetric configuration is very nearly ideal for this type user. Submarines and navigators of deep draft vessels, likewise make constant use of "valleys" in areas where a possibility exists that shoal water could cause the ship to ground.

Catalog

The present nautical chart catalog format was developed in an effort to reduce the cost of the more expensive, bound, index sheet-type catalog. At boat shows and in conversation with chart users, it has been verified that the present catalog format is apt to be confusing to many amateur boatmen and contains data of a much larger area than most individuals need or care to be burdened with. An easier indexing system should be devised to facilitate use.

Chart Layouts

The development of an operational automated chart production system should trigger the adoption of a new chart layout system. The present system has grown up over the years to meet the changing demands caused by an expanding country and an industrialized economy. These demands have not arisen in a systematic fashion, similarly chart layouts and numbering schemes have developed haphazardly.

> This situation could be greatly improved by adopting a new master plan. The task group recommends that a start be made in this direction.

MARINE CHART DIVISION MANAGEMENT, POLICIES, AND PROCEDURES

In this section, the task group presents its analysis of the major problem areas of management policy, chart content, maintenance, and coverage. In addition, ways and means of effecting program economies are explored.

The task group recommends: (1) that policy and procedures manuals be prepared; (2) that a research position be established for full-time concentration on improved cartographic, construction techniques and concepts; (3) that at least one Division staff position be devoted, full-time, to monitor the justification, coverage, scale, and frequency of printing all charts in the production system; and (4) that a formal review board be created to provide critical guidance to the Division in the area of system monitoring and chart planning.

Division Operations

Because the management and staff of the Marine Chart Division have the first line working supervision of the "marine chart system," management policy was chosen as one of the areas for initial study. The task group found several examples where a reorientation of effort or a reemphasis of goals would improve management effectiveness. Financial constraints imposed on the Division have reduced its capability (potential) of maintaining an efficient

production system, of reviewing chart coverage (layouts and scale) in terms of demonstrated demand for these products, and of anticipating and responding to needed improvements in these products in a timely manner.

The Division is severely handicapped in the serious consideration of the modernization and streamlining of its operational procedures--except through eventual automation of the mechanics of chart production--by staff resource limitations. The marine chart system continues to be operated under a blanket of restraints developed in previous years, evidenced by the extension of yesterday's charts, methods, and procedures in the hope that they may adequately meet the requirements of today's marine market. Divisional management is well aware of the deficiencies in the present system. NOAA plans developed over the last few years have caused major research and development efforts to be directed toward the automation of the system. The Division recognizes the potential for improvements in efficiency and economy promised by automation--and indeed, the Marine Data System Project is making substantial progress in developing an automated, computer-assisted chart production system. Thus, a "holding-action" policy governs the Division's activities until some indeterminant future date when automation will emerge from its research, development, test and evaluation phases as the hoped-for panacea of

all the Division's problems.

A postponement of the confrontation with present and future problems cannot be continued if the NOS is to stay in the marine chart production business, under the impending industrial funding concept. A positive attack must be devised whereby Division management can meet these changing needs now. Means must be developed whereby the present "holding-action" policy can be converted to a dynamic and progressive program of awareness and action. The successful avoidance of obsolescence and decline of NOS charting depends on the development of sound alternatives to the present operations. This must be accomplished by supplementing and reorganizing the Divisional management staff.

All management efforts in the Division must be thoroughly coordinated through an organized and expedient transfer of information. This will not only help in the detection of problems and creation of new ideas, but in the discovering of reasonable and acceptable solutions.

It is imperative for the efficient functioning of the Division that staff positions be assigned to perform certain critical tasks, and that the individuals so assigned be generally isolated from other Division duties for concentration toward completion of these tasks.

The task group has found deficiencies in areas critically important to the progressive development of the

"system." These areas are:

I. Deficient marine charting policy and procedure guidelines.

II. Inadequate research concentration.

III. Lack of efficient communication.

IV. Limited monitoring of the marine chart system.

I. A. Problem: Deficient marine charting policy and procedure guidelines.

1. Some charting policies are not documented (particularly those concerning some aspects of chart content), and much of the policy that is documented is not reaily accessible and may not be clearly defined. Consequently, some speculation and confusion exists which has caused inefficiencies in the utilization of manpower resources resulting in excessive costs in the areas of charting responsibilities, users requests, chart planning, priorities, frequency of revision, basic chart content, etc.

2. The Marine Chart Division cartographers have never operated with a comprehensive manual that accurately reflected up-to-date detailed charting procedures. The presently used reference, "Nautical Chart Manual," issued in 1963, is superseded in part by more than 150 separately issued revising regulations. It is extremely difficult, if not impossible, for the cartographer to maintain an up-to-date list of cross-referenced data, and to efficiently refer to this collection of regulations for the resolution of problems.

3. A very definite requirement for useful cartographic specification manuals has been emphasized in the automated marine charting plan as developed by the Marine Data Systems Project. Work toward the development of these specification manuals was initiated in the Marine Chart

Division in 1964 (see Appendix D). The need was reaffirmed in 1965, (see Appendix E) and a working plan was developed, but no results were achieved. A request for up-dating the "Nautical Chart Manual" was approved by the Director by memorandum of March 10, 1970, but manpower within the Division has not been available for this project (see Appendix F).

4. It should be noted that, in general, each attempt to compile the subject manuals has been assigned to the production areas and not to a staff or isolated position for the express purpose of manual compilation and the required research. This has resulted in the rapid abandonment of the project each time it has been started, due to the writers' other work involvements.

5. In the composition of orders and memos of cartographic applications, ready access to previously researched information is not usually possible due to the diversified assignment approach. A time-consuming search of files, and an awareness of knowledgeable contemporaries who may have contributed to a previous piece-meal development of the subject, is mandatory for the accomplishment of an adequate job.

I. B. Solution:

1. It is imperative that first priority effort be devoted toward the compilation of an official documented

NOS "Marine Chart Policy Manual." This policy statement must include requirements of the following items:

a. Area of charting responsibility
   (1) Interior waters, rivers, and lakes
   (2) Coastal waters and seaward limit
   (3) U.S. possessions in the event of transfer of sovereignty
   (4) Areas bordering foreign countries

b. Disposition of user requests
   (1) User requirements studies
   (2) Co-operative charting requirements
   (3) Other users requests

c. Function of "Nautical Chart Planning and Review Board," as proposed in Section IV
   (1) New charts
   (2) Existing charts
   (3) Special-purpose charts and publications (Chart #1, "Navigate Safely" flier, etc.)
   (4) Related publications (Coast Pilot)
   (5) Special studies

d. Priority guidelines

e. Basic chart maintenance criteria

f. Basic chart content

(1) Projection and grid accuracy standards

(2) Utilization of hydrographic data

(3) Utilization of topographic data

(4) Utilization of aid to navigation information

(5) Required basic content of marine charts

g. Interagency cooperation

h. Legal obligations

2. The compilation of a "Marine Chart Procedure Manual" must also receive a high priority, and must, of course, be constructed around the provisions set forth in the "Policy Manual" described above. This Procedure Manual must expand certain areas of changing requirements, as well as detail the procedures required in the total construction and maintenance of the marine chart. Areas of emphasis not now sufficiently developed and controlled in the present "Nautical Chart Manual" must include:

a. NOS boat sheets

(1) Application of critical data

(2) Notice to Mariners requirements

b. NOS hydro surveys

(1) Degree of application for various stages of survey completion

(2) Degree of application required for removal from an active forwarding source category

c. Wire drag survey application

d. Rock data

(1) Source

(2) Selection

e. Aids to navigation

(1) Use of light list

(2) Landmarks

(3) Accuracy requirements

f. Topography

(1) Use of NOS sources

(2) Use of GS and other outside sources

(3) Contour requirements

3. It is strongly recommended that a present Divisional staff position be assigned, full-time, to perform this critical task of compiling the Policy and Procedure Manuals, and to act as liaison to the Marine Data Systems Project to insure that the Division's requirements are met in automated marine charting plans.

4. It is also recommended that this position be responsible for the coordination and writing of interim "Cartographic Orders" until the Policy and Procedure Manuals are completed in a format which can be readily absorbed into the manuals. This position should remain available to the system for monitoring and maintaining the manuals.

II. A. Problem: Inadequate research concentration

We must not maintain the erroneous assumption that the primary product of the Marine Chart Division--the nautical chart, essentially unchanged in 150 years--can still be considered as the optimum portrayal of marine data for meeting the needs of today and the foreseeable future, especially when one considers the fact that the chart is still basically constructed by the same methods, and reflects the same basic content display designed to satisfy the needs that existed during the inception of the agency in 1807.

The entire chart production system must be continuously monitored to insure the best alignment to meet changing requirements. To insure efficient utilization and dissemination of marine data into the most reasonably useful display, it is mandatory that NOS adopt a more receptive, positive, and concentrated approach toward the establishment of a coordinated research attitude for the exploration of the usefulness and feasibility of new ideas.

All too often it appears that fresh ideas are too hastily rejected or not carried through to a sound conclusion. This is often incorrectly interpreted as a lack of serious interest or sufficient consideration by those responsible for establishing Division policy. However, it must be

emphasized that the lack of a routine research program necessitates the use of the diversified assignment approach. This involves assignments to many individuals, all of whom have other workload obligations and limited time resources available for the recognition and thorough development of the implications of these new ideas. It is clear that the disposition of many items must frequently be treated with utmost expediency.

The NOS must be proudly aware of the acknowledged and demonstrated acceptance of its mapping and charting products as a standard for others to build on. But we must, ourselves, also adopt as a strategic objective the refinement and improvement of this standard through the exploration of changing cartographic technology.

II. B. Solution:

1. For maximum efficiency, it is recommended that the research and development of new procedures and methods concerning the "marine chart system" be transferred from the production areas to a staff responsibility under the Chief of the Division. This will encourage a more unified and concentrated search for the most expeditious solutions to the many problems encountered in operations, and relieve the production areas of a multitude of tangential projects.

2. Specifically, a research position is strongly recommended, and would be applied toward the following objectives:

a. Continuously monitor the marine chart system to make certain that it reflects the most modern and economical methods of chart production.

b. Analyze marine data requirements as determined by the Requirements Analyst on the staff and translate them into graphic portrayals which will most nearly satisfy optimum safe and efficient use of our marine products.

c. Evaluate and develop new and unique cartographic materials, construction techniques, and concepts, resulting in constant upgrading of the marine chart system. Reasonable and enforceable conclusions must be forthcoming concerning the following:

(1) A feasible and sufficiently useful substitute for manually compiled and engraved topography in back of the mean high water line on the nautical chart must be developed. The automated marine charting plan does not provide for a data bank of interior topography, except for those items considered to be individually located marine landmarks.

Recent advances in photogrammetric and reproduction technology indicate that the use of orthophotography--photographic imagery in the correct orthographic (horizontal) position--may be suitable for this purpose. An initial study by the Marine Chart Division has resulted in a successful prototype, orthophoto Nautical Chart 582. Every indication points to the fact that maximum

cost savings can be expected in the application of this procedure to certain new charts, and lesser savings, if any, to existing charts. Considerable research is still required in the development of maintenance procedures, useful balance of photo portrayal, avoidance of interference with other chart information, chart scale/area application, and degree of elevation and culture enhancement.

(2) The advantages of a simplified type style in improvement of legibility and in ease of chart construction and maintenance, must be investigated.

(3) Research new ways of presenting marine information, e.g., the clear and usable display on existing charts--by the use of overprinting fluorescent inks, color screening, new symbology, or other--such information as additional radio aids and electronic navigation systems (Omni, Loran C, etc.), data facilitating the use of homing devices (Area Navigation System, RDF), and specific information desirable for fishing interests, pollution monitoring, and shoreline erosion control.

(4) Devise a feasible method for inserting water level or oblique photographs of useful marine landmarks into the automated Coast Pilots. Research the necessity for close contour portrayal of land features, as is now the policy, and of extending topographic detail to the neat lines

of the chart when it serves no useful marine navigational purpose. Evaluate portrayal of all chart detail.

(5) Conduct research in the cost/benefit advantages of producing special-purpose charts to include items already mentioned, and to present new information to meet limited or future needs, e.g., the display of data affecting air-sea dependency vehicles and high-speed vessels (hydrofoils, hovercraft, etc.). This might include factors creating a turbulent or burdened seaway such as predominating wind speed and direction, tidal and shoaling conditions, currents, wave heights and fetch, areas tending to become debris laden, speed-restricted harbors, heavily trafficked areas, and traffic control systems.

(6) The composition of modernized chart formats, directed initially toward reducing costs through conversion of the present charts into a more economically produced form. The development of totally new and different presentations would be the long-range goal.

Since the most immediate savings to the system will be through reduction of workload in the total chart production system, the conversion to new formats must be conducted in evolutionary stages which can be easily absorbed into the present chart maintenance operations. Many of the following format proposals represent an ideal

way to decrease the total number of charts, standards, aid proofs, and drawings requiring processing.

Brief descriptions of some formats are offered for consideration, along with examples, and are listed in the recommended order of chronological assimilation into the system:

(a) Expand the use of the technique of converting certain large-scale Harbor Charts to a smaller size--by reduction of geographic area and/or scale as practicable--for incorporation into smaller-scale charts as insets. Examples of this are shown in illustration "a" at the end of this section.

(b) Combine several large-scale Harbor Charts of an area--again by reduction of geographic area and/or scale as practicable--into a one-chart display as a collection of insets. Examples of this are shown in illustration "b" at the end of this section.

(c) The development of back-to-back printing, with the base chart on one side and two or more Harbor Charts printed on the reverse side, may be applicable to some areas. An example of this is shown in illustration "c" at the end of this section.

(d) The elimination of the separate Small-craft Chart covers (Area and Route Charts) is desirable primarily to avoid costly reproduction processing requirements.

This involves making negatives and negative touch up, layout preparatory to making pressplates, processing the plates, presswork, finishing (trimming, folding, stapling), and hand insertion of the charts into the cover.

Reproduction and finishing costs for these covers vary between 15 percent and 20 percent of the total reproduction cost of the chart. Sixty-seven separate Small-craft Chart covers are on a 1-year edition schedule, and six are on a 2-year schedule. Eliminating the covers as a separate item to be produced could mean a savings of as much as $58,000 per year, at present, based on an average of the FY 1972 production costs of $235/1000 for 85,380 SC Area Chart covers, and $195/1000 for 139,382 SC Route Chart covers. This includes an arbitrary amount of $50/1000 for hand stapling and insertion of the charts into the covers. These costs do not include Division compilation costs which would probably remain relatively constant, as the data would still require maintenance regardless of how it is formatted.

It is proposed that the cover data be transferred to the chart base by means of an expanded chart paper size. This can be done by increasing the margins in the narrow dimension (for both formats, for uniformity, to a folded size of 7-3/8" x 20") and adding one more panel to the long dimension of the Area Charts. The two basic formats

presented here retain the existing border size--no change would be required to detail inside the borders to accommodate either format.

The 7-3/8-inch panel width should be retained, as it was designed to avoid folding through the compass roses and bar scales, and also utilizes the maximum press capacity of 59 inches in a multiple of eight panels. Future consideration should be given to 5-inch panels, and folded in half giving a 5" x 10" final size, as with the more conveniently handled Aero Sectional Chart format.

- Small-craft Route Chart: Increase paper trim size from 15" x 59" to 20" x 59", gaining 5" x 59" margin area on both the front and the back side of the chart.

- Small-craft Area Chart: Increase paper trim size from 18-1/2" x 51-5/8" to 20" x 59", gaining 7-3/8" x 20" panel area on both the front and the back side of the chart.

An example of each of these proposals is shown in illustration "d" at the end of this section.

(e) Eliminate duplicate Small-craft Area Chart/Conventional Chart coverage by issuing only one combination chart. Combining these 23 charts into one format can readily be accomplished without encountering major procedural difficulties with cost savings being realized by the elimination of one of the sets of charts.

Nineteen of these 23 charts are on a 1-year cycle. Two charts are on a 6-month cycle, and two

are on a 2-year cycle (without a corresponding conventional issue). All 23 charts can be reformatted as proposed without changing their present cycles.

- Produce these charts in only the conventional flat format. Number the marine facility locations in purple as presently done on the Small-craft Area Charts, but print the cover data, tide tables, facility tabulation, etc., on the back. This format can be extended to the procedure described in (c), the inclusion of larger scale Harbor Charts (or insets), along with the cover data.

The major advantage of this format is the savings gained by the elimination of the separate production of the 21 Small-craft Area Charts. This production now entails special negative step-up processing to the pressplate to accommodate the center cut, a complete and separate press run for each Area Chart (although the base drawings and negatives are the same as the Conventional Chart except for the addition of the Small-craft purple overprint), finishing, and handling. Other advantages already mentioned include back-to-back printing (c), and elimination of the cover (d).

- Produce these charts in only the Small-craft Area Chart format, which can be done in either of two ways:

Issue the charts as they are now, with the center cut and then folded. This means, of course, that

an uncut conventional-type flat chart would not be available to those who customarily use and prefer flat charts, and have no need for the added marine information of the Small-craft Charts.

Another way would be to produce them in the extra-panel 40" x 59" trim size, parallel folded into 7-3/8" x 40" panels, and then folded in half to give a 7-3/8" x 20" final size. This format would have the folded appearance of the Aero Sectional Chart, only larger. An inherent disadvantage is that when folded, it discourages the application of back-to-back printing, as in format (c), as any information printed on the back tends to become "locked-in," that is, not conveniently accessible to the user without unfolding and refolding his chart. In spite of this disadvantage, this format may be the best compromise solution for the elimination of duplicate charting. An example of this format is shown in illustration "e" at the end of this section.

It should be mentioned here, as a matter of history, that the original Small-craft Area Charts were first folded in half through their length, and then accordion folded. This method of folding was well accepted, but was discontinued due to obsolescence of the folding machine which had the capacity for the long first fold. The only replacement for this machine is of foreign

manufacture, which forced the development of a different format. A cursory sampling of users was conducted in 1970 to compare the desirability of the original format with that described in the preceding paragraph, with the result that of 279 responding, 189 preferred the original format. As a result, the present cut format was devised, but no survey has ever been conducted to compare user acceptance of this cut format with any other format.

(f) Produce split coverage charts showing small-scale, deep or open water coverage through the center or along one side of the chart, and large-scale extensions of the base and harbor insets alongside. Back-to-back printing can also be applied here.

(g) The development of a book sized, multipage presentation of several harbors with a chart section, Coast Pilot description, and oblique aerial photograph for each harbor. This format could be an easily updated loose-leaf, subscription-type book. This is representative of the type of format being proposed here and is published independently by a private organization, using NOS charts as a major source. An example of one of these publications is shown in illustration "g" at the end of this section.

(h) The "atlas" concept should receive serious consideration as a future chart presentation. Many

atlases are now being published by nongovernment agencies, and as with format (g), NOS data is the major chart source. Marine atlases are well known, and some are shown in illustration "h" at the end of this section.

It is interesting to note that these atlases, which generally sell for $5 to $10, sometimes carry an implied recommendation for navigational use as well as the notation "not to be used for navigation," and even a cost comparison with equivalent NOS charts. An example of this is shown here as extracted from the Macmillan Marine Atlas for New England:

> "With the publication of this marine atlas, the boatman can now travel from Maine to Maryland using three convenient Macmillan Marine Atlases and continue his cruise on Maryland's Chesapeake Bay with the author's first atlas, Guide for Cruising Maryland Waters."
>
> * * *
>
> "The 20 charts and 40 insets used in this atlas have been carefully reproduced from the U. S. Coast and Geodetic Survey charts, which if purchased would cost more than $30, but are not to be used for navigation."

(i) The development of a chart showing in detail the depths of channels in entrances to ports should also receive consideration. These "Deep Draft Pilot Charts" would be mainly for use by operators of large deep draft ships in piloting the channels.

(j) Two items are suggested for immediate application to all Small-craft Charts and would also be incorporated into all of the proposed formats as applicable.

- Redesignate the Small-craft Charts to more clearly specify that they contain added marine information to make them more useful as an all-purpose chart, instead of the present misconception that Small-craft Charts are designed for only small craft use. The designation SC attaches a stigma to the chart, and hinders or precludes their acceptance by operators of large vessels and other professional mariners.

A simple and possibly the most effective solution to this problem would be to change the labeling from "-SC" to "+SC", to state without question, that the chart is a basic navigational chart first, but with supplemental marine information. This would most likely hasten acceptance by some resistant sectors of the marine public through their realization that they are getting more chart for their investment.

• Full use should be made on all multiple-fold formats, especially the chart catalogs, of the "slant cut" indexing technique as shown on the "Jepco Navigation" aero chart. The difficulty of quickly locating a specific area on the chart catalogs is well known, and also applies to the use of Small-craft Charts in the multiple-fold formats. The Jepco chart and an example of how this technique could be applied to the nautical chart catalog is shown in illustration "j" at the end of this section.

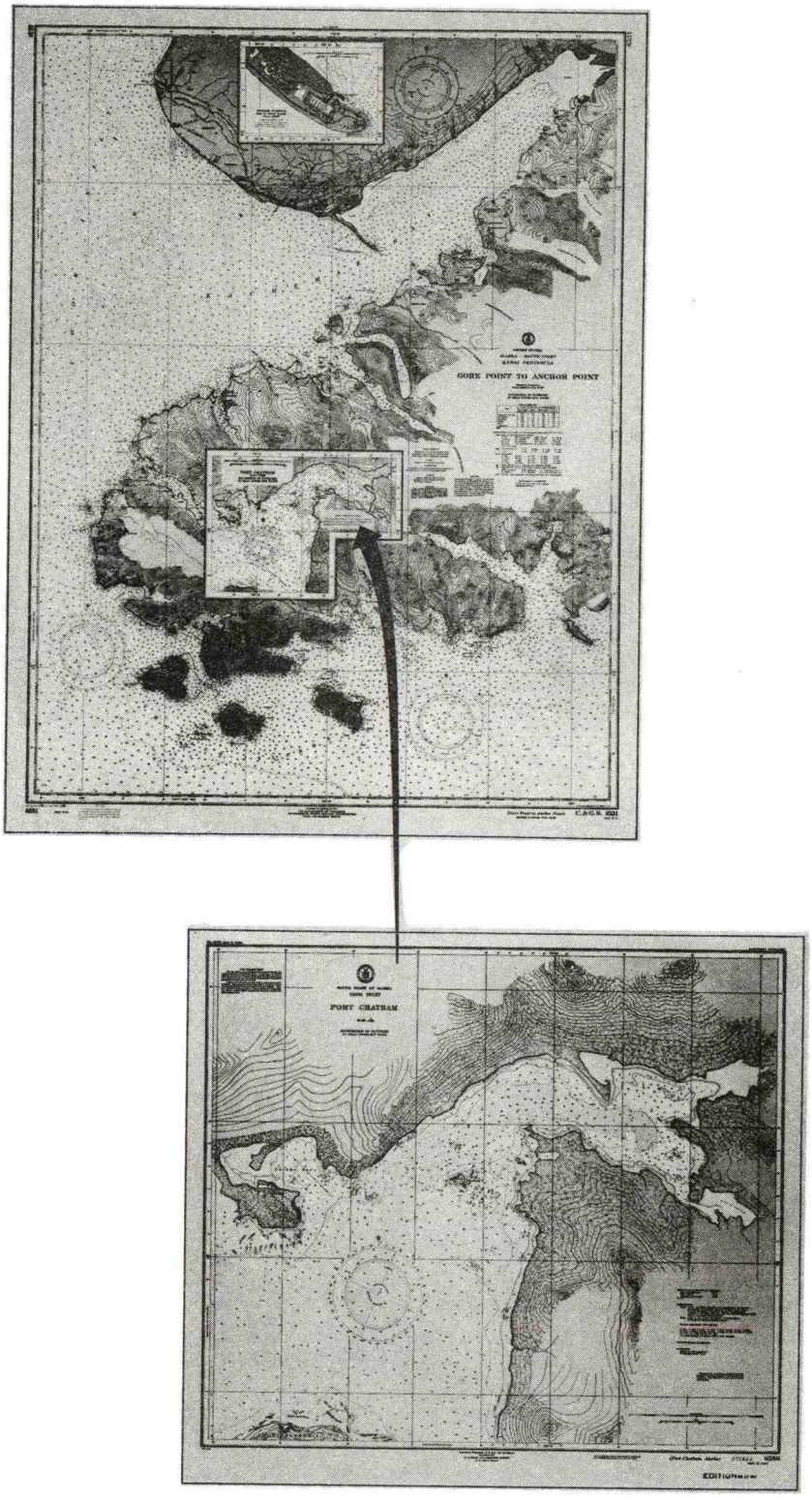
d. Study ways to merge marine charts with data and display methods used on other NOS charts as an effective and economical way to improve the marine chart presentation, e.g., the application of aero chart shaded relief techniques to show marine relief, or vignette techniques to show marine limits or large-scale chart coverage on Small-scale Charts. A thorough study must be undertaken to determine how the marine charts and bathymetric charts can be merged.

e. Examine and develop feasible methods of absorbing metrication implications into the marine chart system.

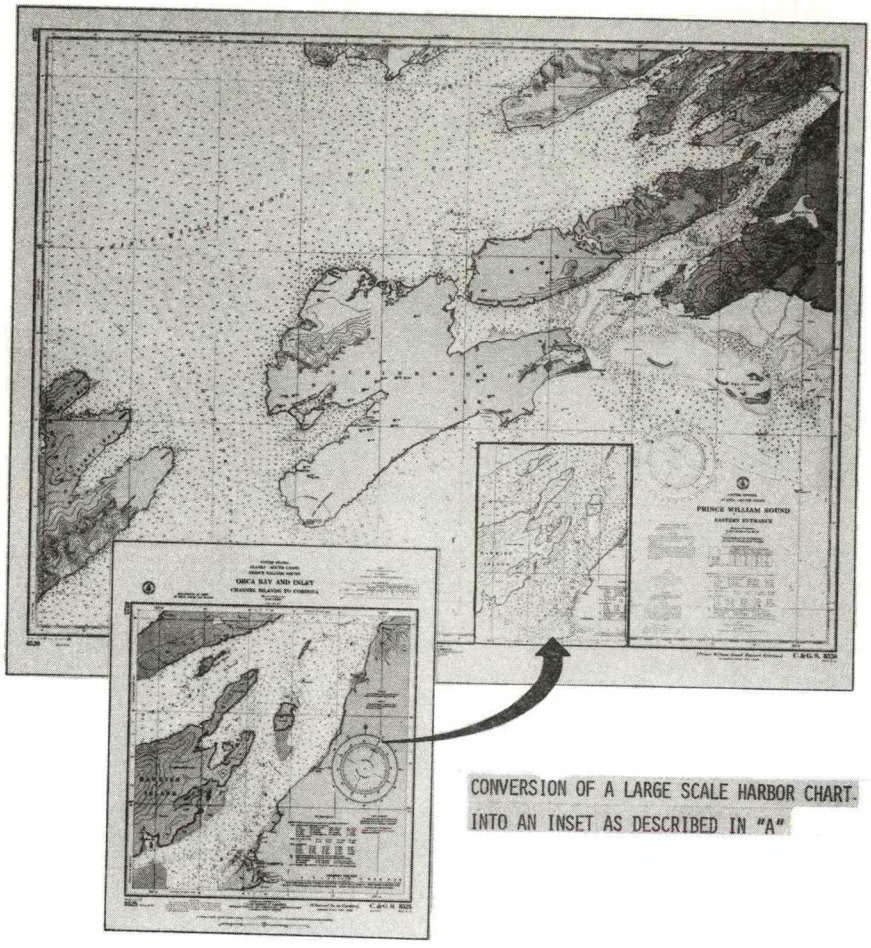
The U. S. is the only major maritime nation that has not yet adopted the metric system as a national standard of measurement. It is reasonable to expect, however, that Congress will act favorably on the recommendations made in a recently completed Commerce

study and generate legislation needed to officially implement a change-over to metrical measurements. In view of the long lead time needed to educate and familiarize the average recreational boater with the metric system, it is probable that 10 or 12 years would pass before the small craft operator could handle metric measurements with facility. Thus, it is important that the development of conversion methods and procedures and their implications be initiated as soon as possible.

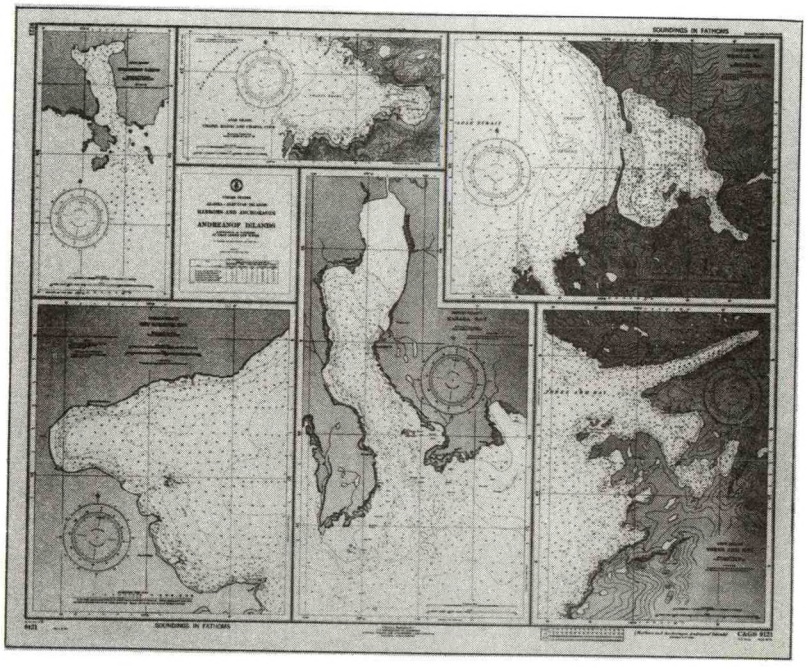
f. Close coordination of overlapping areas of interest should be maintained with the Marine Data Systems Project to make certain that the automated marine charting plan and the automated products embody the criteria required by the changing marine chart system.



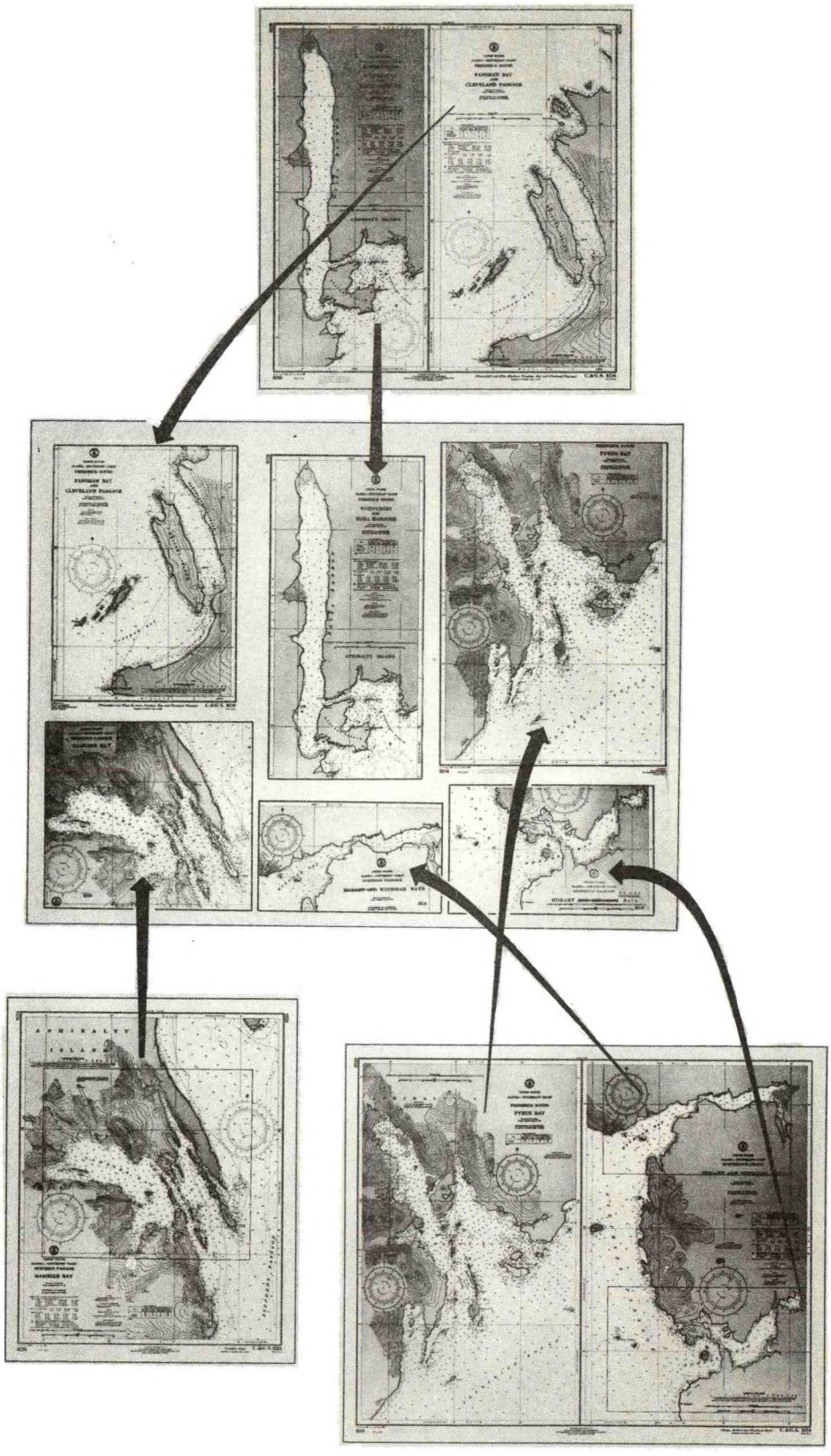
CONVERSION OF A LARGE SCALE HARBOR CHART INTO AN INSET AS DESCRIBED IN "A"



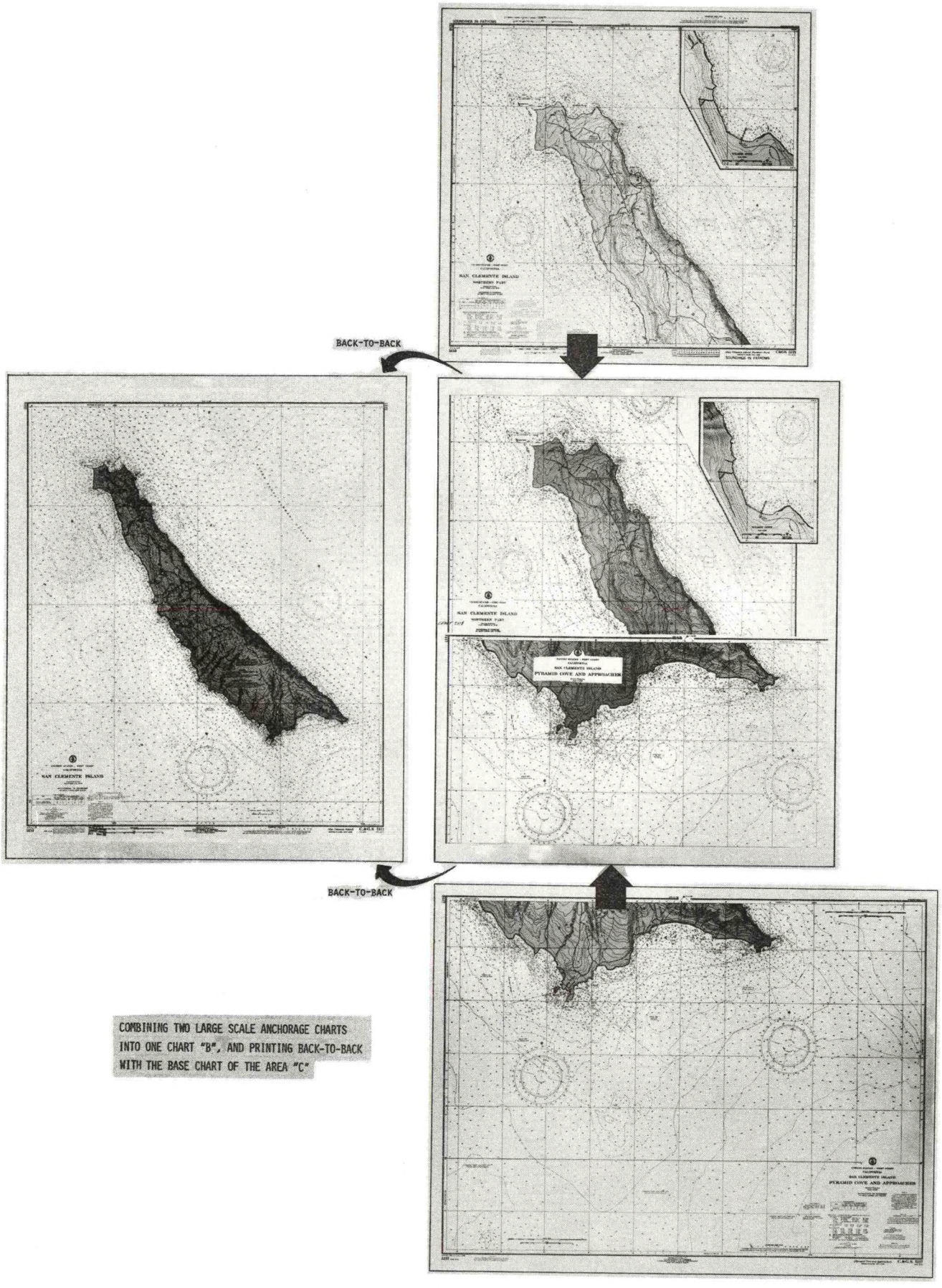
CONVERSION OF A LARGE SCALE HARBOR CHART INTO AN INSET AS DESCRIBED IN "A"



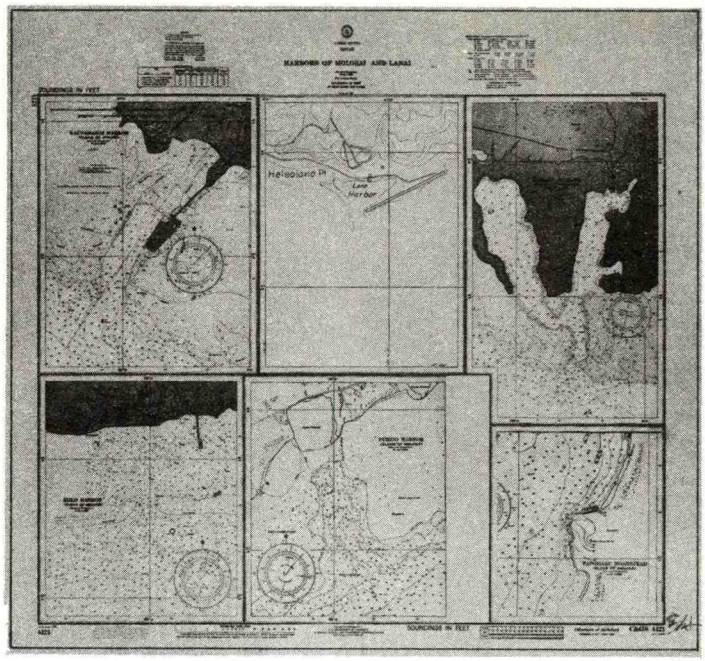
COMBINING SEVERAL HARBORS INTO ONE CHART AS DESCRIBED IN "B"



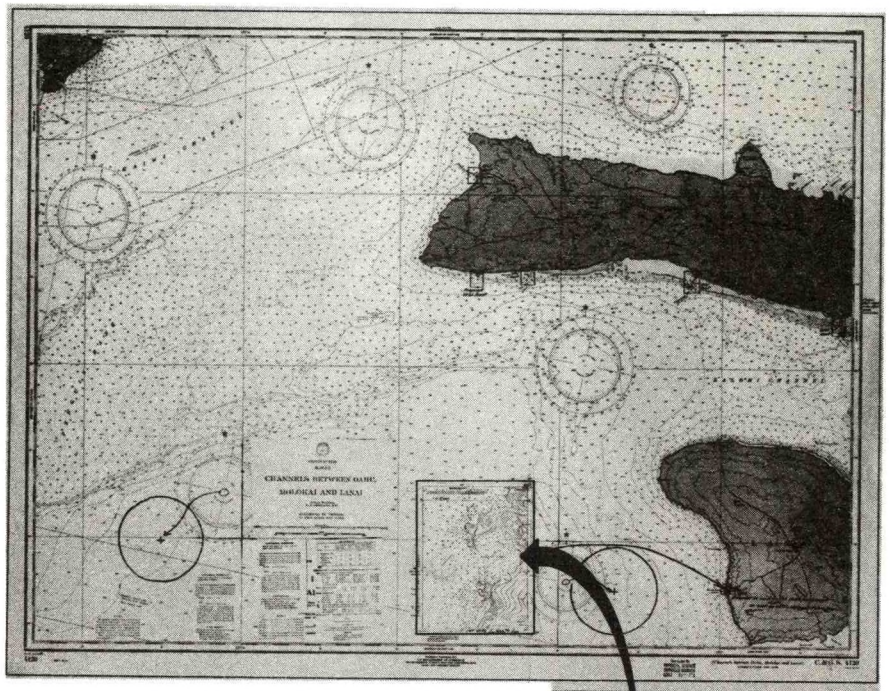
COMBINING THREE LARGE SCALE HARBOR CHARTS INTO ONE CHART AS DESCRIBED IN "B"

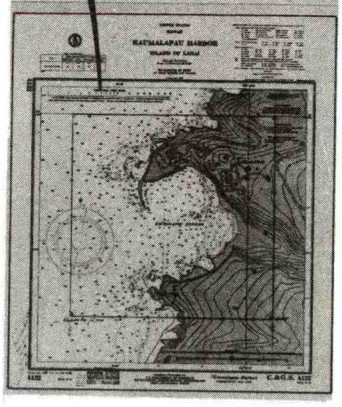


COMBINING TWO LARGE SCALE ANCHORAGE CHARTS INTO ONE CHART "B", AND PRINTING BACK-TO-BACK WITH THE BASE CHART OF THE AREA "C"



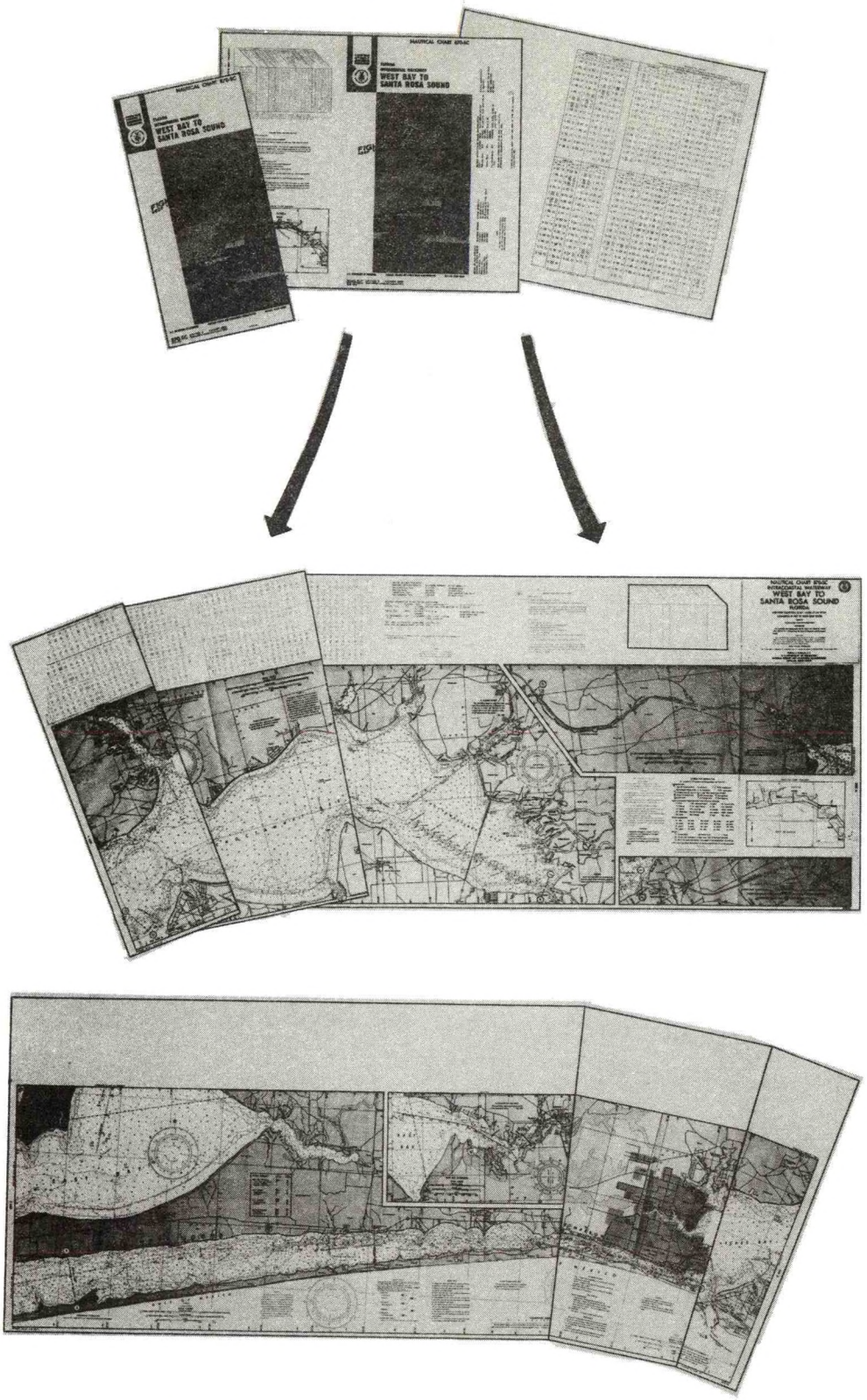
BACK-TO-BACK





CONVERSION OF A LARGE SCALE HARBOR CHART INTO AN INSET "A";
COMBINING SEVERAL HARBORS INTO ONE CHART "B";
AND BACK-TO-BACK PRINTING "C"

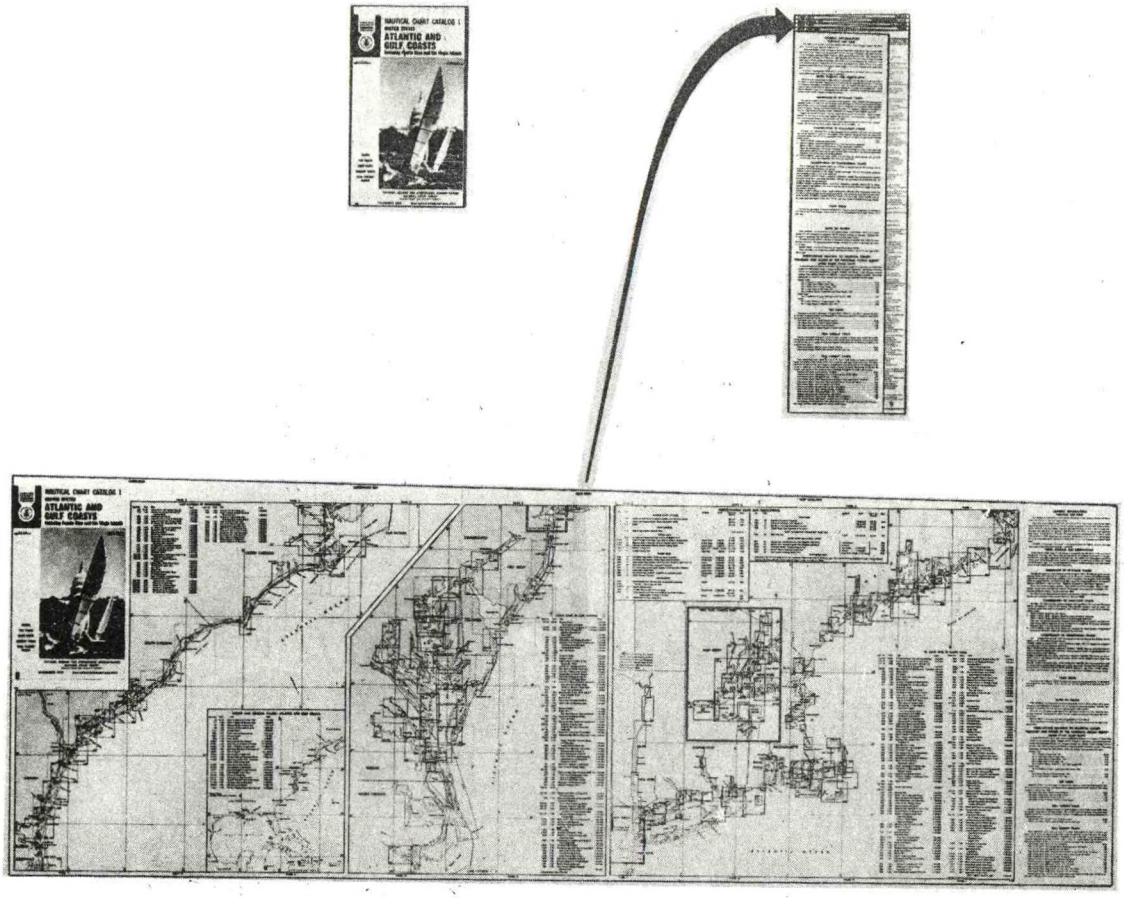
ELIMINATION OF SMALL-CRAFT AREA CHART COVERS BY TRANSFERRING DATA ONTO AN EXPANDED CHART PAPER SIZE AS DESCRIBED IN "D"



ELIMINATION OF SMALL-CRAFT ROUTE CHART COVERS BY TRANSFERRING DATA ONTO AN EXPANDED CHART PAPER SIZE AS DESCRIBED IN "D"

HARBOR PRESENTATION, CONSISTING OF CHART SECTION, "COAST PILOT" DESCRIPTION, AND OBLIQUE PHOTOS FOR EACH HARBOR AS DESCRIBED IN "G"

A FEW OF THE MANY MARINE ATLASES BEING PUBLISHED AS DESCRIBED IN "H"



"SLANT-CUT" INDEXING FOR NAUTICAL CHART CATALOGS AS DESCRIBED IN "J"

III. A. Problem: Lack of effective communication

1. The Marine Chart Division operates with only limited and informal communication between the staff and operating areas. Although not discouraged, organized informative discussions at any level within the Division are seldom scheduled. The study group feels that the present system of generally independent units, operating within the Division but without benefit of a periodic direct exchange of information as a group, at least at the administrative level, significantly handicaps the efficient functioning of the Division.

III. B. Solution:

1. In order to provide for the timely transfer of information between the various components of the Marine Chart Division, it is recommended that regularly scheduled meetings be established at the two basic controlling levels within the Division.

a. Discussions at the Division Chief's level--regulating and development--are most important for the direct transmission of guidance and direction from the Division Chief to the entire staff for more effective administration. These meetings would also utilize the varied experiences of the individuals to gain further insight into Division affairs, and increase the interest and knowledge of each individual. As valuable by-products of the meetings, group

contribution toward the solution of certain problems, and suggestions or information on the application of new ideas or products could be expected.

b. Controlled discussions at the Nautical Chart Branch level--production and operating--are recommended for the exchange of ideas relating to cartographic matters such as source application, and the need and development of items which would require a change in regulation (through revision of the Nautical Chart Manual, or in the interim until a manual is available, the issuance of a "Cartographic Order"). Undoubtedly, some items discussed at this level could be brought to the attention of the Divisional staff and would increase the value and improve the progress of the marine chart system through enlightenment of all individuals concerned.

The collective heads of the Marine Chart Division's cartographers should be used more fully than only for the maintenance of charts. Meetings at this level would represent a most desirable "sounding board" and source of information from the production level concerning all aspects of the system.

IV. A. Problem: Limited monitoring of the marine chart system

There is a need for more organized coordination, planning, and monitoring of the marine chart system. Chart planning and guidance is fragmented by assigning planning projects to various personnel as the Division workload permits. The results are sometimes deficient due to the individuals varying and/or limited background exposure to marine user requirements. There is a tendency to design charts more from a cartographic point of view rather than for optimum marine navigation use.

It has become routine procedure in the Division for the proposed layouts and specifications of new chart planning and revised chart coverage to be reworked at several operational levels in order to obtain a proposal which will reflect the ultimate but unstated policy of the NOS. The assurance, then, that acceptable and consistent criteria are used becomes a somewhat involved procedure, accomplished only by an inefficient progressive development of the project through the subsequent levels of command.

The entire chart maintenance program is adversely affected because no time is allotted to the organized monitoring of the necessity of producing certain charts, or of maintaining them as they now exist.

The task group has spent considerable time investigating the chart maintenance area. Detailed Policy and

Procedure Manuals do not exist but are necessary as has been pointed out. Current operating policy has been defined based on statements obtained from the approved plan and from interviews with various Division personnel. The task group's understanding of the system is summarized in the following list of statements:

- "Charted information is not updated and printed with sufficient frequency to remain current and of high quality." Thus, a goal of the Nautical Charting Program is to "decrease the time interval between updating and printing of charts from the present average of 2-1/2 years to an average of 1 year by 1980."*

- All charts on issue are currently scheduled for new editions on fixed cycles that vary from 6 months to 4 years. No charts are scheduled on cycles greater than 4 years.

- The more frequent revised printing policy was adopted as a goal by NOS in lieu ~~of discontinuance~~ of the hand correction service and, to some degree, in recognition of the problem of users' lack of access to Notice to Mariners issues.

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* NOAA PLAN FOR NAUTICAL CHARTING, January 1972, p. 70

- The scheduling of individual charts for new editions is based on many criteria. The fixed cycle is primary. Priority order of charts within the fixed cycle is determined by historical accumulation of rate of corrections. The cycle of any chart can be modified by an unanticipated quantity of Notice to Mariners corrections, receipt of new data on changes significantly affecting the chart, and unexpected depletion of stock.

- NOS produces a total of 829 charts, about 400 of which are printed as new editions each year.

- Present funding constraints cause manpower limitations which leave NOS with the capability to do little more than maintain the charts already on issue. NOS is far short of the average 1-year cycle goal. NOS has curtailed new chart construction in favor of chart maintenance and efforts to automate.

The following discussion will determine whether or not the amount of chart maintenance work can be reduced, savings realized and efficiencies introduced into the total Marine Chart Division program without any effect on the level of risk to the chart user.

The task group has made the following assumptions:

- Absolute active demand for NOS charts is an expression of user requirements which should be taken into account.

- NOS is not completely a public service organization and cannot afford to produce and maintain one chart for one mariner or one class of mariners and use this as justification for producing large-scale charts of other areas without a similar specific requirement.

- The installation of the industrial funding concept requires that NOS evaluate its product more in terms of active demand than has been done previously.

- The current set of charts on issue has grown into a maze that in many instances satisfied unique user requirements that may no longer exist. There are a group of charts that do not belong in the main maintenance stream, and in the interest of economy should be separated into a special category.

- A critical examination of NOS charts on issue, new charts planned, and the maintenance system is necessary.

The task group made a statistical analysis of chart distribution records to determine low and high volume demand charts. Specific evaluations were carried out on selected charts with emphasis on maintenance, planning, rate of change of the area in question, and duplication. The evaluations are followed by a discussion of action alternatives and finally, recommendations of the task group.

The statistical analysis of user demand for NOS

charts considered a total issue over a 5-year period and resulted in a detailed regional chart-by-chart breakdown over the 3-year period 1970, 1971, and 1972. The regional breakdown conforms generally to the maintenance areas established within the Marine Chart Division. These are as follows:

Area 1 - Northeast Atlantic

Area 2 - Mid-Atlantic

Area 3 - Southeast Atlantic and Puerto Rico

Area 4 - Gulf of Mexico

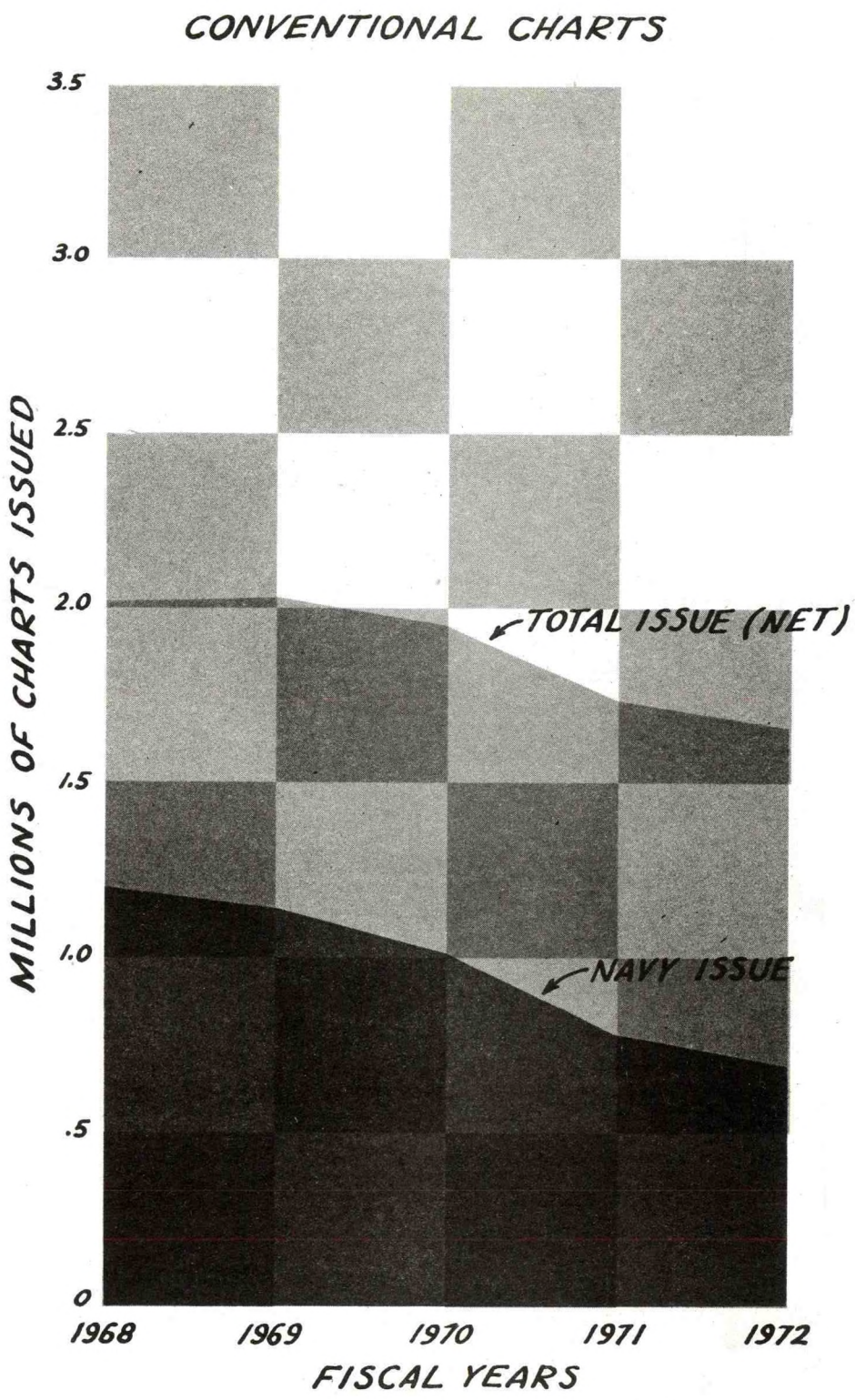
Area 5 - West Coast

Area 6 - Alaska and Pacific Islands

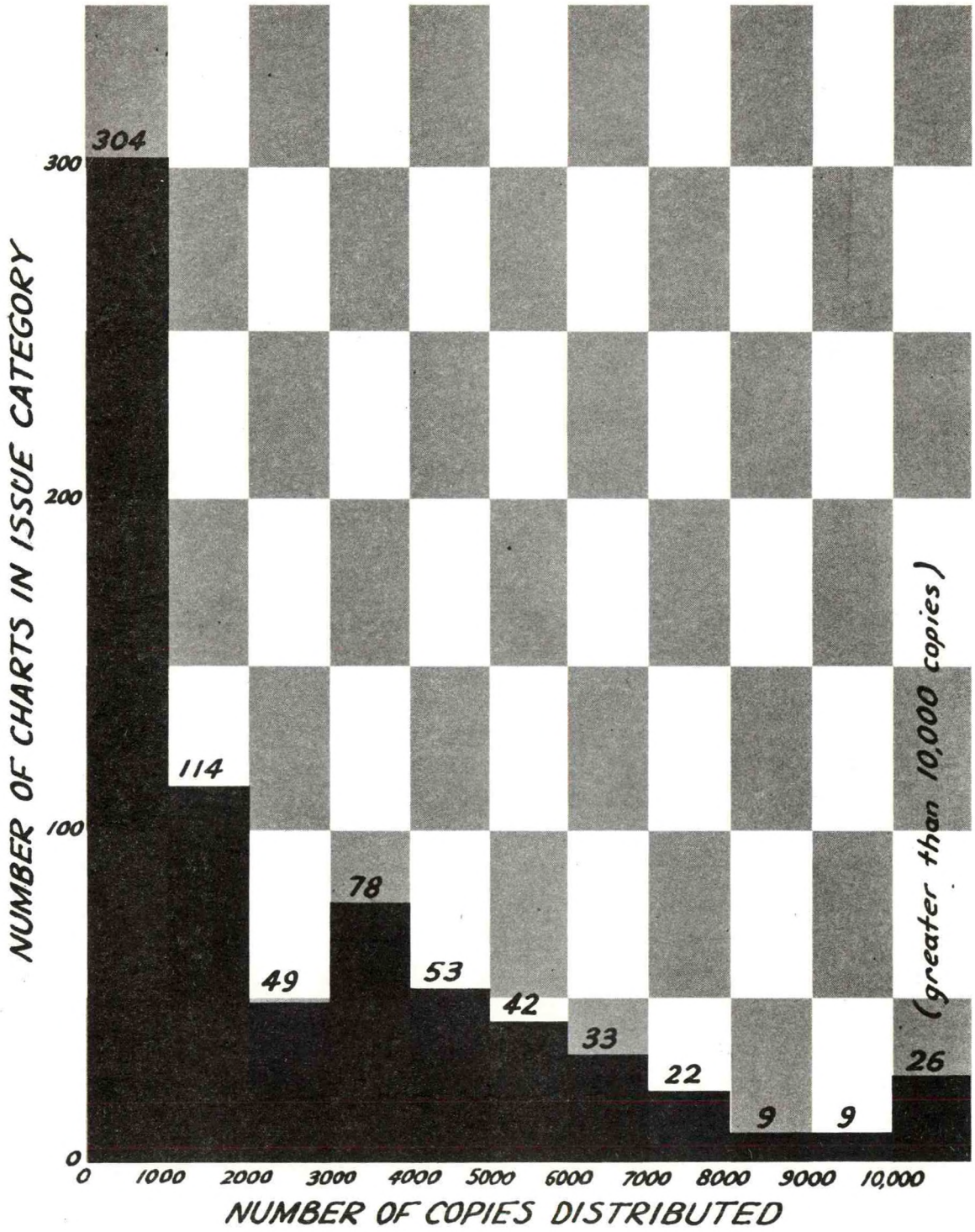
The graphs on the following eight pages show the total issue by the year and the number of charts in various demand ranges for each of the 3 years sampled for both Conventional and Small-craft Charts.

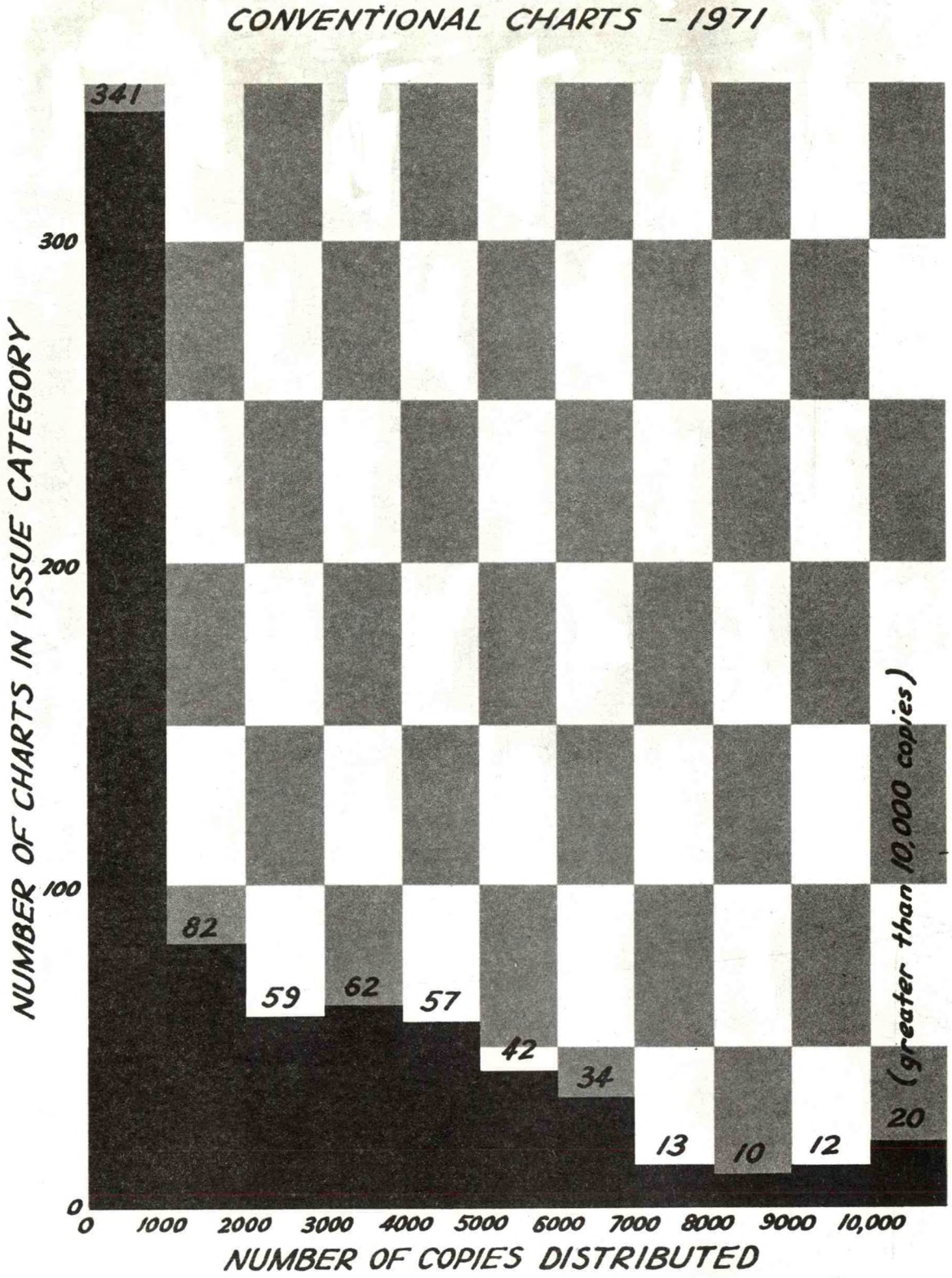
A study of these graphs will show that total conventional chart issue has declined by 17 percent between 1968 and 1972. During the same period, the distribution to the U. S. Navy declined by 43 percent.

The graphs also show that the single largest distribution category is for Conventional Charts distributing less than 1,000 copies each year. Stating this more dramatically, nearly one-half of all NOS charts on issue distribute less than 1,000 copies each. In the present

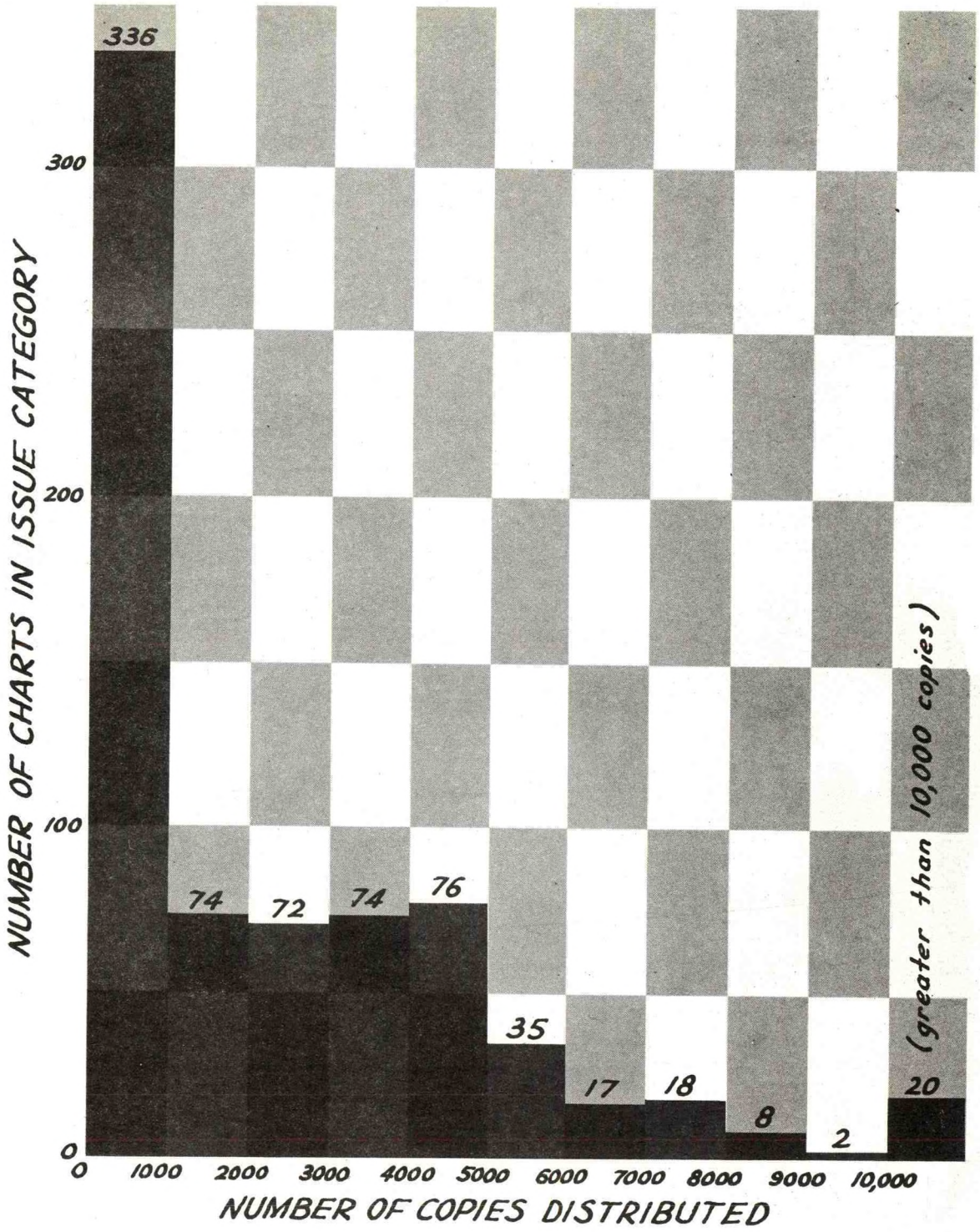

CONVENTIONAL CHARTS
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
MILLIONS OF CHARTS ISSUED
TOTAL ISSUE (NET)
NAVY ISSUE
1968
1969
1970
1971
1972
FISCAL YEARS

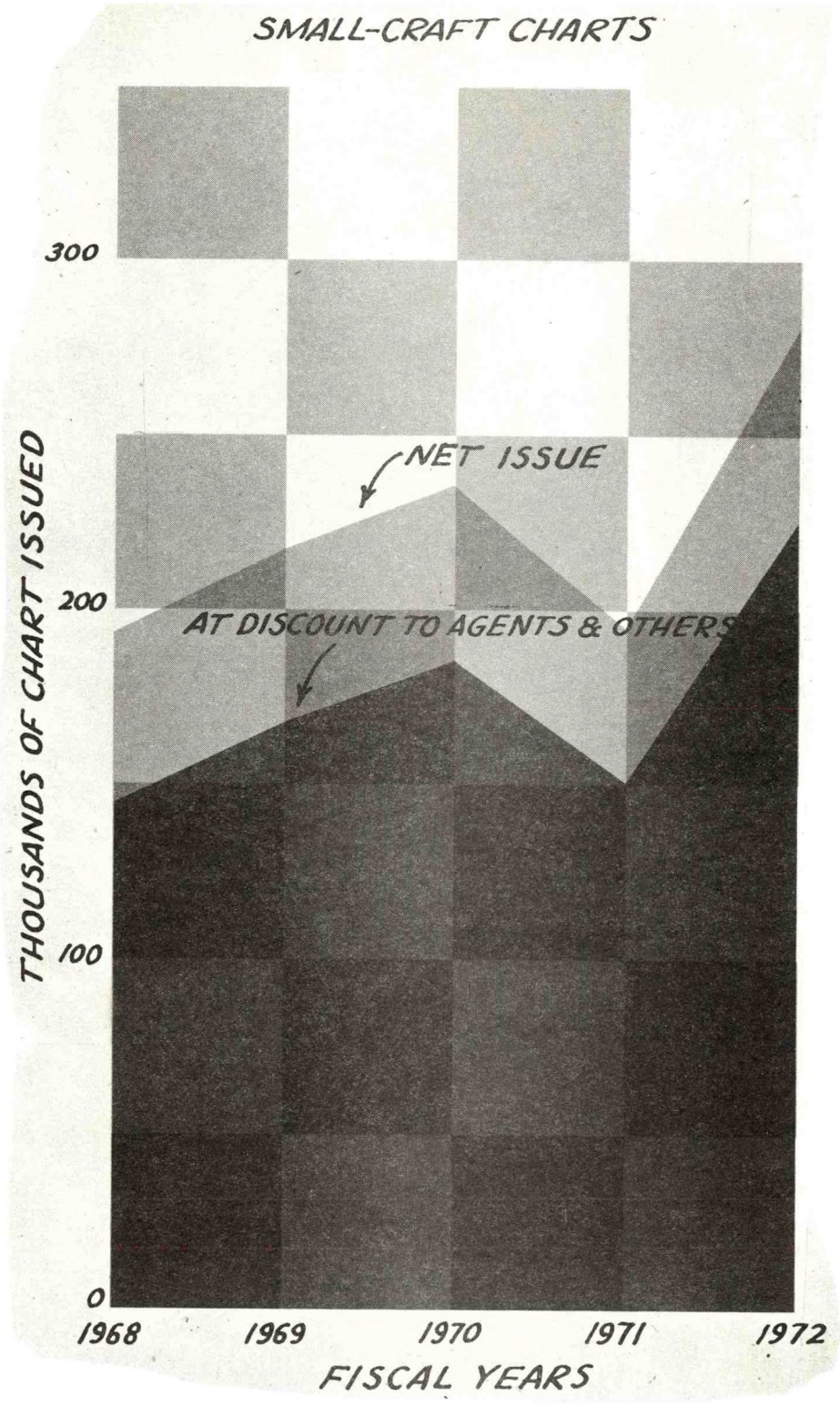
CONVENTIONAL CHARTS - 1970



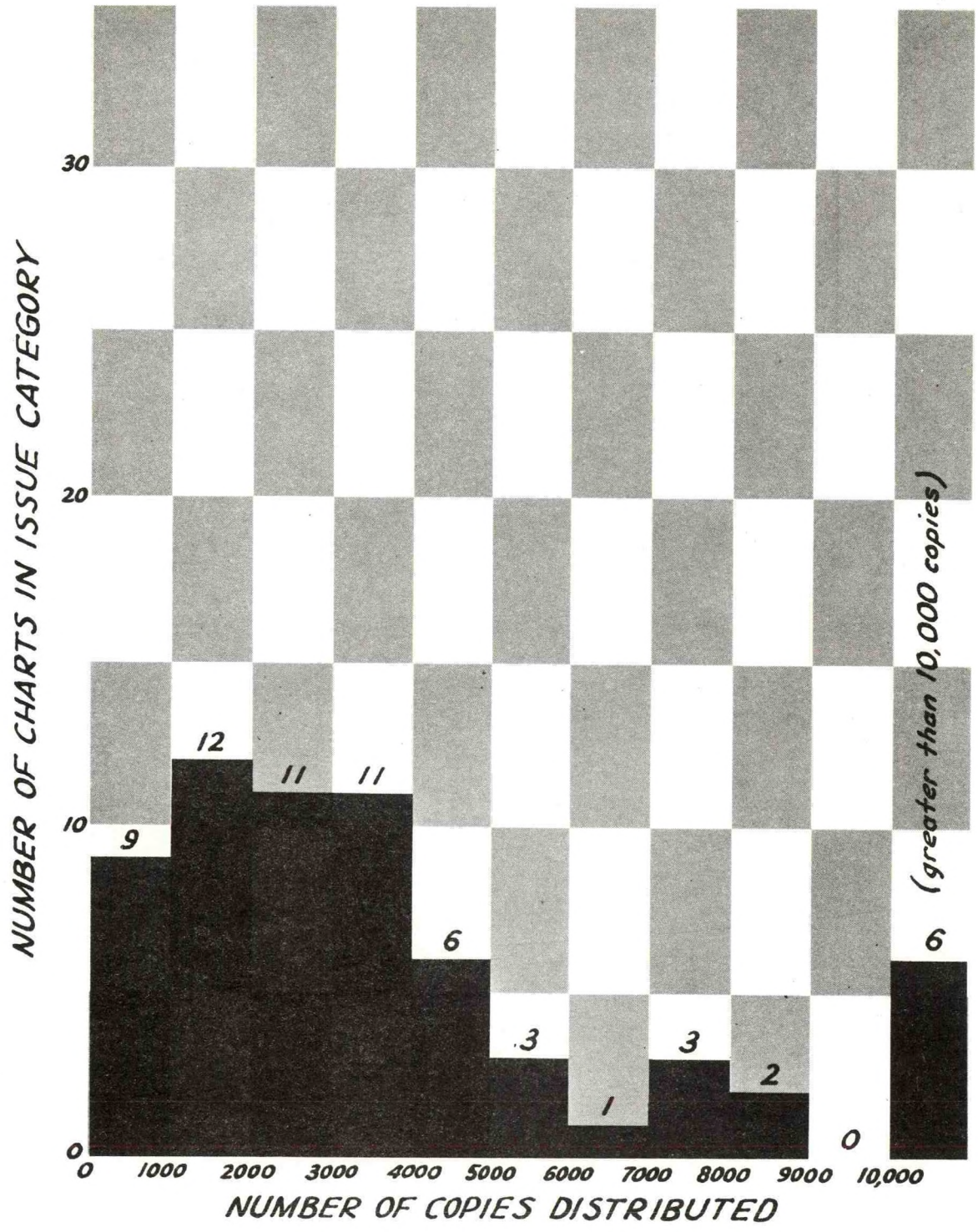

CONVENTIONAL CHARTS - 1971
NUMBER OF CHARTS IN ISSUE CATEGORY
0
100
200
300
341
82
59
62
57
42
34
13
10
12
20
(greater than 10,000 copies)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10,000
NUMBER OF COPIES DISTRIBUTED

CONVENTIONAL CHARTS - 1972

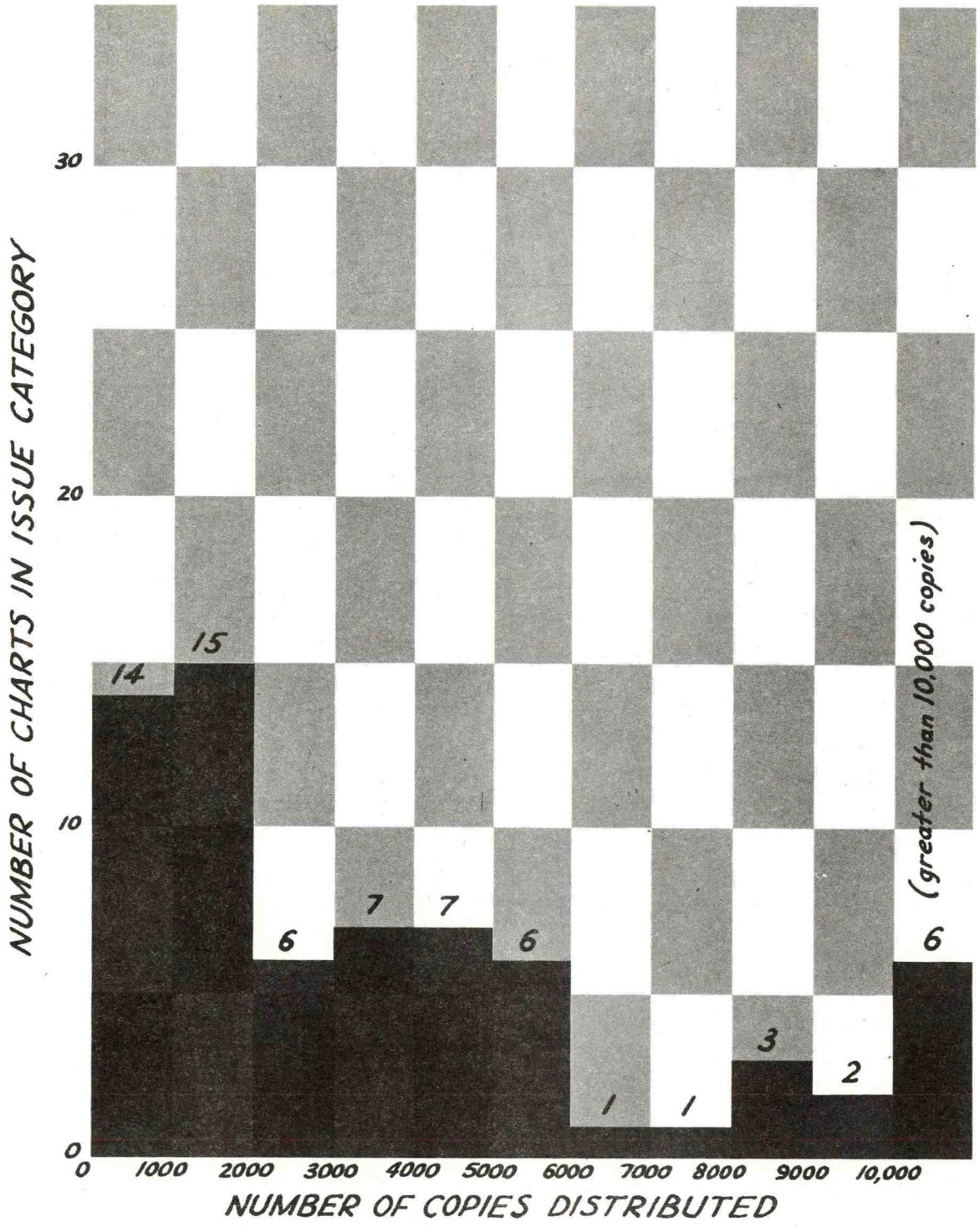


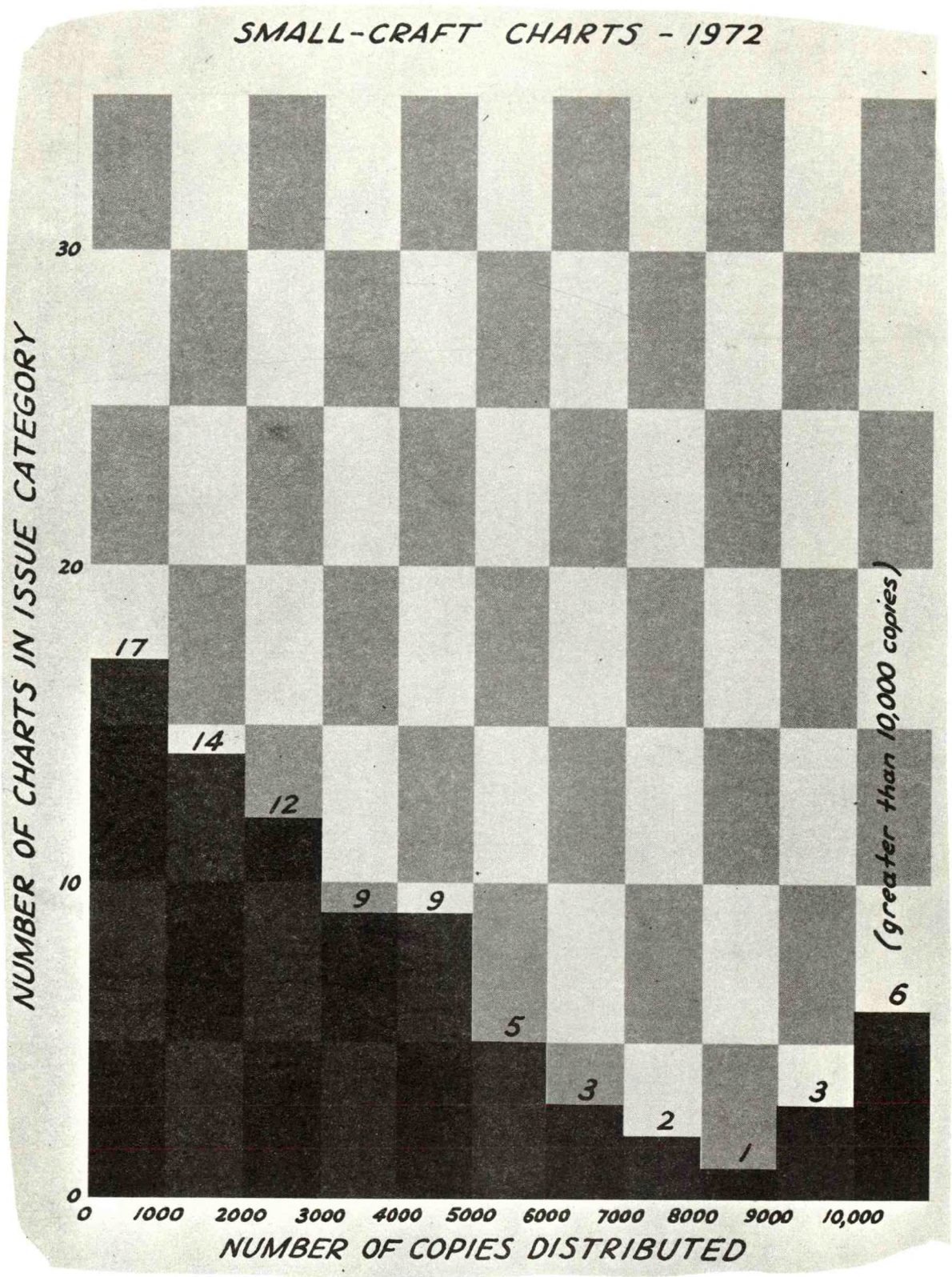

SMALL-CRAFT CHARTS
300
200
100
0
THOUSANDS OF CHART ISSUED
NET ISSUE
AT DISCOUNT TO AGENTS & OTHERS
1968
1969
1970
1971
1972
FISCAL YEARS

SMALL-CRAFT CHARTS – 1970



SMALL-CRAFT CHARTS - 1971




SMALL-CRAFT CHARTS - 1972
NUMBER OF CHARTS IN ISSUE CATEGORY
30
20
10
0
17
14
12
9
9
5
3
2
1
3
6
(greater than 10,000 copies)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10,000
NUMBER OF COPIES DISTRIBUTED

economy-minded atmosphere, charts in this category should be examined closely to see if user needs could adequately be satisfied without issuing new editions as often as is done now, or with coverage at scales different than now charted, or with reduced area coverage, or with reformatting.

The graphs were developed from tables included in Appendix G which tabulate the distribution of Conventional Charts by region. Statistics for the Small-craft Charts were not broken down by region. Appendix G also contains lists of charts by chart number. These lists provided the first group of charts for detailed examination.

The tables in Appendix G show the expected result that the only area containing charts in the demand category of under 100 copies per year is Area 6 (Alaska and the Pacific Islands). The task group has arbitrarily chosen 200 copies as an initial point to begin study. Issues under 200 copies will be considered low demand charts and selected ones will be critically examined.

The method of counting corrections must be examined in more detail before evaluation of specific charts begin. A single correction is not one buoy or one light or one Notice to Mariners item as is normally assumed, but rather one correction is defined as one hand correction (the operation required by the user to correct his chart). An example will best illustrate the point. A buoy to be added

to a chart would appear as follows:

R"WR4"
QkFIR Whistle
RaRef

This one item would be counted as four corrections and tabulated on the back of the aid proof which contains an accumulated number of corrections. When the accumulated total exceeds 40 then the chart is considered to have excess corrections and is usually inserted in the cycle for a new edition. In the following examples, corrections counted by this present method will be referred to as "hand corrections."

Many low demand charts cover areas in Southeast Alaska. The task group selected one to look at in detail. The original first edition of chart 8224, 1:40,000, Gambier Bay, is dated 1892. NOS is currently issuing edition six, published in 1970, and scheduled for reissue in 1974. One of the original justifications for surveys and accurate large-scale charting of this bay was economic development and the safety of steamers using the area to reach a cannery. (In fact, 31 lives were lost when a vessel struck an uncharted rock in 1913.) The cannery was reported as being in ruins in 1941; therefore, the original justification for this chart's existence at the scale charted ceased.

This discussion of chart 8224 generally applies to every other large-scale chart in the Stephens Passage area of Southeast Alaska (8242, 8216, 8218, 8228, 8246, 8247, and 8227). Chart 8218 is in the process of being reconstructed at a significant cost in compilation and future cost in reproduction. This work is not necessary when it is charting a nonexistant cannery with wharves in ruins and a ghost town (Windham). Based on demand, none of the above charts should be in a fixed maintenance cycle of 4 years or less.

In order to illustrate that the above analysis should also be applied to higher demand charts, the task group looked at the series of Sailing Charts (1000, 1001, 1003, and 1007) to consider if NOS maintenance efforts could be reduced without any effect on the level of risk to the chart user. Chart 1001 was selected for a detailed analysis to see if it is necessary to retain it in its present 1-year new edition cycle. The following aid proofs for old editions were examined:

Aid Proof 48 - corrections printed on edition 18, October 1971.

Aid Proof 47 - corrections printed on edition 17, December 1970.

Aid Proof 46 - corrections printed on edition 16, January 1970.

Aid Proof 45 - corrections printed on edition 15, December 1968.

The following is a tabulation of corrections from each new edition:

18th Edition - 25 "hand corrections" obtained from seven Notice to Mariners items.

17th Edition - 14 "hand corrections" obtained from six Notice to Mariners items.

16th Edition - 9 "hand corrections" from two Notice to Mariners items.

15th Edition - 16 "hand corrections" from six Notice to Mariners items.

In summary, 64 "hand corrections" from 21 Notice to Mariners items accumulated over the 4-year period, 1968 through 1971, when four new editions were put out. Of the 21 Notices during this period, only eight can be considered as possibly affecting the safety of navigation as follows:

3 were fixed aid changes

2 were unexploded ordance positions

1 discontinued a radio beacon

1 redesignated Loran rates without affecting the curves

1 applied a note concerning a previously charted dumping area

In analyzing these corrections as to their possible effect on the mariner, two of the fixed aid changes and the radio beacon were located where coverage is provided by larger scale 1100 and 1200 series charts which the prudent navigator would use when navigating close to shore.

The following example shows where there is unnecessary duplication in the set of charts.

The Florida Keys and Florida Bay provide an example where overlapping scales and duplicate coverage exist. Currently duplicate 1:80,000 scale coverage is provided by 1249, 1250, and 141-SC. Coverage of the Keys from Miami to Key West is provided by nine (in effect, as some are back-to-back) 1:40,000 scale Conventional Charts.

Chart 141-SC is a folio type and documented evidence exists that this chart is confusing and difficult to use. It is also a high demand chart (greater than 17,000 copies per year) but this demand is partially caused by the elimination of hydrography in Florida Bay on chart 1250. This effectively forces the users to purchase 141-SC. A total of 12 charts are now on issue for this area.

IV. B. Solution:

It is imperative that an experienced, open-minded, and authoritative examination be directed toward the new chart program, the existing chart coverage, and the status of useful demand of all nautical charts. The result of

this examination will be the realization of substantial economies within the system. The savings that accrue must be reapplied to projects within the Division. It is extremely important to the life of the system that a Division staff position be assigned to perform a critical examination of the present and proposed chart coverage, and chart maintenance cycles, with the objective of efficiency and economy throughout the chart system. This function would be referred to as the chart planner. In order to function effectively and with progressive continuity, this position must be exempt from involvement in the other operations of the Division staff except as needed to obtain input directly related to the evaluation of the charts.

The task group recommends that the following systematic procedure be used in examining the charts on issue. The objective must be the reevaluation of present justification for producing low demand charts, and where justified, the need to produce them at the scales, overlap, geographic area coverage, or in the formats as they now exist.

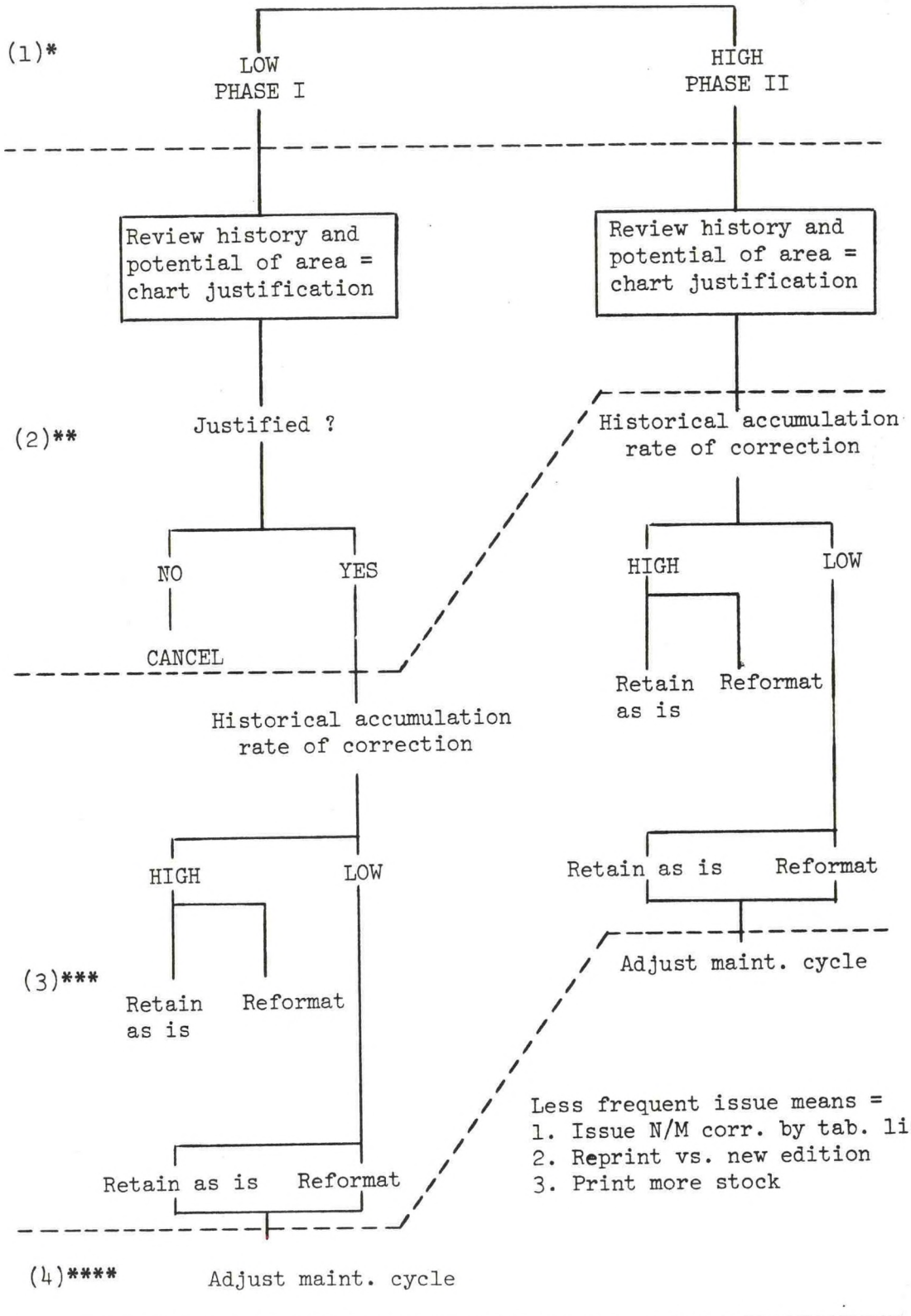
The examination should be conducted in two phases: Phase I, concerning the evaluation of low demand charts; and Phase II, concerning the evaluation of the remainder of the charts with a low historical accumulation rate of correction. A Phase III operation could be directed toward

increasing the frequency of issue of the highest demand charts through a transfer of production effort gained by Phase I savings.

A review of the area will be required to determine whether a chart-by-chart analysis, or an analysis of several charts in an area, will be the most appropriate examination approach.

Some general criteria which should be considered, plus a proposed study flow are presented in the accompanying diagram.

CHART DEMAND
Civilian Issue



(1)* The 15 different chart distribution customer categories must be examined for a minimum of 4 years for each chart to take into account the new editions which are on a 4-year maintenance cycle. Those charts consistently distributing, on the average, less than 200 copies/year, civilian issue, should be extracted for Phase I study.

A cursory examination of the FY 1972 civilian issue tabulations show that there are approximately 120 charts distributing less than 100 copies/year, and approximately 90 charts distributing between 100 and 200 copies/year.

It is expected that the examination of these Phase I charts will have the most rapid effect on reducing the workload in the maintenance program either through cancellation or reduction of the geographic area of maintenance through reformatting.

The quantity distributed to Defense and Coast Guard would not be included in the demand consideration, but in the justification of the chart.

(2)** The initial justification for the chart should be researched, and the present and potential use of the area examined to determine the active need for the chart as it now exists. Many charts were issued to accommodate isolated marine facilities existing a century ago, but which have been destroyed or abandoned, possibly obviating the need for a chart coverage at all.

(a) The active military need must be determined, and if nonexistent, and the area is also charted at a smaller usable scale for its present and potential use, cancellation should be considered.

(b) Charts for which the only remaining use is to show a harbor of refuge are ideally suited for reformatting in order to avoid the need to issue a limited-use, low-demand chart.

(c) Certain low-demand charts may be justified for retention if they are the only marine chart coverage of an area. Chart 953, Navassa Island, is an example of this, where a separately issued chart must be maintained due to lack of other chart coverage.

(d) It may be necessary to retain chart coverage of an area, possibly through reformatting, where they

represent a graphic portrayal of a rapidly changing data base. For example, some charts in areas of rapidly eroding shoreline and bottom may be of major use in environmental impact monitoring, although not immediately justified from a marine navigational standpoint.

(3)*** The historical accumulation rate of correction (change) will entail the research and examination of all affecting data in the chart area, with emphasis on the quality of the correction rather than the quantity. When considering Notice to Mariners corrections as part of this evaluation guideline, the critical nature of the corrections should be the main consideration and not the number of "hand corrections" recorded on the Aid Proofs.

(4)**** The cycle of issue for those charts with a low historical rate of correction should be carefully evaluated to determine if the interval between printings can be extended. Low demand, low correction rate charts may be more economically produced by printing a greater quantity of charts, but at a less frequent interval.

For those charts placed in an extended maintenance cycle, a system must be devised whereby the interested mariner can update his chart for critical corrections during the interim period between new editions of the chart. It is known that our chart sales agents do not ordinarily maintain the recommended 12-month supply of the weekly Notice to Mariners for the chart user to search for "critical" corrections pertaining to his chart. It is also increasingly difficult for the user to obtain the weekly Notice to Mariners by mail from the publisher.

A proposal for producing a list of combined local and weekly Notice to Mariners items is now being considered by the Marine Chart Division. This proposal recommends that these lists be issued only for 4-year cycle charts at the beginning of each calendar year to include data current only to the close of the preceding year, and issued only to the chart agents.

Alternatively, the task group feels that a separate

list of corrections compiled for each extended maintenance cycle chart has merit. This list would begin with the print date of the chart and would be issued to agents and by mail request on a fixed, rotating, update cycle until a new edition of the chart is printed. Thus, the workload for compilation, reproduction, and distribution of these lists would be apportioned throughout the year, and not geared toward a January issue for all lists.

The compilation of the correction lists must be given a high priority within the Division.

The lists should be disseminated to all chart agents, and publicized by adding a sentence to the current purple caution note now contained on all charts. A revised note would appear as follows:

> CAUTION
> This chart has been corrected from the Notice to Mariners published weekly by the Defense Mapping Agency Hydrographic Center and the Local Notice to Mariners issued periodically by each U. S. Coast Guard district to the print date shown in the lower left hand corner. A list of corrections subsequent to this date may be obtained on request from C32, National Ocean Survey, NOAA, Rockville, Md. 20852.

The Marine Chart Division must maintain a complete, up-to-date correction sheet for each chart on maintenance cycles of greater than 1-year printing. This list could

be copied and forwarded to the user upon request. The method would enable the user to have a handy complete list of corrections for each chart and eliminate the need to consult back issues of Notice to Mariners.

This Notice to Mariners correction list will give the NOS an ideal opportunity to provide significantly safer navigation for the mariner through an effective chart updating service, with the reciprocal benefit of economizing within the system.

The systematic examination will provide charts and/or areas where improvements and economies can be made in the Nautical Charting Program. Proposed improvements and estimated savings are presented which correspond to the specific charts mentioned previously.

The low demand charts in the Stephens Passage area of Southeast Alaska can now only be considered as anchorage, fishing, or possibly charts necessary for search and rescue. Their original reasons for existing as complete maintained Conventional Charts are not valid today. The NOAA PLAN FOR NAUTICAL CHARTING lists four new Conventional Charts and one new Small-craft Route Chart planned for

issue in this area. The Conventional Charts are 1:40,000 scale. The Small-craft Charts are 1:40,000 scale. This double coverage does not seem justifiable based on the current demand for the existing large-scale charts of the area. Moreover, the planned coverage ignores areas on the eastern shores such as Tracy and Endicott Arms, where one would expect the demand for 1:40,000 scale coverage to be greater than that at the center of Stephens Passage, if indeed such demand exists at all. The Division should examine the actual documented need for these 1:40,000 scale charts and planned charts in many other areas. The cost of providing this large-scale coverage and the future costs of maintenance do not seem justifiable in this relatively low demand area especially if alternate methods are considered. An immediate solution is to put the seven existing low demand charts in this area on an extended maintenance cycle or greater than 4 years with increased emphasis on providing corrections that accumulate through the chart correction lists.

A reasonable and attainable long-range goal would be to provide two 1:80,000 scale charts of this area and cancel all other existing conventional charts. The existing charts in the area having scales larger than this should be re-justified based on documented user demand. If such demand does exist, then a number of choices are available:

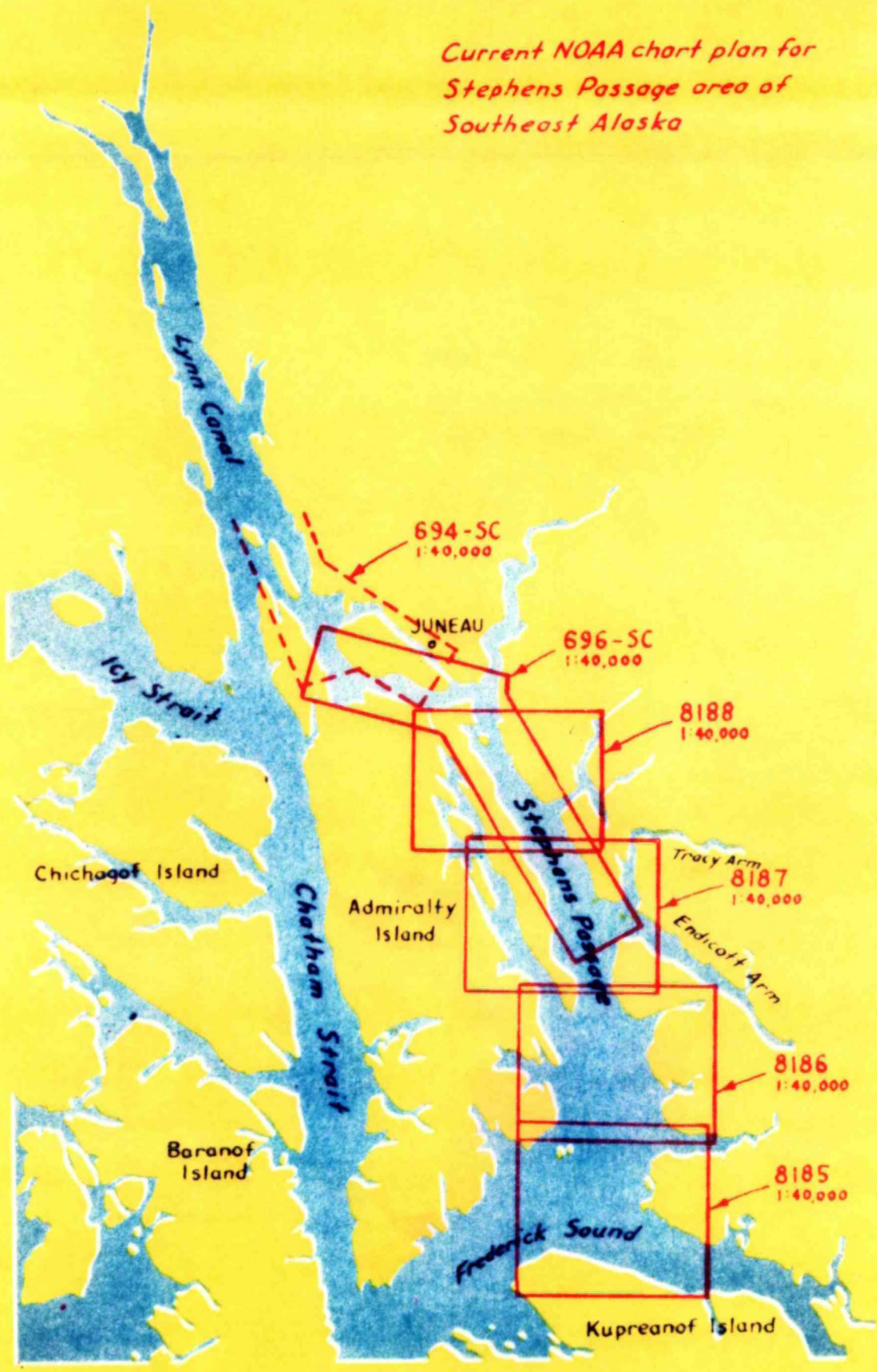
(1) these areas would be charted as insets on the northern proposed 1:80,000 scale chart; (2) those within the southern proposed chart would be charted as a group of insets on one chart with each inset providing minimum geographic area coverage, or charted as insets on the back of the 1:80,000 scale chart. This will adequately satisfy the majority of users and savings will be incurred in maintenance and reproduction over the currently planned five new charts for Stephens Passage.

The approximate costs of implementing the task group's proposal are now compared with those that would be necessary to carry out the approved plans for the Stephens Passage area. The figures are based on average costs.

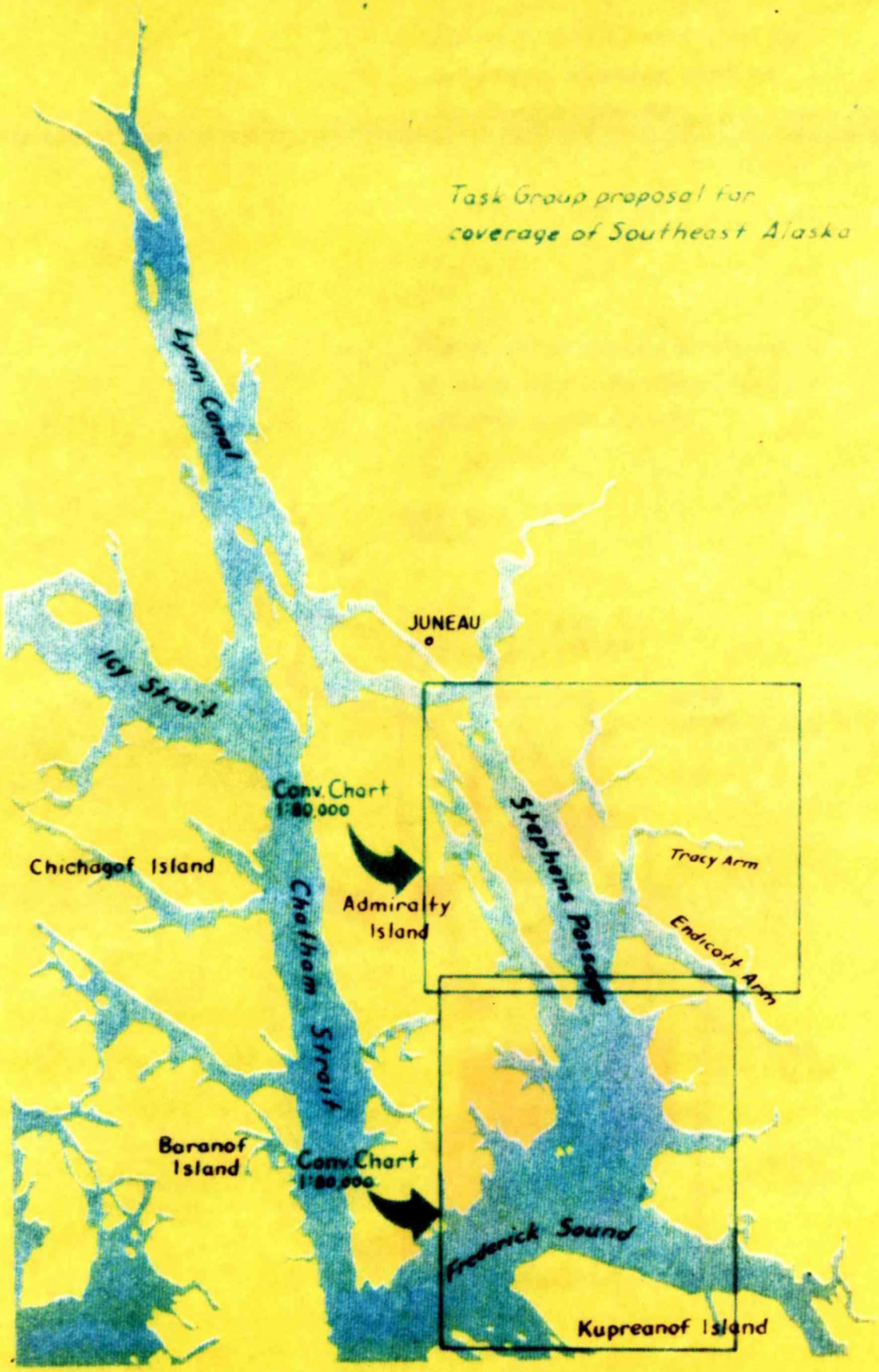
PRESENT APPROVED PLANS		TASK GROUP PROPOSAL	
Produce 4 Conventional and 1 Small-craft Charts		Produce 3 Conventional Charts	
New Chart Construction Costs ($K)			
Compilation	$ 86	Compilation	$ 48
Reproduction	$ 29	Reproduction	$ 16
	$115		$ 64
Maintenance Costs ($K)			
Compilation*	$ 4	Compilation**	$ 4
Reproduction*	$ 9	Reproduction*	$ 4.5
	$ 13		$ 8.5

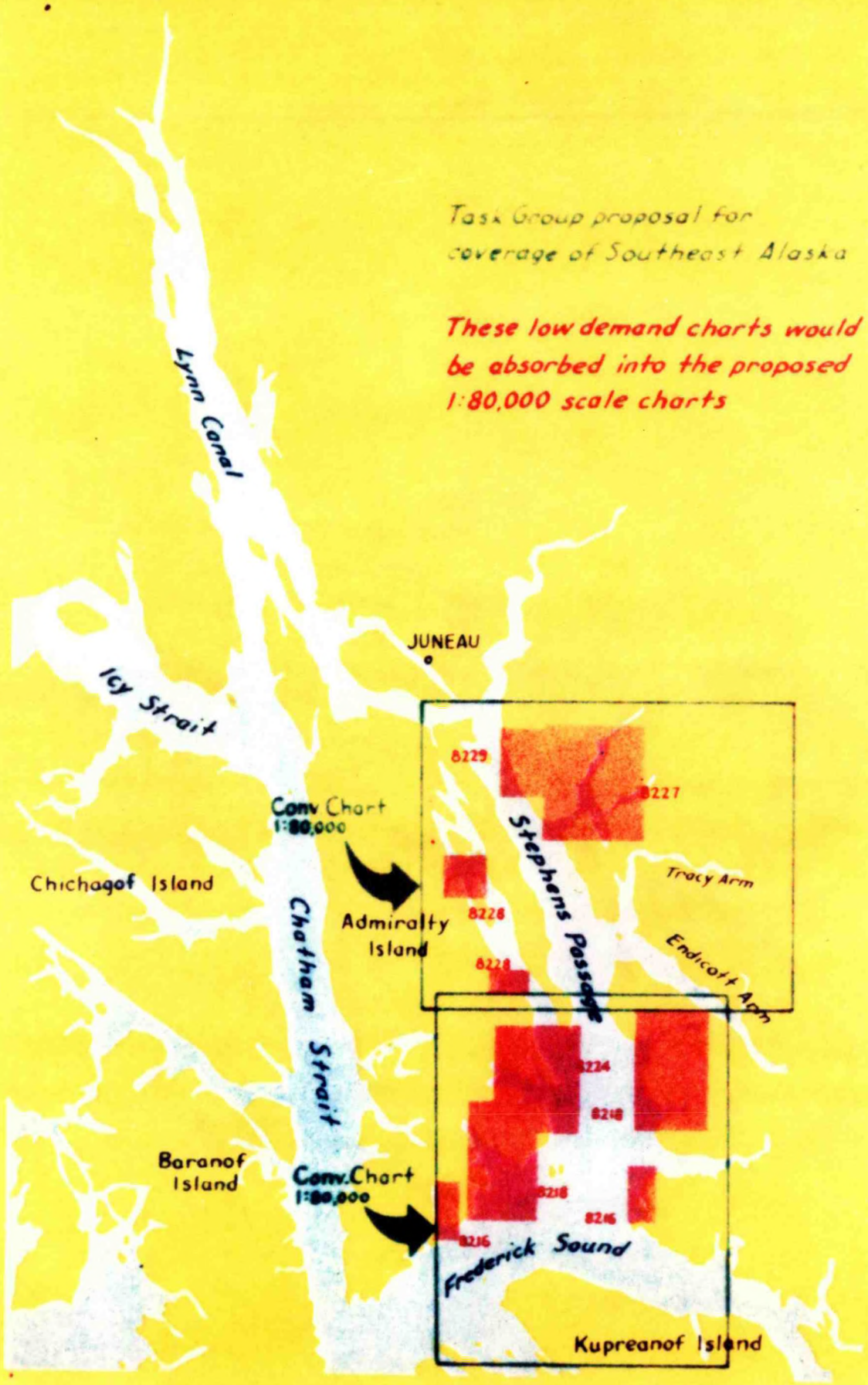
* A factor of one-half applied to averages because this area has a low rate of correction material applied to chart.

** This estimation is the same as the approved plan estimate because the cost involved is for maintaining the area and not by the number of charts.


Current NOAA chart plan for
Stephens Passage area of
Southeast Alaska
Lynn Canal
Icy Strait
Chatham Strait
Stephens Passage
Tracy Arm
Endicott Arm
Frederick Sound
JUNEAU
Chichagof Island
Admiralty Island
Baranof Island
Kupreanof Island
694-SC
1:40,000
696-SC
1:40,000
8188
1:40,000
8187
1:40,000
8186
1:40,000
8185
1:40,000

Task Group proposal for
coverage of Southeast Alaska




Task Group proposal for
coverage of Southeast Alaska
These low demand charts would
be absorbed into the proposed
1:80,000 scale charts
Lynn Canal
JUNEAU
Icy Strait
8229
8227
Conv Chart
1:80,000
Stephens Passage
Tracy Arm
Chichagof Island
8228
Admiralty
Island
Endicott Arm
8228
Chatham Strait
8224
8218
Baranof
Island
Conv.Chart
1:80,000
8218
8216
8216
Frederick Sound
Kupreanof Island

Therefore, the cost of implementing the present approved plan will be $115,000. The cost of implementing the task group proposal will be $64,000. A cost avoidance of $51,000 is indicated. In addition, assuming that all charts are on a 4-year new edition cycle, the savings each cycle will be $4,500.

The Sailing Chart example (1001) discussed previously should not be on a 1-year new edition cycle. Corrections to this chart have not been evaluated as to their critical nature and real necessity to the safety of navigation. This chart and others like it should be extended to a less frequent cycle. The decrease in printing must be coupled with the issuance of a correction list. It should be noted that the cost of producing one edition to last for 4 years, for example, will be appreciably less than the cost of producing two editions to last 2 years each of the same 4-year period.

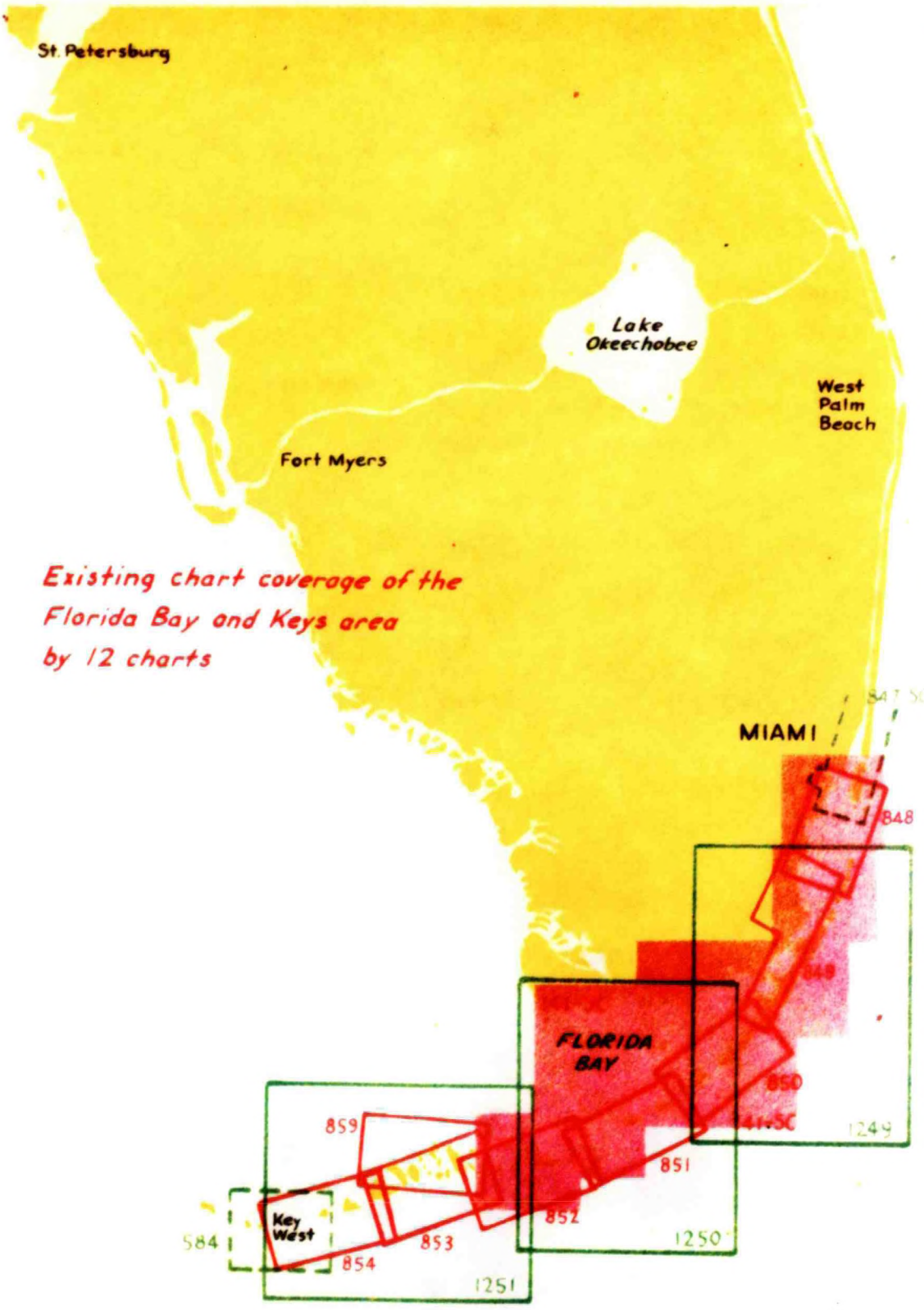
A plan to modernize and streamline chart coverage in the Florida Bay area should include the application of hydro to charts 1249, 1250, and 1251. Two 1:40,000 scale Route Charts of the Keys from Miami to Key West should be

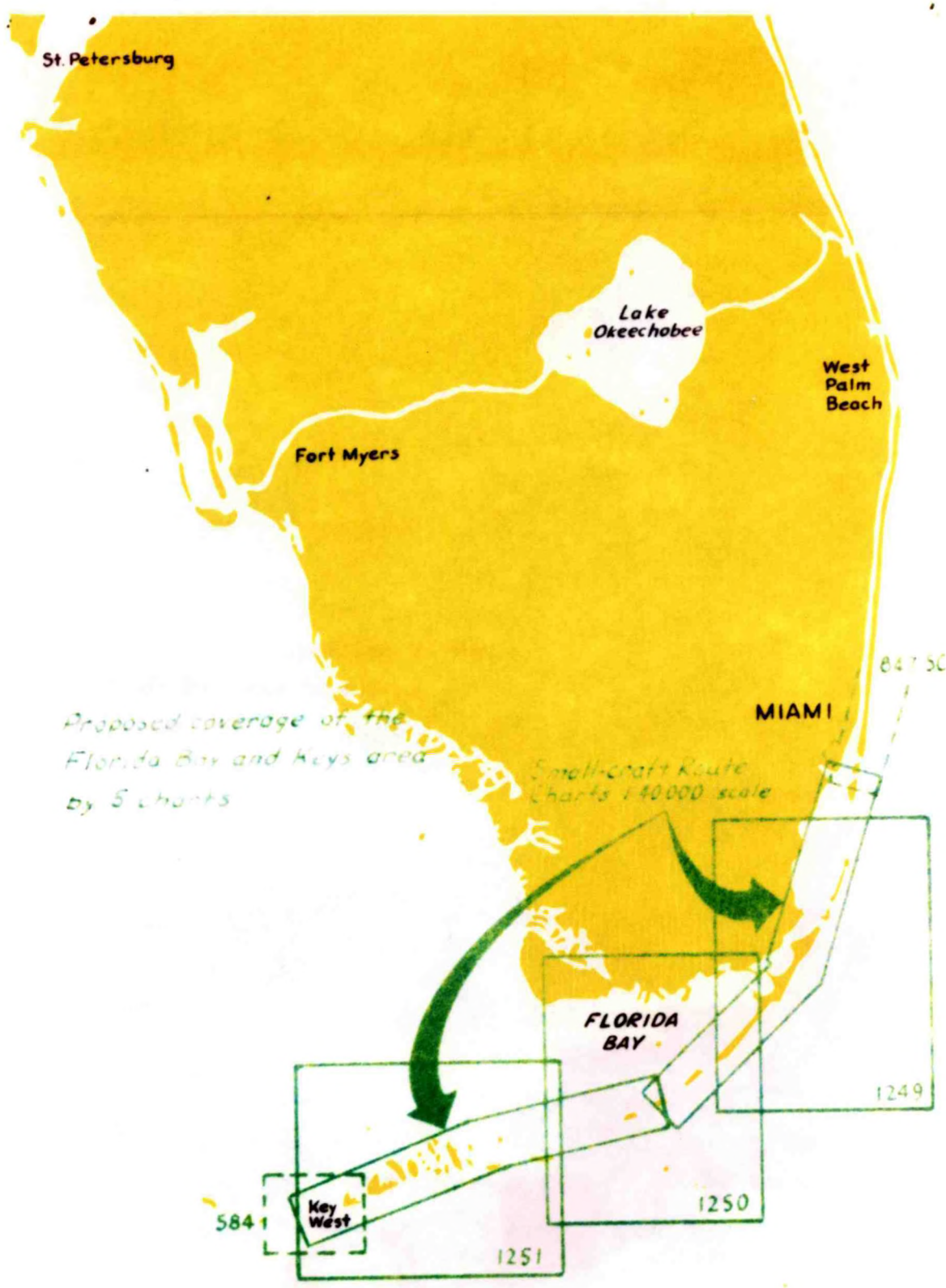
provided to eliminate the nine (some are back-to-back) Conventional Charts now on issue. Chart 141-SC, basically 1:80,000, should then be cancelled to eliminate duplicate coverage. Marine facilities in this area, the primary purpose of the Small-craft Chart, exist only in the Florida Keys. This proposed five-chart layout provides the same coverage as now provided by 12 charts, and offers the user the advantage of more easily used chart formats.

A cost comparison between maintaining the present chart coverage and implementing the task group's proposal is presented below:

PRESENT SYSTEM	TASK GROUP PROPOSAL
Maintenance of 11 Conventional Charts, and 1 Small-craft Folio Chart	Revise charts 1249, 1250, 1251 (extensive hydro application to chart 1250)
Maintenance costs ($K) Compilation $19.9 Reproduction 44.0 $63.9	Maintenance costs ($K) Compilation $ 4.2 Reproduction 9.0 $13.2
	New construction - Construct two Route Charts
	New construction costs ($K) Compilation $44.0 Reproduction 17.2 $61.2

The cost of maintaining the present system (figures based on average costs) is $63,900 for the 11 charts. The cost of implementing the task group proposal is $61,200.


St. Petersburg
Lake Okeechobee
West Palm Beach
Fort Myers
Existing chart coverage of the Florida Bay and Keys area by 12 charts
MIAMI
848
FLORIDA BAY
850
1249
859
851
852
853
854
Key West
584
1250
1251


St. Petersburg
Lake Okeechobee
West Palm Beach
Fort Myers
MIAMI
Proposed coverage of the Florida Bay and Keys area by 5 charts
Small-craft Route Charts 1:40000 scale
FLORIDA BAY
Key West
5841
1249
1250
1251

A comparison of the costs to maintain the present coverage vs. the proposed coverage (assuming all charts on identical cycles) for one new edition cycle is as follows:

PRESENT SYSTEM	TASK GROUP PROPOSAL
$63.9K	Maintenance of three Conventional and two Small-craft Route Charts

Maintenance costs	($K)
Compilation	$10.6
Reproduction	22.2
	$32.8

For each new edition cycle a savings of $31,100 will be realized.

A solution to the problem of limited monitoring of the marine chart system would be the installation of a "Chart Planning and Review Board," established for the primary purpose of providing critical guidance to the Division in the area of system monitoring and chart planning.

The task group believes that the Division would benefit from a more direct contact of the board members outside the Division, to some of the details and involvements of chart planning operations.

The Board should consist of the administrators and staff members who are most directly involved and experienced in the marine navigational use of charts, and have had direct and first-hand exposure to the geographic areas involved. This would provide the Division with the well-rounded expertise in the practical use of charts which is now limited to only a very few individuals in the Division.

It is suggested that the nucleus of the Board consist of the following:

Associate Director, Marine Surveys and Maps (C3)

Chief, Operations and Planning Group (C3x1)

Chief, Marine Chart Division (C32)

Division Staff Chart Planner (Proposed)

As the function of the Board becomes more defined, the members could be adjusted to a more effective complement, and possibly expanded to include others considered to have influence over Division operations.

It is expected that the most effective use of the Board will be as a "watch-dog" on the marine chart system in order to prevent recidivism, and as a high-level information collecting and decision making group. Some items to which the Board might usefully devote their attention would be:

1. Examine and advise on the proposals of the Division's staff chart planner of section IV. B. preceding

and on other chart planning matters which the Division Chief considers appropriate.

2. Review the necessity to adopt, construct, and maintain charts designed specifically to satisfy military requirements, especially if the military is the only significant purchaser. The Board should consider directing an investigation into the military requisitioning procedure for charts to assist in determining the active need for these charts. Documentation should be provided for all charts justified. Cancellation would be the goal here, as absorption into a different format would not require such complete involvement by the Group.

3. New NOS charting policy, and changes in policy as stated in the NOS "Marine Chart Policy Manual," of section I.B. should be deliberated at this level.

4. Other advantages of the Board would have budgetary and organizational requirement implications, and would assist in more effective consideration of Division requirements and priority weighing of conflicting requests for support from outside of the Division, such as Photogrammetry, Tides and Currents, field acquisition of data, etc.

ADDENDUM

The conclusions and recommendations contained in this report are the result of the task group's own experience and understanding of the marine chart system. Considerable input has been received from many sources. Some items are in direct contrast with current NOS approved policy plans which govern the Marine Chart Division operations.

In the course of the study, additional areas have been reported that require investigation but due to time limitations the study group was unable to conduct any thorough analysis. The subjects are mentioned here and discussed but no attempt at complete analysis or detailed solution is attempted.

1. Cooperative Charting Program

A principal activity of the former NOS field offices was the processing of chart correction data. The procedures that evolved comprised a valuable tool in the program of maintaining nautical charts, since it eliminated the chaff and thereby enabled cartographic personnel at Rockville to concentrate on critical and valid changes.

Although all NOS operations suffered as a result of the field installation shutdown, the maintenance of nautical charts undoubtedly was most affected. Without the benefit

of local, on-the-scene representatives, who acted as buffers and controllers, the Marine Chart Division must now spend valuable time processing raw correctional material. Employees assigned this task complain of being swamped by the flow.

The Cooperative Charting Program is a fine way to promote the NOS image. The benefits of the program are many. The USPS/USCGAux promotes the proper use of NOS products and services through their education programs, collect marine facility information for application to Small-craft Charts, and assist in chart evaluation surveys. In addition to the high-level publicity gained, much valuable chart correction material is received. Unfortunately, there is a large volume of inadequate material received.

A responsibility of the USPS/USCGAux Cooperative Charting Chairmen is to coordinate and submit correction notices, but there is considerable variance in their judgment of usefulness of data. There is a demonstrated need for the chairman to consistently screen each recommendation as to its validity. This would be of inestimable help to the over-burdened staff in the Chart Information Branch and the chart compilation areas.

The "Point-Credit" system currently used has a deteriorating effect on the quality of the Cooperative Charting Program. This system encourages participants

in the program to submit large volumes of incomplete, invalid, unusable material simply to gain credit and win the title of "best" squadron or flotilla. The point system, if retained, should be critically evaluated toward a more useful awarding of points for only those items of genuine potential chart value.

In addition to the heavy workload imposed on the Division in processing the reports, considerable effort is involved in acknowledging the receipt of this data and writing personal letters of thanks for the valued help. A concentrated effort should be initiated to further upgrade the level of reporting. Form letters could be used covering many situations, and the writing could be automated as previously recommended by the Marine Data Systems Study Team Report dated January 1971.

It is recommended that this program be examined to determine changes necessary for a more efficient work flow.

2. Personnel Practices

This study group was made aware of several instances where individuals have not received due official recognition for temporary assignment to staff positions of the Marine Chart Division. This oversight is considered to have deleterious effects on future promotions for those involved by not giving them credit for time served in an acting status. An official statement recognizing this service,

and placed in the employee's personnel file, would provide a very expedient rectification of this matter.

3. Marine Chart Division Liaison with the Office of Aeronautical Charting and Cartography

It has been suggested that the Marine Chart Division would benefit from direct high-level coordination of effort with the Office of Aeronautical Charting and Cartography through participation in the C4 weekly staff meeting. It is felt that the entire Office of Marine Surveys and Maps, and specifically the Marine Chart Division, would benefit through exposure to policy making background concerning reproduction methods, distribution operations, product pricing considerations, and other factors of importance to the Marine Chart Division.

4. Boat Show Participation

An important public relations effort by the NOS has been the manning of boat shows that are held annually in large metropolitan centers across the nation. These events are patronized by large numbers of mariners and provide a unique opportunity to maintain close liaison with chart users, as well as to verify user reaction to NOS charts and related products.

In the past both the Marine Chart Division and the Distribution Division personnel have been selected, but because of the training and experience to be gained from close personal contact with the public, the task group recommends that the Marine Chart Division staff members

and compilation team leaders be favored for assignment for the manning of boat shows. In this manner, the Marine Chart Division employees would gain an insight and a greater understanding of problems peculiar to the geographical areas for which the team has responsibility. Team leaders would be utilized primarily for shows that are held in their geographical area of maintenance.

Not only would the user benefit from consulting with professional cartographers, but more important, NOS would benefit through the production of improved charts due to acquiring a first-hand knowledge of users problems and other circumstances peculiar to a particular geographical area.

5. Publicity

In order to get charts into the hands of every possible user, all facets of the public news media should be investigated. In order to make the public more conscious of its contents, the telephone company has conducted a nationwide campaign in publicizing the yellow pages directory. It is recommended that space be obtained from the telephone company as being in the public interest and a notice included which would direct mariners to the nearest agent or distribution point where charts could be obtained. Likewise, space in all magazines and periodicals devoted to marine affairs should be investigated and announcements concerning our products be forwarded for publication. Many publishers avidly solicit such releases and would be very pleased to

cooperate with us.

There are numerous other ways of creating a better public image, and all avenues should be explored in depth.

APPENDIX A

APPENDIX A

COASTAL NAUTICAL CHARTING PRODUCTS

NOS produces five principal nautical charting products for U. S. coastal waters and the Great Lakes depending on the scale required by the user, and eight Coast Pilots, and a Great Lakes Pilot. Only the following oceanic charts are considered in this study:

1. Sailing Charts are published at scales smaller than 1:600,000. They are used for offshore passage between distant coastal ports and for approaching coasts from the open ocean.
2. General Charts are published at scales ranging from 1:100,000 to 1:600,000. They are intended for navigation of vessels whose positions can be fixed by landmarks, lights, buoys, and characteristic soundings, but whose courses are well offshore.
3. Coastal Charts are published at scales ranging from 1:50,000 to 1:100,000. They are intended for nearshore coastal navigation inside offshore reefs and shoals, and for entering relatively large bays and harbors.
4. Harbor Charts are published at scales of 1:50,000 or larger depending on the size and importance of the harbor and the number and types of existing dangers. They are intended for navigating in harbors and restricted channels and passages.

5. Small-craft Charts are published at various scales. They are designed to be hand-held during use and are particularly advantageous for use in close quarters such as those found in recreational craft. They contain information not found on the other types of charts mentioned above. This includes information on marine locations and facilities, tides and currents, anchorages, marine weather services, and basic rules of the road.

APPENDIX B

APPENDIX B

COMPARISON OF MARINE CHART DIVISION ANALYSIS OF USER NEEDS WITH THAT OF OMB STUDY

The following discussion compares the Marine Chart Division's understanding of user needs with those expressed directly by approximately 300 selected users on the OMB questionnaire. The Division's understanding has been formed over the years from the many requests received by all kinds of users, from personal contact with users through NOS field offices and boat shows, and from the cooperative charting program with the U. S. Power Squadrons, and Coast Guard Auxiliaries. The numbered statements below summarize the main points of the Marine Chart Division's reply to the OMB's survey. This is followed by the task group's extraction of the user comments on the OMB questionnaire. In almost all cases, the results of the questionnaire strongly support the Marine Chart Division's self analysis on their adequacy in meeting user needs.

Format

1. The average chart size (36" x 48") is very difficult to use on the most fishing and recreational craft because of limited space. In most cases, coastal charts provide the largest scale chart coverage of offshore fishing grounds.

Small-craft Charts are issued in four different compact formats but NOS still receives complaints from federal, transportation, and recreational users about, or suggestions for improving, area format, content, and size. A prime example is the area "split" format which is objected to because courses cannot be easily plotted from locations on one side of the chart to locations on the other side.

> Questionnaire respondents from all user classes support this inadequacy for all chart types. More overlapping of adjacent charts of same scale was specifically mentioned by the Coast Guard and State transportation agencies (Alaskan Ferries). That certain chart sizes are too big for use aboard smaller vessels was a specific complaint of some Coast Guard tug operators, commercial shippers, and recreational boaters. Several respondents remarked that a bound looseleaf booklet of chartlets would be useful.

2. The larger scale coverage has been requested for west coast and Alaskan harbors.

> Coast Guard, commercial fishermen, State agencies, and recreational respondents gave this inadequacy strong support by their remakrs in the questionnaire. Cook Inlet and Puget Sound were specifically mentioned.

3. Although marginal information notations on Harbor, Coastal, General, and Sailing Charts usually meet user needs, many notes refer the mariner to Coast Pilot books, and so the mariner, to navigate safely, is forced to obtain

these books in addition to charts. Furthermore, Harbor and Coastal Charts do not contain complete tidal information. Nearly all navigational users need this additional information which can only be provided by tide tables.

> Several Coast Guard respondents suggested that Coast Pilot, Coast Guard regulations and distress information be put on Small-craft Charts.

4. Color portrayal (especially magenta) is not complete satisfactory. A problem exists for navigational users when using all classes of charts at night under red lights.

> This inadequacy was specifically mentioned by Coast Guard and commercial fishermen in the OMB questionnaire.

Area Coverage

1. The Coast Guard, marine commercial, and recreational users have requested Small-craft coverage for many areas where such coverage is now nonexistent.

> ~~Reference to the bar graphs indicate that~~ inadequacies in geographical coverage are of most concern to the Coast Guard and recreational boaters for all chart types. In the remarks section of the OMB questionnaire this inadequacy was specifically mentioned by the Army Corps of Engineers for the Juan de Fuca Strait, Willapa Bay, and Grays Harbor; by the Coast Guard for the Columbia and Willamette Rivers; by tug operators and towing companies for the Columbia and Snake Rivers; and by recreational boaters for the Juan de Fuca Strait and Columbia River.

2. Area coverage by Harbor Charts is generally adequate for commercial navigators. However, the development of deep draft tankers and other vessels has created additional charting demands, e.g., better Harbor Charts in areas of Alaska now being used by deep draft vessels. Harbor Charts are not available for all areas requested by the Coast Guard and commercial fishermen. Search and rescue operations of the Coast Guard desire complete, adequate, and large-scale charts for many new areas, especially in Alaska.

> This inadequacy was specifically mentioned in the OMB questionnaire by the Corps of Engineers for the Willamette River; by the Coast Guard for Kodiak and Afognak Islands, Willamette River, and Alaskan harbors of refuge; by recreational boaters for the Willamette River, Pt. Vincente (Calif.), and Southeast Alaska; and by State agencies for Puget Sound, Columbia River, Grays Harbor, Willapa River and Southeast Alaska.

3. The area content of many Coastal Charts should be improved to meet the changing requirements of the users. New port development, channel dredging, and changing traffic patterns that have occurred since the initial planning of these charts have resulted in a need to reevaluate the chart limits in order to provide more complete coverage on certain charts. New Coastal Charts have been requested by all user classes for the Strait of Juan de Fuca, for Hawaii, and for Alaska.

In the OMB questionnaire, fisheries researchers gave support to this inadequacy by specifically mentioning the Bering and Chukchi Seas; by tug operators and pilots for the Bering Sea; and by recreational boaters and State resource management agencies for Southeast Alaska.

4. Federal and commercial users have requested coverage for some coastal areas of Alaska by General Charts where such coverage is now nonexistent.

This inadequacy was not specifically mentioned in the OMB questionnaire; however, ferry operators did point out the need for wire-dragging the ferry operating areas in Alaska.

5. Sailing Chart coverage could be improved for some users by providing a small scale chart of the complete east coast from Maine to Florida including the offshore islands of Bermuda and Puerto Rico. This would be similar to Chart 9000 covering the west coast of the United States.

This inadequacy was not specifically mentioned in the questionnaire.

Distribution System

1. The distribution system could use some improvement. A large portion of charts (all types) are sold by private contract sales agents (marinas, boating supply stores, map retail outlets, etc.). Complaints have been received that certain charts are not available and that obsolete editions are being sold. A contributing factor to this problem is that the chart agency inspection program has been drastically reduced due to lack of available funds. Often

users do not know that certain charts exist or that new editions of existing charts have been published. Moreover, buyers of charts more than 2 years old cannot readily (sometimes not at all) obtain old Notices to Mariners.

> The results of the OMB questionnaire indicate that this inadequacy is of greatest concern to commercial and recreational users. Typical remarks are as follows: "agents don't have a complete stock;" "more sales outlets are needed;" "need better advertising methods," etc.

Cultural Data

1. NOS is partially dependent upon reports from users for adding or deleting landmarks. Recreational boaters are constantly reporting more landmarks than are applied to Small-craft and Harbor Charts. Whether they have need for or use all that they report is questionalbe. Thus, it is unclear whether NOS is adequately meeting updating requirements for recreational boaters or not. On the other hand, because the Coast Guard uses landmarks to reposition their buoys, a valid requirement exists for updating landmarks on Harbor and Coastal Charts. Landmarks are an aid to all users when anchoring. Nevertheless, the amount of area charted and the volume of change constantly occurring make it virtually impossible to keep current on all landmarks in all areas. A common complaint is that landmarks are not charted which should be and that charted landmarks are in error or have been removed.

A general picture that emerges from the OMB user survey is that cultural content on Harbor Charts is of concern to the Coast Guard and that updating of cultural information on all chart types is inadequate for an appreciable percentage of the recreational users polled. Specific remarks in the questionnaire are as follows: "need better identification cultural details (commercial shippers);" "in many instances the view from the water does not agree with the chart (federal and recreational users);" "need more landmarks charted (federal users and commercial shippers)."

2. There is a great demand from federal, research, fishery, and recreational users to apply information concerning reservations, wildlife refuges, and parks to Small-craft, Harbor, and Coastal Charts in order to enforce laws and encourage use.

This inadequacy was mentioned by only a few federal respondents.

3. Recreational boatmen are interested in seeing more road names leading to boat ramp and shore facilities and historical locations charted on Small-craft and Harbor Charts, while all other user classes, though requiring some information on roads and other cultural data, do not need all the detail shown on Harbor Charts. Additional roads are sometimes needed on Coastal Charts as an aid to the general public where no large-scale charts are available.

These points were not specifically mentioned by respondents to the OMB questionnaire.

4. Numerous prominent fishing grounds and reefs are identified by name in radio and newspaper reporting, in

various industry publications, and by fisherman and government sources. Many of these names are in common use and are well known locally, but are not charted. Recreational, fisheries, and research users have requested that these names be charted, especially on Coastal Charts.

No information was received concerning this point.

5. Only a minimum amount of facility information is shown on Harbor Charts; however, the facility and services information is shown on the Small-craft Chart which was developed specifically for the recreational boater. When the Small-craft Chart for an area is not available and the user must navigate with the Harbor Chart, he must also carry the Coast Pilot books to obtain information on facilities and services. Only those facilities for which regular up-date input is received are charted. Also, NOS does not chart or identify actual commercial names of the facilities. Reuqests have been received from recreational users for charting the actual names on Small-craft Charts.

This inadequacy was specifically mentioned by a few respondents to the OMB questionnaire.

Coastal Zone

1. A more complete definition of shoreline characteristics has been requested on Harbor Charts by Federal, research, and fisheries users.

2. A complete and up-dated charting of coastal vegetation (woodland, marsh, mangrove) is desirable for navigational

assistance in areas devoid of other easily recognizable features, especially where Coastal Charts are the largest scale charts available. Better definition of the wetlands--the area between high and low waters--is also required for resource management and land use planning.

> These inadequacies, recognized by the Marine Chart Division, received strong support from the OMB user survey from State resource management and public works agencies.

Relief Portrayal

1. A major complaint from nearly all classes of users is that contours on some Harbor and Coastal Charts are too generalized, are from obsolete or inadequate surveys, or are not in great enough detail. Contours and elevations are often not shown on Small-craft Charts. A recent user evaluation questionnaire indicated they are often desired by Federal, marine, transportation, and recreational users. More gradient tints than are generally used have been added to some Small-craft Charts in the Florida Bay area with favorable results to recreational boaters. Military and commercial navigators use undersea topography as an aid to navigation.

> Results from the OMB survey support these judgments with most of the complaints coming from commercial mariners, State public works agencies, and the Army Corps of Engineers. Some typical remarks by users are as follows: "more

land topographic detail as an aid to navigation (research users and fishermen--Coastal Charts, and commercial mariners--General Charts);" "more contour information using shaded techniques (military and commercial mariners, all chart types)."

Navigational Data

1. Many aids to navigation useful to all user classes are privately maintained and insufficient data is available for charting this information on Small-craft, Harbor, and Coastal Charts.

This inadequacy was not specifically mentioned by the OMB survey respondents.

2. The vast majority of fixed and floating aids are positioned within requirements, but a significant number must be charted from preliminary data until such time as accurate positions can be obtained. Information for updating is published in the Notice to Mariners but the buyer of a new chart may not have access to the information. This is a common complaint received from all user classes and it pertains primarily to Small-craft and Harbor Charts.

This inadequacy was mentioned specifically in the OMB survey by Coast Guard and recreational respondents.

3. Small-craft Chart users are constantly asking for the charting of more radio station locations for use with RDF equipment.

This inadequacy was not specifically mentioned by respondents.

4. There is a great demand from all classes of users to show Loran A on all Coastal Charts. At the present time, Loran A has been shown mainly on those Coastal Charts at the entrance to major harbors and bays. Loran A is shown on all General and Sailing Charts. Many electronic navigational systems are operational or in development. As an example, a private company is producing Sailing Charts with Omega lines overprinted. Some requests have been made for Loran C charts by federal, marine transportation, and fisheries users. Some requests have been made by marine transportation and research users of Loran C. One of the primary users for new editions of General Charts containing Loran is the U. S. Coast Guard. When Loran stations are discontinued, added, or moved, it is absolutely necessary to revise the charts. Obsolete editions are useless to all classes of navigators who need Loran.

> Several Coast Guard, tug operators, and pilots responding to the OMB questionnaire remarked that they needed Loran C in addition to Loran A for General and Sailing Charts, while a few Coast Guard, Military Sealift, and offshore oil respondents said they needed Loran A and Omega on Coastal, General, and Sailing Charts.

Depth Information

1. Basic descriptions are not available for all areas covered by Harbor Charts. Many areas are covered by inadequate leadline surveys where depth contours are not

adequately delineated and peaks and deeps may have been missed during the original surveys. The NOS does not have complete or accurate information on all obstructions. Many Coastal and General Charts also cover areas of obsolete or inadequate surveys. Dangers and obstructions probably do exist that are not charted. Many charted obstructions contain the notation PA (position approximate) or PD (position doubtful). These items have been reported but remain unverified and are in need of updating with an accurate depth and position determination.

Requests have been made by federal, marine transportation and fisheries users for more detailed classification of pipelines and cables on General Charts. For example, the sample note on Chart 1117 shows that NOS is not completely satisfying the users' needs: "Caution--Uncharted submerged pipelines and cables may exist in the vicinity of oil well structures.... Mariners should use caution when anchoring."

Description of the bottom is not complete on Sailing Charts. There is no assurance that all dangers have been charted, because specific underwater features are not shown with enough detail due to lack of available data.

Basic sounding data (bathymetry) is not available for all areas covered by Sailing Charts. In some areas only sparse soundings are available, some shown 30- to 40-miles apart. In areas where electronic navigation aids are weak

or nonexistent, the soundings aid in establishing an estimated position and act as recognition points for the navigator. This is extremely useful to marine transportation users employing NOS Sailing Charts.

Existing Harbor and General Charts do not show the type of information desired and needed by fishermen, such as closely spaced depth soundings and frequent and reliable contours. Existing charts do not show sufficient data on snags, wrecks, subsurface utilities and other hazards to bottom fishing gear, and only sparse bottom characteristics are charted. The fisherman, especially those using bottom gear in dredging and trawling require more detailed information.

> Results of the OMB survey lend support to these statements. Some typical remarks of users taken from the questionnaire are as follows:
>
> a. Need greater sounding density on Small-craft, Harbor, and Coastal Charts, especially outside of channels, and more complete coverage of shoal area (from fisheries and oceanographic research users, Army Corps of Engineers, State public works and resource management agencies, tug operators and pilots, recreational boaters, shippers, and commercial fishermen).
>
> b. Need more frequent updating; depth discrepancies noted between some charted and observed depths (from Army Corps of Engineers for Harbor Charts; from Coast Guard for Harbor and Coastal; from research users for Harbor and Sailing; from tug operators

and pilots for all except Sailing Charts; from recreational users for Small-craft and Harbor; from shippers for all charts except Small-craft; and from State transportation agencies for Harbor, Coastal, and General Charts).

2. NOS does not always receive information about privately maintained channels. Consequently, many of these items are charted in approximate or doubtful locations. This information is particularly useful to the recreational boater. In addition, the standard Harbor Chart does not show actual depths for dredged channels. Only controlling depths are shown in tabular form. Considerable interest has been expressed for showing actual depths in channels. The companies operating large ships claim there is a tremendous economic advantage for knowing that even one extra foot exists over the charted controlling depth. Interest has been shown in what NOS terms the "Deep Draft Pilot Chart" which shows the location of actual depth only in channels.

This inadequacy was specifically mentioned for Harbor, Coastal, and General Charts by nearly all of the tug operators and pilots responding to the OMB questionnaire.

Additional User Needs

The following list contains additional remarks from the OMB questionnaire on inadequacies that were not identified specifically by the Marine Chart Division in their part of the OMB study:

1. Need better definition and display of bottom properties (Army Corps of Engineers--Harbor and Coastal Charts).

2. Need topographic detail on Harbor and Coastal Charts the same as on the 15-minute Quads produced by the U. S. Geological Survey (State resource management and public works agencies).

3. Need NOS triangulation stations on Harbor and Coastal Charts (State resource management and public works agencies).

4. The new light symbol now being applied to all types of NOS charts is unsatisfactory.

5. Show depths in meters (oceanographic and fisheries researchers--Harbor, Coastal and General Charts; and Coast Guard--all types).

APPENDIX C

APPENDIX C

PRICING POLICY

Of particular significance to the study is the fact that, commencing January 1, 1973, chart reproduction and distribution service costs will no longer be financed from the regular salaries and expenses appropriation. Instead, the former annual S&E base will be reduced by approximately $3,000,000 and funds needed for carrying out the two above mentioned operations, or functions, will be financed through the use of a special-type revolving fund. Authority for this change is contained in Public Law 91-412, which was approved September 25, 1970. This legislation empowers the Department of Commerce to retain the proceeds from the sale of most maps, charts, and other special reproductions and analyses as appropriation reimbursements. Because collections from the sale of charts and maps are to be deposited in this special account (P.L. 91-412), instead of being credited to Treasury miscellaneous receipts, funds will now be available for disbursement without regard to fiscal year.

Under NOS's former accounting system, an accurate selling price for maps and charts was not a critical factor. However, the initiation of a semicommercial or industrial type of merchandizing reverses this concept since the cost

and marketing of products must henceforth insure a sufficient return in order to avoid a depletion of funds and keep the account solvent.

The downstream effect of this new fiscal policy will dramatically impact the philosophy underlying the production of charts and radically alters the long-held theory that the work and efforts of the NOS must be limited, for all practical purposes, to public interest, or public service, projects that are not considered to be financially attractive by private enterprise.

Commencing January 1, 1973, the impersonal forces of supply and demand must dictate the choice of which charts will be scheduled for reproduction. Charts that return a profit will automatically be scheduled for printing, whereas any that could cause a deficit must be either eliminated or counterbalanced. A formal review mechanism is needed to decide how publications that represent a liability to the fund are to be treated. An important function of the review should be the revision and constant monitoring of the program price structure inasmuch as the pricing of charts is crucial to the successful operation of the revolving fund.

In this connection, it might be helpful to provide a description of the present system of determining prices, as well as one or more alternatives in order to permit a

comparison to be made of the merits of each. Because of continually rising cost of materials and supplies, it becomes necessary to periodically reprice publications and thereby enable the government to obtain a more equitable return of its investment.

The empirical formula, listed below, is the chief tool employed by the Pricing Committee to arrive at the basic sales price of NOS products.

Production Unit Cost
+ Cost of living
+ Executive administration
- Scheduled printing (other government agencies)
+ Department of Commerce overhead
- Condemnation (copies only)
- Free issue
+ Postage
+ Allowance for discounts
= Basic sales price

Other considerations that enter into the final result include: (a) losses on one chart may be made up by an increase in price of another in order to keep the price of a series of charts in balance; (b) in 1971, nautical chart prices were increased for administrative necessity (these prices have not been reduced); and (c) when similarities of charts in a series or similarities between

series occur, then by judgment, similar selling prices are invoked (on the higher side), regardless of actual costs.

This approach to pricing guarantees an equitable recovery of fluctuating costs and makes obsolete the multi-price system, formerly used, which was based on variables such as the overall size of paper, and the number of pages used to form the folio-type Small-craft Chart.

Prices established by this mechanism apply to nautical charts intended for sale to the public. In 1972 a charge of $1.50 was made for the conventional type and $2.00 for the small-craft type. Charts sold to the public represent a much higher return than publications distributed on official issue. Nautical charts are furnished to government agencies at a base production unit cost, which is $.36 for conventional charts and $.55 and $.70 for the small-craft series.

To carryout the intent of the provisions of P.L. 91-412, it is recommended that costing and merchandising methods used by private enterprise that assure a favorable balance of payments be adopted by NOS in lieu of the present chart pricing policy. By adjusting prices to offset inventory losses, discontinuing the free issue of charts, charging postage on each individual order, including a preparation charge for individual orders sent to the Washington Headquarters, as well as a distributable charge

to cover bad debts, etc., it will be possible to set a more realistic selling price for NOS output.

One method of adjusting prices would be to place a premium on charts for which there exists little or no demand. It is logical to expect a mariner to pay a much greater cost for charts for which there is a limited demand than for a chart which is sold by the thousands of copies.

An alternative method would be to obtain a high yield profit by increasing the cost of charts in great demand by a small amount such as $.25 or $.50. This would permit the low-demand charts to be sold at a nominal fee and offset any loss by the profit realized from the higher cost charts.

Because of existing legislation governing NOS pricing policy, little can be done to recover costs through chart sales without some form of new legislation. Therefore, the task group recommends that further investigations of pricing policy be deferred until later phases of this study.

APPENDIX D

APPENDIX D

INFORMATION COPY
8352

Assistant Director for Cartography

November 19, 1964

C-8352

Chief, Nautical Chart Division

Prerequisite Study for Nautical Chart Specifications

1. Purpose

This study is intended to provide preliminary background information and comprehensive guidelines for the vertical and horizontal accuracies needed for Nautical Charts.

2. Administrative Procedures

The responsibilities, procedural steps, and timetables for this study were established on 10/30/64. Mr. D. Benson, Chief, Verification Section was assigned to prepare an outline and method of attack on 11/18/64 with advisory aid from Mr. E. Thomas, Cartographer. The first preliminary draft is to be submitted by 11/27/64. Approval or modification of this draft shall be completed by 12/1/64.

3. Objectives and Goals

The objective of this study is to determine accuracy specifications of source data to be applied to nautical charts.

These specifications will be applied to Bureau surveys as well as data from other sources, and are intended to expedite data processing of automated and hand processed records.

4. Techniques to be Used for Preliminary Report

1. Develop and prepare a statement for each classification of the present nautical chart as generally related to:

a. Scales involved.
b. General depth range.
c. Describe intent or user needs.

2. Label without specifically defining the general vertical and horizontal accuracies believed essential to each of the chart classifications.

a. By geographic area.
b. Nature of the bottom.
c. Major feature charted.

Everyone is aware of the many special or specific problems which shall arise in the determination of these specifications so the November 27, and the December 1 report shall include only general categories and general accuracies. The full impact of the proposal can be further discussed before final recommendations are made.

Lorne G. Taylor

Report pending 6/65

APPENDIX E

FORM CD-121 (PRES. BY A.O. 206-10)

UNITED STATES GOVERNMENT

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

Memorandum ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION

Pilot Approved

TO : Chief, Nautical Chart Division
Through: Operations Officer, Nautical Chart Division

DATE: July 28, 1965

In reply refer to:

FROM : D. Benson, E. Thomas, L. Evans

(at the logical beginning of the decision making process – before data is applied to the drawings)

SUBJECT: Chart Specifications Group, proposed plan

This proposed approach to the writing of detailed charting specifications is submitted in response to your oral instructions of July 15, 1965.

With your approval we propose to combine the preparation of charting specifications with the implementation of the pre-compilation review concept in the following procedures:

Procedure A

1. The 5 reviewers generally assigned to conventional charts would each spend 4 hours each week making pre-compilation reviews of charts in their geographic area.

2. A chart recorded at 20 weeks on the exhaustion report would be prepared for pre-compilation review by the appropriate reviewer. The reviewer will make a written statement which relates his decision on charting data from the document. His justification for the action to be taken will be written at that same time. The statement will specifically relate the decision making to a general chart specification.

Procedure B

1. The reviewers would meet once a week for one hour with D. Benson, E. Thomas, and L. Evans to discuss briefly and correlate their specifications.

Procedure C

1. As each item of the chart specifications would become acceptable to the majority of the group it would form part of an overall draft of charting specifications.

2. The specification must describe certain qualities of guidance for compilation. If it is a specification which can be generally related to an image size, scale of the display or to a specific image then this should be coordinated with the description already prepared for chart symbolization.

General

E. Thomas would record cartographic decisions and serve as recorder, as well as Automatic Data Processing advisor to this group.

This approach would serve a 3-fold purpose:

1. It will be a starting point for writing of specifications for charts based on analysis of the source data.

2. It will get us started on (see note the idea of putting the most experienced cartographers in the driver's seat. Analysis and evaluation of source data at this point in the operation, once fully implemented, should increase production significantly by:

   a. Avoiding wrong decisions by personnel whose limited experience does not provide the best judgement.

   b. Avoiding most differences of opinion as to the proper treatment to be made by allowing the reviewer to express his approach first.

   c. Speeding up the decision processes because the more experienced man would arrive at conclusions more quickly. The training of the less experienced personnel should also benefit by this technique.

   The factors expressed in a and b would both tend to reduce drastically the need for kick-backs of revisions to the drawings from the reviewer to the compiler.

3. This approach is a direct transitional step to the application of information where the reviewer will have to direct the flow of data from the source document to the compilation.

Justification

Although this approach will not produce chart specifications as rapidly as one with an all-out concentration on specifications alone, it appears to be a good approach for several reasons:

1. By relating each item of the specifications to its actual application the reviewer will achieve better results and more reliable analysis than to use a purely hypothetical approach.

2. The potential benefits to the present production schedules, and to preparing for any transition to a new system from this method will compensate for any "loss" of time from regular production.

3. Until automated data processing can be finalized, or at least until present planning can be more fully developed, we will not know the entire specification requirements. It is realized that specifications have to be recorded more adequately than is done under the present system. Speed toward automated systems should not be directed as a paramount consideration at this time. It is much more realistic to get started, develop a procedure which will provide a means for specification development and allow both the manual system and the future automated system to profit.

David Evans [illegible]

Douglas H. Benson

Ernest E. Thomas

(1) 5 hours/man/week -no more!

(2) I am interested in knowing exactly what will constitute a pre-compilation review. In my opinion the reviewers should be cautioned that this does not include detailed instructions for the graphic portrayal - sounding selection etc. The review operation will lose some value at best. If care is not [illegible] HFS [illegible]

I concur with HFS, but idea is in right direction and should be tried. [illegible] 7/29/65

APPENDIX F

UNITED STATES GOVERNMENT

Memorandum

U.S. DEPARTMENT OF COMMERCE
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
COAST AND GEODETIC SURVEY

TO : Director

DATE: March 10, 1970

In reply refer to: C32x1

FROM : Chief, Marine Chart Division

SUBJECT: Request for approval for revision of Nautical Chart Manual

The present Nautical Chart Manual (NCM), 6th (1963) Edition, requires extensive revision. There have been so many memos and cartographic orders to amend or supplement the Manual that an updating of the current edition is not feasible.

We propose to initiate preparation of a new 7th Edition, organized along the provisions of the C&GS Directives System (EM 75-01/5-9-69). The plan would be to issue separate chapters or sections as they are ready, each issue to supersede the existing NCM and memoranda to a clearly stated degree. The order of issue would be governed by priority needs, but numbered according to an overall outline.

We plan to organize the 7th Edition to provide the best feasible correlation with Chart No. 1 (Symbols and Abbreviations). Appropriate references will also be carried to the IHB Technical Resolutions to assure better coordination with and awareness of international standards. The attached outline of the proposed organization of the manual is in preliminary form. If the concept is approved, the outline will be completed in greater detail to assure proper coordination.

This plan would allow the preparation of a revised manual without an unfavorable impact on the Marine Chart Division program and without the need for special funding. Distribution would be limited to those within C&GS with a definite need for the manual. Reproduction would be by direct reproduction of typescript.

Recommendations regarding issue of the completed manual for wider distribution will be considered as the job progresses. However, I question the justification for a formal publication beyond the needs for internal C&GS use and a limited exchange within the nautical charting community. We understand that there was very little demand

on the Superintendant of Documents for the public sale stock of the 6th Edition.

Approval to proceed with the proposal as outlined is requested.

John O. Boyer

John O. Boyer

Attachment

Recommended Approval:

Associate Director
Hydrography and Oceanography

Acting Director, Executive and
Technical Services Staff

Approved:

3/17/70

Director

See attached minute memo to C from C x 1 and my notes thereon.

DA

APPENDIX G

APPENDIX G

DISTRIBUTION OF CONVENTIONAL CHARTS BY AREA - FY 1970

Distribution Figures	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
0-99						56
100-199			6		10	47
200-299		1	8	1	7	23
300-399	1	1	8	1	10	16
400-499			6	1	6	11
500-599	2	2	3	1	2	12
600-699	2	3	4	1	3	6
700-799	2	4	1		5	2
800-899	2	1	3	1		3
900-999	4	2	1		2	10
1000-1099	30	8	15	4	12	45
2000-2999	14	3	9	1	8	14
3000-3999	13	10	8	14	13	20
4000-4999	12	10	8	10	10	3
5000-5999	7	11	3	7	10	4
6000-6999	5	6	3	5	11	3
7000-7999	5	4	5	2	4	2
8000-8999		3	2	2	2	
9000-9999		3	1	3	1	1
> 10000	8	9	4	3	1	1

DISTRIBUTION OF CONVENTIONAL CHARTS BY AREA - FY 1971

0-99						45
100-199	1		5		10	81
200-299	3		6		11	29
300-399	1		4		8	18
400-499	1		2	1	1	11
500-599	2	3	2	1	5	6
600-699	4	2	2	1	7	16
700-799	2	2	1		5	8
800-899	3	2	4		2	10
900-999	2	1		1	1	8
1000-1999	20	10	14	4	11	23
2000-2999	11	5	7	10	13	13
3000-3999	15	14	7	10	11	5
4000-4999	13	10	12	9	12	1
5000-5999	10	9	7	6	8	2
6000-6999	5	9	5	6	7	2
7000-7999	2	3	3	4	1	
8000-8999	2	3	3	1	1	
9000-9999	3	4	2	2	1	
> 10000	6	6	4	1	2	

DISTRIBUTION OF CONVENTIONAL CHARTS BY AREA - FY 1972

Distribution Figures	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
0-99						73
100-199			4		2	68
200-299	2	1	5	1	12	26
300-399	1		4	1	9	23
400-499	2	2	1	1	11	10
500-599	2	5	3	1	6	10
600-699	2		1		4	5
700-799	3		1		2	5
800-899	2	3	3	1	3	5
900-999	3	1				6
1000-1999	18	11	11	4	8	22
2000-2999	12	8	7	12	16	17
3000-3999	17	12	17	13	12	3
4000-4999	17	15	12	10	17	5
5000-5999	11	6	9	5	4	
6000-6999	3	4	4	3	2	1
7000-7999	2	5	4	3	4	
8000-8999	1	3		1	3	
9000-9999	1			1		
> 10000	7	7	4		2	

LIST OF CONVENTIONAL CHARTS WHICH DISTRIBUTED LESS THAN 200 COPIES IN 2 OUT OF THE 3-YEAR PERIOD - 1970, 1971, AND 1972

681	6162	8227	8532	9020	9370
915	6163	8228	8540	9021	9381
922	6168	8229	8541	9022	9382
923	6169	8239	8573	9023	9383
924	6170	8241	8665	9024	9403
4101	6404	8242	8666	9025	9450
4104	8083	8246	8667	9052	9451
4111	8124	8247	8700	9103	9453
4113	8141	8253	8705	9120	9457
4114	8146	8254	8710	9121	9459
4118	8147	8260	8833	9123	9460
4121	8151	8261	8834	9124	9462
4122	8162	8264	8841	9127	9464
4123	8164	8265	8993	9128	9467
4136	8168	8266	8994	9130	9468
4164	8171	8271	8995	9139	9470
4167	8172	8272	9005	9140	9471
4172	8173	8280	9006	9141	9473
4177	8174	8457	9007	9147	9474
4188	8210	8521	9003	9149	9476
4191	8216	8523	9009	9180	9478
4193	8218	8524	9018	9198	
5971	8224	8525	9019	9369	

LIST OF CONVENTIONAL CHARTS WHICH DISTRIBUTED GREATER THAN 10,000 COPIES IN ANY 1 OF THE 3-YEAR PERIOD - 1970, 1971, AND 1972

353
369
400
562
582
905
1000
1002
1003
1007
1108
1109
1111
1112
1113
1116
1207
1208
1209
1210
1211
1212
1213
1215
1218
1222
1223
1224
1225
4102
5101
5142
8201

LIST OF CONVENTIONAL CHARTS WHICH DISTRIBUTED UNDER 200 COPIES IN EACH 3-YEAR PERIOD - 1970, 1971, 1972

4108

4195

8214

8546

8704

8822

9010

9030

9129

9146

9374

9402

9452

9454

9455

9456

9458

9461

9463

9465

9466

9469

9472

9475

9477

The following small-craft charts distributed less than 1000 copies:

1970	1971	1972
310 SC	166 SC	248 SC
311 SC	310 SC	310 SC
314 SC	311 SC	311 SC
518 SC	518 SC	314 SC
634 SC	634 SC	634 SC
635 SC	635 SC	635 SC
682 SC	682 SC	682 SC
891 SC	865 SC*	895 SC
	866 SC*	896 SC
	867 SC*	897 SC
	895 SC*	898 SC
	896 SC*	
	897 SC*	
	898 SC*	

The charts marked with an asterisk were issued as new charts during this 3-year period. All charts except 682 are on a 1-year edition cycle.