

# COMPUTERIZED COAST PILOTS

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*IHB Note.* — The reader wishing to study other aspects of this subject may refer to :

- *International Hydrographic Review*, XLVII, No. 1, January 1970, pages 143-153 : "U.K. Hydrographic Office conducts searching review of Sailing Directions", by Captain V.A. MOITORET, U.S. Navy (Ret.).
- *International Hydrographic Bulletin*, IX, September 1970, pages 320-323 : "NAV-OCEANO — New concepts in Sailing Directions", by John C. MARTIN and Charles R. McLOUD, U.S. Naval Oceanographic Office.

## EXPLANATION

Since the first sailing directions were published in the 18th century, the printing of marine data has been a slow process. The advent of computers has changed all of this. It is now possible to produce publications in a fraction of the time it took even 10 years ago. This article describes the method of publishing the 1970 edition of U.S. Coast Pilot 4, Atlantic Coast-Cape Henry to Key West, by an automatic photocomposition system.

## INTRODUCTION

The Coast Pilots of the Coast and Geodetic Survey (C & GS) are a series of eight books consisting of from 200 to 350 pages each that contain important marine information about coasts and harbors of the United States, including Puerto Rico and the Virgin Islands. Subjects include landmarks, navigation regulations, channels, anchorages, dangers, routes, weather, ice, pilotage, customs, and port facilities. Most of this information cannot be shown graphically on nautical charts and is not readily available elsewhere.

The history of Coast Pilots, or Sailing Directions, goes back many centuries. One writer says the Egyptians produced such a work between the sixth and fourth centuries, B. C. In 1796, Edmund March BLUNT (1770-1862)

of Newburyport, Massachusetts, published the American Coast Pilot, which was not the first such book of American waters but was the first published in the United States. BLUNT's Coast Pilot was in its 21st edition when the copyright was sold to the United States in 1867.

The first formal Coast Pilots issued by the C & GS were the two 1869 volumes in which Professor George DAVIDSON (1825-1911) described the coasts of California, Oregon, Washington, and Alaska. These were followed in 1874 by a Coast Pilot that described the Atlantic Coast from Eastport, Maine, to Boston, Massachusetts.

Since then more than 50 different volumes have been issued, but today the information has been consolidated into the following eight books : Atlantic Coast — 1, Eastport to Cape Cod; 2, Cape Cod to Sandy Hook; 3, Sandy Hook to Cape Henry; 4, Cape Henry to Key West; 5, Gulf of Mexico, Puerto Rico and Virgin Islands; Pacific Coast — 7, Pacific Coast and Hawaii, 8, Alaska, Dixon Entrance to Cape Spencer; and 9, Alaska, Cape Spencer to Beaufort Sea. In 1958, Coast Pilot 6, Puerto Rico and Virgin Islands, was combined with Coast Pilot 5, Gulf of Mexico.

In 1967, a questionnaire was mailed to masters of merchant vessels through their operating agencies, commanding officers of U.S. Coast Guard and Coast and Geodetic Survey vessels, Pilot Associations, U.S. Power Squadrons, and the U.S. Coast Guard Auxiliary. The purpose of the questionnaire was to determine the adequacy of Coast Pilots for the present day mariner. "Yes-no" answers were solicited to certain proposals, and users were requested to comment on specific subjects of interest to them. Replies far exceeded C & GS expectations and provided a sound basis for evaluating the subjects included in the publications. As a result of the survey, new editions published after 1967 have been streamlined to eliminate detailed information, obvious from the largest scale chart. This includes details about individual bridge and overhead cable clearances over minor waterways, depths in places not used by general navigation where large-scale charts have been produced in recent years, and controlling depths of channels where the information is tabulated on the charts. In the case of major channels, the Coast Pilot gives the dredging (project) depth and a statement as to the stability of the channel. To comply with the request of many mariners, more detailed information about port facilities is included in the new editions. Many requests were received to print Coast Pilots in larger type and in looseleaf form to eliminate the annual supplements.

### PROCESSING DATA

A new edition of each Coast Pilot is published about every 4 to 10 years, and cumulative supplements are issued annually. New editions are prepared only after a thorough field inspection by special Coast Pilot ship or shore parties. The inspection is necessary to verify or revise all statements in the

pilot, to delete material no longer of value, and to add new worthwhile information.

The annual supplements are prepared from reports received during the year. They include reports from C & GS ship and shore parties, Notice to Mariners, merchant and government vessels, small craft, local port authorities, other government agencies, U.S. Power Squadron, U.S. Coast Guard Auxiliary, and others.

The printer's manuscript is prepared from Coast Pilot field inspection reports and updated as necessary from subsequent marine information received. The pages are typed double space and the copy is marked to show how the pages are to be printed, including geographic names and other information to be printed in boldface type. The index is prepared on 3-by-5-inch cards from page proofs of a new edition. These cards are checked, arranged in alphabetical order, and sent to the printer for type-setting. A page proof of the index is also proofread.

The text is set on Linotype machines (hot type) at the Government Printing Office in 8-point type. After proof of a book is approved for printing, reproduction pages are made from the "hot type" to produce negatives, and the job is run by offset press. The books are sewed and have buckram covers to withstand wear for a 5-year period. All of this work is time consuming, because it takes 6 months or more from the time the manuscript is submitted to the printer until the finished product is available for distribution. So that the user may have an up-to-date book, a supplement is published in the Notice to Mariners at the time the book is advertised for sale, and a cumulative supplement is issued annually until another new edition is printed.

It was never economically feasible to issue Coast Pilots in looseleaf form because of the high cost of setting type for the annual change pages and the printing problems involved in preparing changes to fit the pages in the books; changes reported each year would have required reprinting over 40 percent of the total pages of most volumes.

#### **AUTOMATIC DATA PROCESSING**

In 1966, the Government Printing Office installed an electronic photo-composer (Linotron) capable of producing graphic art quality typography onto photographic film or paper at the rate of 1 000 to 10 000 characters per second (5 to 10 seconds per page) from magnetic tape. Representatives of the C & GS met with officials of the Commerce Department, the Government Printing Office, and Mergenthaler Linotype Company (developer of the Linotron), to determine whether the Coast Pilot series were suitable for the electronic composing process at a saving in cost and in time. All officials agreed that the Coast Pilots were ideal for electronic composition, but a programmer was not available in the C & GS to program the books and

funds were not available to have the work done by a private contractor. Attempts were made from time to time through the first part of 1969 to have the programming and keyboarding of Coast Pilots done by personnel within the government, but very little progress was made.

In October 1969, C & GS was contacted by a private contractor who requested a meeting to review printing problems and to determine whether the Coast Pilots could be automated at a saving in time and cost. Government representatives met with officials of Composition Methods, Inc. (CMI) to discuss the automation of Coast Pilots. It might be stated that systems analysts now with CMI were with the Mergenthaler Linotype Company when the Linotron was developed and installed at the Government Printing Office. After several meetings, it was determined that CMI could develop a computer file for Coast Pilots that would eventually save printing costs and reduce the publication time considerably. Because C & GS had completed field work for a new edition of U.S. Coast Pilot 4, Atlantic Coast, Cape Henry to Key West, and had a printer's manuscript ready, it was decided to use this edition as a "test-pilot" project and C & GS requested CMI to provide a proposal for programming and keyboarding.

A proposal was received from CMI to program and keyboard Coast Pilot 4 with an option to keyboard and incorporate annual changes in the Master Coast Pilot 4 File. The proposal also included a price for complete documentation of Coast Pilots in the event C & GS decided to do the work. Since funds were provided in the budget for a new edition of Coast Pilot 4 and the automation price was well within the allotment, a contract was let for a computerized file of the book.

### AUTOMATIC COMPOSITION

The procedure for preparing manuscript for automatic composition was the same as used for "hot type" composition — double spaced type-written pages marked by a blue underscore to show boldface items. In addition, the manuscript was marked with a red overscore to show those items that were to be indexed and the numbers of the largest scale charts covering the geographic features.

The manuscript was further marked by CMI by adding function codes for paragraphs, boldface, index items, and other special requirements. The data was then converted into machine-recognizable form by keyboarding. The paper tape produced by the keyboarding operation was processed through a File Creation and Maintenance System (developed by CMI) to produce the initial Coast Pilot File on magnetic tape. The computer used was an IBM 1130 equipped with a paper tape reader, two magnetic tape units, a printer, a disk, and a card reader/punch.

A computer printout of the file was prepared for proofreading. The corrections and changes marked on the proof print were keyboarded and

processed by the File Maintenance System to produce an updated and correct Coast Pilot 4 File on magnetic tape. This tape was sent to the Government Printing Office where it was used as input to the Master Typography Program (MTP).

The MTP is a complex computer program that establishes the format of a book from assigned parameter cards. Some of the routines are assignment of width of columns, length of page, justification, hyphenation, point size, and running chapter headings.

The output tape produced by the MTP was used as input to the automated photocomposer (Linotron) at the Government Printing Office. The Linotron produced on paper the fully made-up pages in 10-point Times Roman type for Coast Pilot 4, including the index in 8-point type, at the rate of six pages per minute. These pages were proofread by the C & GS and a corrected copy furnished CMI together with changes to the volume reported through Notice to Mariners 18 dated May 2, 1970. The corrections and changes were then keyboarded and again processed by the File Maintenance System to produce an updated Coast Pilot 4 File on magnetic tape.

The revised magnetic tape was processed through the MTP as before, but film negatives were produced by the Linotron instead of paper pages. After making minor corrections to some of the negatives, the book was printed by offset in the usual manner.

The manuscript for Coast Pilot 4 was furnished CMI on January 5, 1970, and the printed book, updated to May 2, 1970, was available for distribution on May 26, 1970. Since this was the first Coast Pilot published by the photocomposition system, considerable time was expended in testing equipment and procedures. It is estimated that new editions of other Coast Pilots can be published in less than 3 months as compared to more than 6 months, the time required to publish Coast Pilots by the conventional method. Once the data is on magnetic tape, it will be possible to update the information and publish a new edition in less than 1 month.

## INDEX

By utilizing the page-orientated property of the master typography system, an automated index was successfully developed. In addition to the blue underscore for boldface items, the manuscript was marked by the C & GS with red overscore to indicate index items and the number of the chart(s) covering the geographic feature. The index items were assigned a function code by CMI and keyboarded. As each item was encountered while processing the input through the master typography system, all the information relating to the index was stored on magnetic tape along with the current page number. The tape containing the index was sorted into alphabetic order and this new tape was processed through the master typography system producing the typeset index.

## COST

Although the cost of producing the computer file and the composed publication compares favorably with the cost of typesetting a new edition by conventional means, it is in the production of future editions that greater savings will be realized. The changes will be noted on a copy of the typeset output that contains typeset numbers in the margin of the negatives but not printed, referencing the data on the composed output to the master file on tape. The changes will be keyboarded and processed by the File Maintenance System to produce the new Coast Pilot 4 File.

It is estimated that once all Coast Pilots are computerized, a total annual saving of \$ 8 000 will be realized in printing costs. Lower cost is not the only advantage to be derived from computerization. Since new editions can be produced more frequently, the need for supplements is eliminated. Also, because the lead time required for composing the publication is reduced from months to a few days, the new edition is more current when it is issued.

The automated Coast Pilots will have a heavy paper cover and sell for \$ 2.00 each as compared to \$ 2.50 each for previous editions with the buckram cover. Even though the overall cost to the user will be more, it is considered that mariners will welcome a new edition annually to eliminate reference to an annual supplement.

## FUTURE PLANS

In view of the satisfactory results obtained for the new 1970 edition of Coast Pilot 4, it is planned to computerize all Coast Pilots when they are scheduled for reprinting. The automation should be completed by 1975. When each book is computerized the annual supplements will be discontinued and new editions for the Atlantic and Pacific Coast Pilots published annually. The Alaska Coast Pilots may be published every 2 to 3 years, unless a considerable number of changes are made in the area to justify printing the books at more frequent intervals.

Field inspections for each book will continue to be made about every 5 years to verify reported information and to obtain other Coast Pilot information not reported through Notice to Mariners and other sources.