

AN IMPROVED SYSTEM OF PRODUCING AND PRINTING LOOSE LEAF SAILING DIRECTIONS AND CORRECTIVE CHANGE PAGES

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Note on the author. — Mr. Frederick W. BOWDEN was born in the whaling seaport of New Bedford, Massachusetts, and was graduated with distinction from the Massachusetts Maritime Academy. After gaining experience at sea as a deck officer in the U.S. Merchant Marine, he joined the U.S. Naval Oceanographic Office as a Marine Information Specialist. Except for active duty as an Officer in the U.S. Navy during World War II, he has served in the Maritime Safety Division of the Oceanographic Office for the past 24 years.

Although Mr. BOWDEN has written *Notices to Mariners*, edited *Pilot Charts*, and compiled *Light Lists* and *Distance Tables* during his career in the Maritime Safety Division, his principal role has been producing and maintaining the *Sailing Directions*. He played a major role in converting the *Sailing Directions* to the loose leaf format and he devised the first practical corrective maintenance system. He has been the Head of the Sailing Directions Branch for the past six years.

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During 1950 and 1951 the U.S. Naval Oceanographic Office replaced its regular bound volumes of *Sailing Directions* with new loose leaf editions, and introduced a new era in the preparation and maintenance of these nautical guide-books that have served mariners so well for so many years.

Before the introduction of the loose leaf system, the Oceanographic Office followed the usual practice of publishing new bound editions at convenient intervals, and kept them corrected and usable by publishing separate annual *Supplements*. Both the basic volumes and their corrective *Supplements* were written by Marine Information Specialists, men with maritime or naval educations and actual navigational experience at sea. The manuscript written by these Marine Information Specialists was sent to the printer who set the information in hot type and furnished galley and page proofs. After the proofs had been read and updated, final printing was done by the usual letterpress method.

Adoption of the loose leaf system did not result from any sudden realization or appreciation of its advantages. For many years the idea of replacing obsolete pages with new pages showing the latest information had intrigued the Office, and the loose leaf system had long been regarded as ideal for publications requiring frequent correcting or updating. Separate *Supplements* containing corrections to specific pages, lines, and words of

the basic volumes were considered inferior and awkward to use. But they were easy to produce, and their low cost weighed heavily in their favor. On the other hand, corrective loose leaf Change pages were known to be expensive. High cost was always the decisive factor against the loose leaf system whenever its adoption was proposed or seriously considered. Tests showed that corrective loose leaf Change pages were as easy to write as Supplements, perhaps easier since there was no need for tedious references to specific pages, lines, and words showing where corrections applied to the basic books. But it was simply too expensive to reset, print, and proof-read whole pages, including their reverse sides, when only a few words or lines had actually changed. One alternative to setting new type for each Change page was to store the type used to print the original books and to use as much of it as possible to print future Change pages. But type storage for nearly 70 volumes of Sailing Directions would have taken too much expensive type metal out of service, and too much expensive storage space would have been needed. It was quite clear that it was high printing costs, not initial preparation costs, that made the loose leaf system impractical.

First steps toward an economical loose leaf system were taken without anyone actually realizing it. A few years before the Sailing Directions were converted to loose leaf, the Office drastically reduced the cost of printing Supplements by substituting the inexpensive photo offset printing process for the more expensive letter press process. Since each new Supplement completely replaced all previous Supplements, it naturally followed that most of the information in the new Supplement was the same as in the old. Only additions and deletions represented the difference between the old and the new. This condition made it a simple matter to update existing Supplement pages by cutting them apart and "stripping in" the small amount of new information that had been separately printed by the usual letter-press method. Both unchanged and updated pages served as repro proofs, which were simply photographed and reproduced in facsimile by the offset printing process. This logical system, which reduced type composition and proof-reading costs by 75 %, eliminated the major obstacle to a practical loose leaf system, and paved the way for its eventual adoption.

Soon after this new system of printing Supplements had been introduced, the idea of using it to print corrective Change pages to a loose leaf volume of Sailing Directions was explored. The basic idea seemed perfectly suited to a loose leaf system, and in 1948 one loose leaf volume of Sailing Directions was published on a trial basis. The book was set in type and printed by letterpress as usual, but during the final printing, clear repro proofs of each page were also printed for subsequent use in the production of Change pages. After a trial period of about 5 years it had been planned to review cost records and make a final judgement regarding the over-all practicality of loose leaf Sailing Directions. A favorable judgement would have resulted in the gradual shift to the loose leaf system as new editions were published. The whole program would have required about 30 years.

Events overtook the Oceanographic Office, however, and the 5-year trial period had hardly begun when the Korean emergency changed the picture completely. Demands for charts and publications grew, and it became necessary to reprint nearly every volume of Sailing Directions to

replenish diminishing stocks. This situation provided the Oceanographic Office with a golden opportunity to switch to the loose leaf system immediately. Experience with the trial volume had shown the initial cost of printing loose leaf volumes to be essentially the same as for bound volumes. Sets of loose leaf Change pages cost more than the Supplements printed by the offset process, but about the same as for earlier Supplements printed entirely by letterpress. By this time, improved systems that would further reduce costs were visualized, and the estimated costs of the loose leaf system and the Supplement system throughout the life span of any given volume of Sailing Directions compared favorably.

Because of the encouraging results of the short trial, the favorable estimate of cost over a reasonable period of time, and the need to replenish stocks, the Oceanographic Office decided in favor of the loose leaf system. In 1950 the process of converting nearly 70 bound volumes of Sailing Directions to the loose leaf format began. By the end of 1951 the task was accomplished.

The easiest and least expensive method of converting the bound volumes would have been to reprint them in facsimile by the photo offset process. The loose leaf system, however, required a paper strong enough to prevent pages from being torn away and lost during normal use. Facsimile reproduction on heavier paper would have made the books too bulky for convenient use in ring binders, therefore the loose leaf volumes were completely reset in new type and printed on larger pages holding more printed matter. During the final letterpress printing, the repro proofs needed for future Change page production were also printed.

Since the key to a successful loose leaf system was known to be the economical production of corrective Change pages, a system that would insure lowest possible costs was introduced at the very beginning. The basic practice of "stripping in" new information on existing repro proofs for photo offset reproduction was retained. But instead of composing the new information in hot type and printing by letterpress as before, the new information was composed in cold type on office machines operated by regular office typists. The cold type composing machines, called Varitypers, are similar to ordinary typewriters in operation, but they have the capacity of producing lines of equal length in variable styles of type that looked like regular letterpress printing. A type style matching the type in the basic books was adopted, and final results compared favorably with letterpress printing. The Varitype machines, which contributed mightily to the success of the Sailing Directions loose leaf system, were used continuously until 1965. Although the basic Varitype system served its intended purpose of producing repro proofs at low cost exceedingly well, it was far from perfect.

For one thing, the printing quality of the Change pages gradually deteriorated. Early Changes produced from new repro proofs were satisfactory, but as time passed the repro proofs became excessively mutilated by the continuous process of cutting apart and "stripping in" new information. Lines and spaces became uneven, and unequal fading of previously Varityped information contributed to the unsightly appearance of the more recent Change pages. It seemed pointless to require high

quality printing for new editions and then be content with lesser quality for their corrective maintenance. Defective repro proofs could of course have been completely reprinted and a new start made, but high costs made this alternative unattractive.

Another difficulty was inherent in the system itself. The Varitype machines were comparatively slow, and information had to be typed twice to produce lines of equal length. In addition, the operators were faced with the tedious task of "stripping in" the newly typed lines onto the repro proofs, which after being cut up for several years became fragile and difficult to handle. The cost of producing repro proofs gradually increased, and the time for a major change eventually arrived.

The basic economy of cold type composition for Change pages naturally led the Oceanographic Office to consider its use for composing new editions of the *Sailing Directions* as well. New editions had always been composed in hot type, but in recent years the final printing had been done by the offset process rather than by letterpress. All that remained to achieve the ultimate in economy was to eliminate hot type composition altogether and to use cold type composing techniques throughout. Recently, the Oceanographic Office decided in favor of such an ideal system, and the process of conversion is now taking place. The new system lends itself perfectly to the requirements of loose leaf corrective maintenance.

The new system revolves around the economical and rapid production of repro copy on relatively inexpensive office cold type composing machines called Justowriters. These machines are similar to ordinary electric typewriters in operation, but unlike the Varitype machines they do not need a second typing to produce lines of equal length. The first typing produces typewritten copy as usual, but a punched tape used to produce equal lines automatically on a second machine is produced simultaneously. Initial typing is done on a Justowriter Recorder. The punched tape is then fed into a Justowriter Reproducer, which produces clean new repro copy automatically in lines of equal length. The completely electrical Justowriters permit fast typing, and repro copy is produced from punched tape at the rate of one hundred words a minute.

Justowriters, like Varitypers, have their limitations, but their basic advantages make necessary compromises acceptable. While a variety of type styles is available, each machine is capable of producing final repro copy in only one. None of the available type styles matched the existing *Sailing Directions* and none seemed exactly suitable. Accordingly, a new type style was specially designed, one that was more uniform in thickness, easier to photograph, and smaller in size so that more information could be printed on a page. Without sacrificing legibility, smaller books and lower printing costs are made possible. Final format was also changed to accommodate the single type style and to eliminate complications that would have cancelled many of the advantages of the Justowriter system. Center folio headings, for example, were eliminated, and all typed matter was set in units of single columns.

The printing of new editions begins, as before, with the conversion of handwritten manuscript produced by Marine Information Specialists into typewritten copy by competent typists. Formerly the typewritten copy

was sent to the printer for conversion to hot type. Galley and page proofs were then returned to the Oceanographic Office for correcting and updating, after which the book was finally printed. About nine months elapsed between the time typewritten copy was sent to press until delivery of the finished book. Now the handwritten manuscript is typed, as before, but on the Justowriter Recorder rather than an ordinary typewriter. The resulting punched tape can be regarded as an almost free by-product of the typing process. After the typewritten copy is checked for accuracy, the punched tape is fed into the Justowriter Reproducer, which automatically produces final repro copy. The repro copy is then sent to the printer, who simply photographs it and prints the final book by the offset process. The finished book exactly duplicates the repro copy, therefore intervening proof-reading is unnecessary. Delivery time has been reduced from nine months to seven weeks. Printing costs have dropped from \$ 15 000 to \$ 4 500.

In actual practice, handwritten manuscript is recorded on punched tape almost as soon as it is written. Manuscript no longer accumulates for a year or more until the new edition is completely written before it is updated, typed, and sent to press. The typewritten copy produced on the Justowriter is proof-read as soon as convenient and marked up to indicate typographical errors. It is then stored, along with the punched tapes, until the entire book is written and all typing completed. The typewritten copy then receives its final updating for the latest information on hand. The stored tape is then corrected and updated as indicated on the typewritten copy, and at this point a vital feature of the Justowriter system comes into play. The previously punched tape is fed back into the Justowriter Recorder to produce new typewritten copy and a new punched tape automatically. Wherever correcting or updating is required, as revealed by the old typewritten copy, the machine is stopped at that point and the corrections and new information are simply typed as usual. The new typing is shown on the new typewritten copy and recorded on the new punched tape. While the new information is being typed, the old tape stands still. After the new information has been recorded on the new tape, the old tape is advanced by hand to bypass the obsolete information. Automatic typing and tape duplication is then resumed. At this stage, correct page format, column lengths, and pagination are determined and tapes of prescribed length are produced. The new tapes are then fed into the Justowriter Reproducer for making final repro copy for the printer. Since tape updating and typing of final repro copy are essentially automatic operations, both are usually done simultaneously on the two machines.

It can readily be seen that the basic system of correcting and updating punched tapes for new editions is made to order for the preparation of subsequent Change pages. Tapes used to produce repro copy for new editions are stored for future use, and the same updating system is used to produce updated tapes for producing updated Change pages. This logical process produces brand new repro copy for each loose leaf Change and preserves the printing quality of the original Sailing Directions. The automatic features reduce manpower requirements of the loose leaf maintenance system and reduce costs correspondingly.

H.O. Pub. No. 61, *Sailing Directions for The Red Sea and Gulf of Aden*,

5th edition, 1965, is the first new edition produced by the new system and may be referred to for a visual evidence of what has been described. It does not quite match the old hot type editions in appearance because of inherent limitations of the cold type composing machines, and because the typists lack the typographical competence of professional type composers and printers. But the over-all quality is more than adequate for the purpose, and improvement in future new editions is expected as the typists gain experience with the new system and increase their typographical skills.

All compromises made so far seem justified in view of the dramatic decrease in production time and printing costs. The cost of the Justowriter machines averages about \$ 3 500 apiece, or \$ 7 000 for the minimum Recorder and Reproducer. Since the new system reduced the printing cost of the first new edition by \$ 10 500, which more than recovered the original cost of the machinery, its value speaks for itself. As soon as the new system's full potential was realized, printing funds originally intended for the old method were quickly diverted into additional Justowriters needed to cover production requirements of the entire Sailing Directions program.

The new Justowriter system is not considered to be the final word in the economical production of loose leaf Sailing Directions and corrective Change pages. But it is a definite improvement over all previous systems, and the experience gained by using punched tape equipment is expected to pay off handsomely as improved and more sophisticated cold type composing machines are developed and marketed. The transition from punched to magnetic tapes, for example, will be easy and the U.S. Naval Oceanographic Office will be in a good position to gain from the speed and economy that improved systems will provide.