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UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

COMMUNITY AND ECONOMIC  
DEVELOPMENT DIVISION

February 22, 1977

The Honorable Robert M. White  
Administrator, National Oceanic and  
Atmospheric Administration  
Department of Commerce



Dear Dr. White:

We recently completed a general survey of the activities of the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Survey (NOS). One phase of our survey focused on NOS's production and distribution of aeronautical and nautical charts. We identified certain weaknesses in NOAA's management of its charting operations which we wish to bring to your attention.

Our survey was performed at NOAA and NOS headquarters in Rockville, Maryland, and at the Pacific Marine Center in Seattle, Washington. To obtain information on the present system of production and distribution, we also reviewed the operations of the Chart Reproduction Division in the Main Commerce Building, and the Chart Distribution Division in Riverdale, Maryland.

Among other things, our survey covered accounting controls; pricing policy; funds management; production and inventory policies, including allowable spoilage, inventory adjustments, and condemnations; contracting out versus in-house production decisions; and chart inventory and sales controls at NOS chart sales outlets.

We believe there is a need to improve overall management direction and policy with regard to NOS's charting operations. Specifically, there is a need for better budgetary controls and cost accounting for the production of charts, chart pricing policies, management of appropriations and Public Law 91-412 funds, controls over production of charts, informational data with which to make analyses of contracting out versus in-house production of charts, and controls over inventory and sales of charts at NOS chart sales outlets. These matters are discussed below.

MANAGEMENT OF CHART PRODUCTION  
COMPLICATED BY INADEQUATE  
ACCOUNTING SYSTEMS

NOS has considerable difficulty in accurately accounting for the cost of producing charts. It also has problems in matching revenues

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from the sales of charts to costs of producing the charts. As a result, it does not have adequate information on profits and losses with which to measure and analyze the results of its operations.

Pursuant to Public Law 88-441, NOS is required to price charts so as to recover certain specified costs of production and distribution. NOS is required to include in the price of its charts to the public all expenses incurred in actual reproduction, including photography, opaquing, platemaking, press time and binding operations; the full postage rates, according to the rates for postal service used; and any additional cost factors deemed appropriate by the Secretary, such as overhead and administrative expenses allocable to the production of the charts and related reference materials. In 1972, NOAA developed a pricing formula which spells out which costs are to be recovered in establishing selling prices for charts.

Public Law 91-412 authorized the Secretary of Commerce, upon the request of any person, firm, organization, or others, public or private, to make special studies on matters within the authority of the Department of Commerce; to prepare from its records special compilations, lists, bulletins, or reports; and to furnish its studies, compilations, and other records upon the payment of the actual or estimated cost of such special work.

Public Law 91-412 provides that the payments for work performed under the Act be deposited in a separate account or accounts which may be used to pay directly the costs of such work or services, to repay or make advances to appropriations or funds which do or will initially bear all or part of such costs, or to refund excess funds when necessary.

NOS uses Public Law 91-412 as authority for a revolving fund to finance chart operations. Under this procedure, NOS reimburses the appropriation accounts which bear the initial cost of production with sales receipts accumulated in the Public Law 91-412 account. However, we could find no evidence that a revolving fund account symbol has been secured from the Treasury Department nor does the revolving fund account appear in the President's budget.

Cost accounting system  
needs improvement

NOS's cost accounting system does not provide the cost information necessary to adequately and accurately determine the cost of producing charts. Accordingly, NOS does not have accurate cost data upon which to base chart prices, pursuant to Public Law 88-441. Also, cost data has not been accurately distributed between Public Law 91-412 accounts and appropriation accounts.

NOS's cost accounting system is a part of NOAA's "Financial Management System" (FIMA). FIMA, a semi-automated process for planning and monitoring the execution of the budget, has been in operation since July 1973. FIMA relies on properly executed "Cost Operating Plans" which are the primary budget system source documents for the collection of planned information. Cost Operating Plans support FIMA by providing the basis for administrative control of funds.

NOS has experienced problems with regard to the use of the FIMA system. A November 14, 1975 NOS position paper entitled, "Adequacy of Funding Procedures to Support the National Ocean Survey Aeronautical Charting Mission" states, "The FIMA System is an excellent vehicle for maintaining awareness at the program level; however, the capability to manage projects and assessments at the lower levels has been inadequate. This has resulted in incorrect accounting of cost data and the development of inaccurate estimates for both chart products and reimbursable tasks."

A primary reason for the lack of accuracy was the flexibility allowed under NOS's task number accounting system. The task number structure was such that NOS officials had wide flexibility to make decisions whether a cost should be considered a direct cost or general overhead cost. Costs which were direct and could be directly related to a job were charged to general overhead and the costs spread between several jobs, resulting in cost distortions. For example, ink is a direct material cost of production and is fully accountable under Public Law 88-441. NOS has been charging the cost of ink to the Management Fund, which is the general overhead operating account. At the end of an accounting period, the Management Fund is distributed to total chart production operations, including reimbursable accounts; public law accounts; and operations, research and facilities accounts. This results in the public law accounts being understated and the reimbursable and operations, research and facilities accounts being overstated.

Under its present cost accounting system, NOS has also not developed standard costs of production for various series of charts. Accordingly, it is unable to utilize management tools, such as variance analysis as a benchmark for determining and evaluating how well it is doing in keeping chart production costs in line with a standard, or analyzing reasons why a particular cost exceeds or does not meet the standards.

#### Inconsistencies in pricing policy

Although NOS developed a pricing formula in 1972 to determine which costs were to be recovered in establishing selling prices for charts, we found that NOS was inconsistent in its application of the formula. In particular, we found that in fiscal years 1974 and 1975,

various costs which were to be included in determining a chart's price were deleted from the formula. The cost deletions were as follows:

--In 1974, per unit cost for charts was computed only on a 9-month basis, and Reproduction Office Overhead expenses were deleted.

--In 1975, per unit cost for charts was computed only on a 6-month basis, and Reproduction Office Overhead and Department of Commerce overhead expenses were deleted.

NOS officials could give no reason why these costs were left out. No policy statements or memos could be found to justify these changes. The personnel responsible for making the decision to delete costs are no longer employed with NOAA.

Although the net effect was that not all recoverable costs were included in the formula to determine chart prices, we also noted that NOS officials often only use the formula as a benchmark guide. They also take into consideration other factors including the need for additional revenue to finance contingencies and the price that is being paid in the open marketplace for like products to determine what price they will charge for their charts. This could result in charts being priced higher than necessary to recover costs. For example, we found that, although NOS computed the unit cost for Conventional Nautical Charts for fiscal year 1976 to be about \$1.55, the retail price was \$3.25.

Because of its inadequate cost accounting system and inconsistencies in pricing policy, NOS often does not know what the costs of producing a particular chart series are. In this regard, NOS's fiscal year 1975 annual report on charting operations shows that nautical charts, in total, are being sold at a profit, thus subsidizing aeronautical charts, which, in total, are being sold at a loss. However, the NOS official in charge of chart production informed us that the figures in the annual reports are not reliable and it is his feeling that aeronautical charts are actually subsidizing nautical charts.

Questionable management of  
sources and uses of funds  
from chart operations

NOS has not adequately managed its receipts from the sales of charts with regard to credits to Public Law 91-412 accounts and appropriation accounts.

Funding for the production of NOS charts is provided by appropriations, reimbursements from other Federal agencies, sales-agent revenues, subscription income, and direct sales. During 1972, NOAA planned to seek Congressional approval to establish a revolving fund

to finance chart operations. However, after discussing the matter with the Department of Commerce's General Counsel, NOAA decided to use Public Law 91-412 as authority for a revolving fund to finance, among other things, chart operations, rather than seek authority to establish a specific revolving fund for chart operations.

NOS has accumulated fairly large balances in the Public Law 91-412 account. This seems to indicate that either prices are too high in relation to expenses or costs are not being properly distributed between appropriated accounts and Public Law 91-412 accounts.

On September 1, 1972, NOAA began using the Public Law 91-412 account as a repository for receipts from the sale of charts to the public. Prior to that time, these monies had been deposited to the Treasury as miscellaneous receipts. The monies collected between September 1, 1972, and December 31, 1972, were to be restricted to a level equal to the NOAA liability for prepaid subscriptions. This liability was estimated by NOS to be about \$750,000. Funding for chart operations was officially phased over to the Public Law 91-412 account on January 1, 1973, at which time the balance in the account was about \$1.5 million. By May 31, 1973, receipts totaling about \$2,473,000 were reported by NOS as being deposited to the Public Law 91-412 account. As of June 30, 1973, the Public Law 91-412 account had a balance of about \$2,250,000. NOAA has continued to operate under the Public Law 91-412 account, and has received funds into and made several large disbursements of funds from the account. As of June 30, 1976, the account balance stood at about \$2,762,000.

CPA firm's review of  
NOS's accounting system  
for chart operations

During the summer of 1976, a Certified Public Accounting firm was hired to make a preliminary study of NOS's accounting for chart operations. In its study the firm reviewed the overall management of funds, cost accounting for chart production, inventory control, and chart pricing policies. The firm noted various deficiencies in NOS's accounting procedures and made several recommendations including:

- Costing, pricing, financial planning, and reporting should be all tied together;
- Use a standard cost approach to accomplish this. This approach provides a more accurate method of determining product costs and prices, means for measuring actual costs and determining differences by cause, and the basis for financial planning;
- Establish selling prices to permit breakeven based on standard cost plus contingency provision;

- Change selling prices on a fiscal year basis to coincide with development of standard costs and financial planning;
- Change prices more frequently if conditions warrant;
- Perform sales and cost of sales analysis by product/product series using standard costs;
- Perform variance analysis by cause of variance;
- Review and modify, if necessary, systems or procedures for recording, summarizing, and reporting chart quantities shipped; and
- Re-evaluate, in terms of propriety of charging to that fund, certain costs presently charged to the management fund, e.g., supervision in reproduction division.

Some improvements  
being made by NOS

We discussed the lack of accounting and pricing controls with officials of NOS's Office of Program Development and Management and the Office of Aeronautical Charting and Cartography (AC&C). AC&C is responsible for multi-year mapping and charting programs. It provides control for production management, implementation of policies, improvement of production techniques and procedures, and the development and validation of production and process standards.

The officials agreed that the problems we outlined existed. They said that the problems have just recently surfaced and certain actions have been taken to alleviate some of the problems. They informed us, however, that with their present accounting capabilities, it will be some time before other problems, especially those involved in the cost accounting area, including the establishment of standard costs and variance analysis, could be resolved.

Actions which NOS officials advised us were being taken included the following:

- AC&C is developing an operational procedures manual. All directives sent to change operational procedures will become policy;
- AC&C has developed a job task numbering system for all costs of production. This system was implemented in October 1976. According to AC&C, this system will assure accurate accounting of all Public Law accounts; and
- AC&C has developed an all-inclusive pricing formula for estimating chart prices.

While we believe that the actions indicated by NOS should improve its control over chart operations, we believe also that the remaining deficiencies in budgetary controls, cost accounting, funds management, and pricing policies warrant immediate attention, especially since such improvements are necessary if NOS is to fully comply with Public Law 88-441. We believe that the Administrator of NOAA should place a high priority on making such improvements.

Recommendation to the  
Administrator of NOAA

We recommend that the Administrator of NOAA direct NOS to improve management of its chart operations by

- developing an adequate cost accounting system for the production of charts. In developing such a system, NOAA should give careful consideration to using a standard cost approach which would enable it to accurately determine product costs, perform variance analysis, and improve its financial planning.
- consistently applying its all-inclusive pricing formula to accurately estimate chart prices and ensure that charts are priced in accordance with requirements set forth in Public Law 88-441.
- improving management of funds from the sale of charts by accurately planning its funding requirements and insuring that production and distribution costs are accurately matched to funding sources; namely appropriations, reimbursements from other agencies, sales-agent revenues, subscription income, and direct sales.

NEED TO IMPROVE CONTROL OVER  
PRODUCTION AND INVENTORY OF CHARTS

There is a need for more definitive policy guidance statements and operations manuals dealing with AC&C's chart production and inventory operations. The lack of policy guidance and procedures has resulted in excessive production overruns, large inventory adjustments, and high chart condemnation rates. Each of these matters is discussed separately below.

Weakness in control over  
Chart Reproduction Division  
results in excessive overruns

AC&C's lack of policy guidance and procedures to the Chart Reproduction Division has resulted in excessive production overruns. On August 19, 1976, AC&C, for the first time, sent a directive to the Chart Distribution and Reproduction Divisions, which stated that "allowable overruns", including spoilage for Aeronautical-Visual and

Nautical Charts would be four percent of the quantity ordered. The directive stated also that all overrun copies would be placed in inventory at the Chart Distribution Division. Prior to the issuance of this directive, allowable overrun for spoilage was planned for seven percent of the quantity ordered and all overrun copies were discarded.

AC&C determined that, although the industry standard for printing jobs allowed for a seven percent spoilage factor, the Chart Reproduction Division could be operated at better than industry efficiency and spoilage could be held to a minimum. Accordingly, by decreasing the spoilage factor to four percent, and assuming the same level of efficiency, AC&C could reduce production costs by decreasing chart overruns.

In reviewing the receiving records at the Chart Distribution Division, we found that the Chart Reproduction Division had not been adhering to the August 1976 AC&C directive. Although the Chart Reproduction Division was placing chart overruns in the Chart Distribution Division inventory, it was continuing to plan its production for a spoilage factor greater than four percent. Consequently, chart overruns were still greater than necessary.

We advised AC&C officials that the Reproduction Division was planning its production for a spoilage greater than four percent. The officials stated they would review the situation and take such corrective action as necessary.

We believe AC&C should closely monitor chart production output and spoilage levels to assure compliance with its August 1976 directive.

Weak internal control results  
in high inventory adjustments

We found average inventory adjustments for various chart series for the five-year period covering fiscal years 1972 to 1976, ranging from .41 percent to 10.16 percent of total inventory. Inventory adjustments are defined by the Chart Distribution Division, as the difference between book inventory and physical inventory.

We believe that a primary reason for inventory adjustment rates being so large is the fact that the internal control system at the distribution center is weak. We believe a well-managed internal control system would do much to alleviate this problem.

With regard to internal control, we noted that, although delivery of charts ordered is made, inventory is not deducted from the records because order forms are misplaced before they are received by the branch responsible for maintaining inventory records.

Under the present system, order forms are received by the Order Processing Branch, where a mailing label is prepared. The form is then sent to the Chart Supply Branch, which completes the order, attaches the mail label and ships the order to the customer. The form is then supposed to be sent to the Records and Statement Branch, where deductions are made to the inventory records.

We discussed the need for improved internal controls over inventory with the responsible officials at AC&C and the Distribution Division. They agreed that improved controls were needed. The official at the Distribution Division said that they did have a check system to see that all orders were being completed and inventory being deducted from the records, but operation of the system required one man-year. When budget restrictions developed, the check system was dropped. They also stated that presently software is being developed for their new computerized inventory system and that, with the computer, internal control weaknesses will be alleviated.

We agree that a computerized inventory control system can improve the internal control of the Distribution Division. We believe, however, that for such a system to be effective, adequate document control also must be established. In this regard, we believe AC&C should consider using a multi-copied order form so that the branch responsible for maintaining inventory records would get a file copy which it could reconcile with the original after the order has been filled.

#### High condemnation rates of charts

We found average condemnation rates for various chart series for the five-year period covering fiscal years 1972 to 1976, ranging from 2.61 to 33.77 percent of total production. Also, yearly rates have remained constant or increased over the previous rates. We believe sufficient chart market demand analysis has not been undertaken by AC&C to bring the condemnation rates down to acceptable levels.

We reviewed condemnation rates for fiscal years 1972-1976 for 25 chart series including 10 Nautical, 7 Aeronautical-Visual and 8 Aeronautical-Instrument. According to the officials of AC&C and the Chart Distribution Division, average condemnation rates should be approximately seven percent.

We found overall five-year averages for units condemned from FY 1972 through FY 1976, to be 16.15 percent for the Nautical chart series; 17.20 percent for Aeronautical-Visual series; and 20.63 percent for the Aeronautical-Instrument series. Only seven chart series--two Nautical and five Aeronautical-Instrument--were in line with the seven percent optimum.

We discussed high condemnation rates with the responsible officials at AC&C and the Chart Distribution Division. The production

manager at the Chart Distribution Division said that he realized the condemnation rates were high in the past, but many uncontrollable variables had developed to cause the higher increase in FY 1976. Two which he noted were (1) the price increase, which was effective April 1975, raised many chart prices from \$1.85 to \$3.25 and resulted in a noticeable decline in sales; and (2) the U.S. Coast Guard has developed a nautical longitude and latitude locating system called the "Loran System C"; with this system being put into operation, the distribution center was required to update and revise many charts before the charts' shelf life was depleted.

The officials also said that the computer system which is being installed will enable them to better manage the approximately 900 Nautical, 110 Aeronautical-Visual and 4,025 Aeronautical-Instrument Charts which are now managed manually. The system is expected to be fully implemented in about 8 months.

We recognize that many different market variables, such as price changes, new technologies, weather conditions, and economic conditions, enter into the demand for charts. However, we believe that NOAA should carry out more formal market analyses so that it can better interpret demand for its charts. For example, had NOAA kept abreast of market developments, it could have anticipated its own price increases and Coast Guard's development of the "Loran System C."

We agree that when the computer system is operational, AC&C should have greatly expanded capacity to collect, store and analyze data on chart production, past market demand, and anticipated future demand. Accordingly, we believe that when the computer system is operational, NOS should develop a program to try to more accurately determine chart production quantities, based on potential demand for the chart. Such a program should take into account past and future market demand for charts, and should include factors such as anticipated price increases, and improved technologies.

Recommendation to the  
Administrator of NOAA

We recommend that the Administrator of NOAA direct NOS to

- improve production efficiency by closely monitoring chart production output and spoilage levels.
- improve inventory control at its Chart Distribution Division. In this regard, NOAA should give consideration to instituting a double checking system for inventory control by using a multi-copied order form.
- attempt to reduce chart condemnation rates by developing a computer program to more accurately determine chart production

quantities based on the potential demand for the chart. Such a program should take into account past and future market demand for charts, and include factors such as anticipated price increases and improved technologies.

LACK OF ADEQUATE DATA TO  
MAKE CONTRACTING-OUT VERSUS  
IN-HOUSE PRODUCTION DECISIONS

NOS does not perform cost analyses to determine which chart production projects could be carried out more efficiently under contract rather than in-house, nor does it accumulate adequate data with which to make such studies.

Guidelines for outside contracting are defined in the Office of Management and Budget's Circular A-76, which states that a new start (in-house production) should not be initiated until the possibilities of obtaining the product or service from commercial sources have been explored. Further, a systematic review of existing commercial or industrial activities (including previously approved new starts which have been in operation for at least 18 months) should be maintained in each agency, under the direction of the agency head or the person designated by him as provided in the circular.

In a 1973 NOS study entitled, "Rising Chart Prices--Reasons For And Efforts To Reduce Them - NOS vs: Commercial Chart Products", researchers concluded that savings could be realized not only through production efficiencies, but also through product modifications, increased sales to reduce unit cost, chart costing procedures, inventory procedures and utilizing commercial printing and distribution under contract.

A 1974 Department of Commerce internal audit of the AC&C's Reproduction Division's activities recommended that the AC&C investigate and determine which of its printing workloads could be accomplished more economically by outside contractors. Investigators cited that outside contracting could be beneficial in reducing the costs relative to excess idle machine time and unproductive manpower hours incurred by maintaining extra staff and equipment to meet peak workloads.

We found that many of the above mentioned recommendations and policies have remained unheeded.

Interviews with personnel at the Reproduction Division's printing and bindery operation point up continued problems with excess idle machine time; 20.7 percent from June 1975 to March 1976, as opposed to 10 to 15 percent for industry averages. Staff personnel for aeronautical chart production stated that they were attempting to eliminate this slack time through contracting out negative engraving and other processes which tend to impede a steady flow to the printing

phase. However, examination of contracts from June 30, 1975, to September 30, 1976, revealed only contracts for printing and bindery operations and no contracts for negative engraving.

No contracting-out versus in-house cost analysis is currently performed to determine whether various projects, charts, maps, information booklets, etc., could be more efficiently produced in-house as opposed to contracting-out. According to the production chief, the staff presently does not have the expertise to perform an analysis of the in-house versus commercial product-mix to judge if certain activities might be more efficiently performed by private industry and vice versa.

In considering whether a project should be jobbed out, the aeronautical production staff appears to only consider the following variables:

- Will the project fit into the existing production schedule?
- Does the Reproduction Division have the manpower to perform the necessary negative engraving, drafting, etc., in a timely fashion to meet the legal requirements of the various aeronautical publications?
- Does the product require special machinery beyond the capability of the Reproduction Division's printing and bindery operation?

As previously noted, NOS has instituted a revised cost classification system, the job task numbering system, which should aid upper management in determining what production costs are being incurred. While this is a good basis for further analysis, we believe AC&C must still develop the capability to project this information into a broad overview of the production operation, so that it can make contracting-out versus in-house cost analysis upon which to base chart production decisions.

Recommendation to the  
Administrator of NOAA

We recommend that the Administrator of NOAA direct NOS to develop the necessary data with which to determine the most cost effective method for producing charts.

INADEQUATE CONTROLS OVER INVENTORY  
AND SALES OF CHARTS AND PUBLICATIONS  
AT NOS CHART SALES OUTLETS

NOS has not issued policy directives on inventory or sales procedures to be used to maintain adequate control over chart inventories and sales at its chart sales outlets.

Our survey at the Pacific Marine Center (PMC) disclosed inadequate inventory practices to assure that all charts and other NOS publications received, sold, or given away are properly accounted for.

To assure that all products and product receipts are properly accounted for, it is important to have records showing the number of products on hand at the beginning of the period; number of products requisitioned and received from headquarters during the period; number of products sold, given away, and condemned during the period; number of products on hand at the end of the period; and receipts for products sold.

In addition, actual inventory and cash on hand should be reconciled regularly with the inventory and sales receipt records.

PMC sales personnel only maintain receipts records for products sold. PMC has not maintained the other records described above, has not taken actual inventories, and has not reconciled actual inventories with inventory and sales receipt records. The PMC employee in charge of the PMC sales activity said that the only guidance he has received dealing with inventory and sales procedures was given to him orally by an NOS headquarters official who is now retired.

We believe NOS should improve sales and inventory control at its sales outlets by establishing and implementing the necessary procedures to provide for proper accounting for chart sales and inventories at its sales outlets.

Recommendation to the  
Administrator of NOAA

We recommend that the Administrator of NOAA direct NOS to improve sales and inventory control at its sales outlets by establishing and implementing the necessary procedures to provide for proper accounting for chart sales and inventories at its sales outlets.

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We wish to acknowledge the cooperation given to our representatives during this phase of our survey. A copy of this report is being sent to the Assistant Secretary for Administration, and the Director, Office of Audits, Department of Commerce, and the Director, National Ocean Survey, for their information. Your comments or actions taken or contemplated on the above matters would be appreciated.

Sincerely yours,



William L. Martino  
Assistant Director