

## Cartographic Support Service

Up until the early 1960's, the Canadian Hydrographic Service relied completely on the Surveys and Mapping Branch of Mines and Technical Surveys for cartographic support service. This service included colour negative preparation, photo-mechanical processing, colour proofing and ozalid printing.

However, times change. Now, many mapping and charting agencies have grown to realize the value of establishing and controlling these services themselves. Today, some of them rival commercial organizations in the scope and quality of their work.

The transition period is never an easy one. Even the initial decision to perform these services internally, instead of contracting them out, is perhaps one of the most difficult a production manager must make.

As an example, a careful analysis must be made of equipment and labour costs. There are materials and maintenance to consider. To best utilize the available space, plans must be prepared and the particular requirements of each field of the projected service analysed.

After all this, if costs alone were the deciding factor, in many cases it may prove to be more economical to use outside commercial services exclusively.

But when large volumes of reproduction requirements exist, we have found that it is better to control and perform these functions in our own shop.

This does not mean that we should totally eliminate commercial services, as these agencies have a definite role to play in any sound and well-managed system.

There are times when activities could accelerate to the point of saturating your own facilities. While overtime or shift work can often help to alleviate this situation, the best long-term solution is to rely on commercial support.

Also, depending on the volume of the reproduction effort, there will always be certain limitations on what type of services can and should be performed in-shop.

On the other hand, we have found that commercial sources can rarely react quickly to priority requirements, as they usually have more than one customer to satisfy.

These are but a few of the points that we considered before deciding to proceed with the installation of our own support units.

They have now become a valuable part of the chart production area and to describe the services which they are capable of providing, the four main activity areas should be mentioned.

These are:

1. Photo-typesetting
2. Reproduction
3. Colour proofing
4. Diazo whiteprints  
(commonly called ozalid prints)

1. Photo-typesetting

Names and notes that appear on our charts are typeset in our own printing unit.

Prior to 1965, we hand-set metal type and printed transparent copy on a flat-bed printing press. Typesetting was time consuming both in make-up of type selection and breakdown of the type once the prints were made.

The quality of the ink transfer made from the relief type face also left much to be desired. Due to the difficulty in controlling the density of the ink, the type might be either too heavy or too light to reproduce properly. Smudging of the image was another frequent problem.

In an attempt to improve this situation, the Hydrographic Service researched various models of electronic photo-lettering machines and after a careful assessment, purchased a British made Monotype Photo-setter. It is a highly sophisticated machine, designed primarily for

cartographic work. From a negative film matrix, this machine will produce character images ranging in size from 5 to 90 point, i.e. 1/18" to 1", in one operation.

The machine exposes individual characters onto film or photographic paper at speeds of up to 60 characters a minute. Characters are selected manually from a dial type disc containing up to 100 images, with the cycle of operations being controlled automatically by sequential electrical and mechanical components. The machine can be loaded with 3 discs, giving the operator a choice of three type styles at any one time.

It also incorporates controls for presetting spacing between letters, which in turn allows the operator to justify text with moderate speed. Accents can also be positioned over any letter as a separate operation, making the purchase of a separate disc for French characters unnecessary. This feature has been a distinct asset in our bilingual charting program.

Increasing demands for typeset material made it necessary for us to convert totally to photosetting and dispose of our lead type and printing press. To compensate for this we purchased an additional Monotype machine in 1968 and in 1971 added a third photosetter, a Diatype film setter, manufactured in Germany. Basically the same as the Monotype, it is a little more compact in appearance and operates at a higher speed.

The advantages derived from operating a photosetting unit in preference to its metal counterpart are considerable. As an example, our present film matrix library occupies 3 cubic feet of floor space, and gives us a range of typefaces from 5 to 90 point in 18 different type styles. The equivalent stock of lead type would occupy 960 cubic feet.

But perhaps the most important fact to remember is that the quality of filmset material is infinitely superior to proofs from metal type. The edges of the characters are sharp and clear and reproduce beautifully on any film or paper medium without any apparent loss of resolution.

## 2. Reproduction

Nearly all the film used in our reprographic section is "high contrast" or "line film". That is to say, it will only reproduce the higher density of tones in their true values and not the intermediate shades of grey that one sees in a camera snapshot. It is sensitive only to the violet and blue regions of the spectrum. Because of the lack of response to red, it can be safely handled under a red light in the darkroom.

These "high contrast" films fall into two main categories, negative acting and duplicating film.

Negative acting produces a negative from a positive original or a positive print from a negative original. On the other hand, duplicating film duplicates the copy. A negative will reproduce as a negative, a positive as a positive.

Duplicating film comes under a variety of names, but the term we use most often when referring to this medium is autopositive. Strangely enough, it was originally intended as a trade name for an Eastman Kodak Company product. Through usage and application however, the name has since applied to the process itself. It is an extremely valuable reproduction technique which we use daily to produce one-step duplicates of originals and checking prints.

Only a few years ago, if a print was required of a linen-backed field sheet, it required two processing stages, a camera to produce a negative and contact processing to produce the print. This process was time consuming and involved the use of expensive equipment. Today the same results can be achieved more simply by the one-step autopositive method. The field sheet is placed face up in a vacuum printing frame and the autopositive film is registered emulsion side down on top. The exposing medium is a high intensity light source which has a yellow filter placed between the light and the film. The yellow light penetrates the film and is reflected back on to the emulsion by the

white background of the field sheet. Where the light encounters the black ink lines it is absorbed and is not reflected. The reflected light acts on the emulsion of the film with a bleaching action. When the film is developed the bleached areas are rendered transparent while the unaffected film which was in contact with the line work resolves into an exact reproduction of the original.

This autpositive medium is also used extensively in preparing in-shop checking prints where cartographic phases can be assessed without the need of preparing intermediate negatives. With checking prints, the technician often deals with two positive originals and several hand drawn negatives to produce a combined print.

A word of caution, while this process is ideally suited for certain phases of our work it requires greater skill and care on the part of the technician to produce acceptable copy. Also, the print is not of sufficient fine definition to be used as a final reproduction medium. However, it is widely used as a positive for making ozalid prints.

Diazo film is another duplicating medium that I would like to mention. It has two features which make it ideal for certain cartographic projects - its speed of developing and its availability in practically any colour of the spectrum. Coloured overhead projection slides are one example that I am sure you are all familiar with.

The best medium to duplicate onto diazo film is a transparent positive print as there is no background to interfere with the exposing cycle. When this is placed in contact with the selected colour of diazo film and exposed to a high intensity white light, the ultra-violet portion of the light decomposes the emulsion not covered by the line work of the copy. Unexposed lines or areas can then be developed by passing the film through the ammonia cell of any office white printing machine. The developing period is only a few seconds, the unexposed line work taking on the shade of colour used as a dye coupler in the emulsion.

I have briefly touched on only a few of the more commonly used products that we process in the reproduction area. There are many other valuable photo-mechanical services that we provide, such as scribe-etches, peel-coats, wash-offs, bluelines on scribe coat, etc.

Unfortunately, time does not permit me to describe each process, but I feel they should be mentioned in passing, as they all play an important part in the construction of the nautical chart.



### 3. Colour proofing

A chart is a composite of many negatives, some hand drawn, others produced by various photo-mechanical means. When their images have to be combined several thousand times on a printing press, the need for a colour proof is evident. There is also the need for accuracy in registration of colour and a requirement for speed and economy in supplying the proof.

The wipe-on colour proofing method adequately meets our needs. It also provides the cartographer with the opportunity to reassess the presentation of information and make last minute changes to the negatives before plating and printing.

The colour proofing base material is an opaque white vinyl plastic, pre-grained for colour reception and is available in various sizes and thicknesses.

Colours are the four basic tints, red, blue, yellow and black. Additional colours are derived from mixing these basic tints. Each colour is pigmented in an albumen solution which, when exposed to ultra-violet light, becomes light-hardened and permanent.

The application method is relatively simple. A small quantity of colour solution is poured onto the vinyl sheet and wiped smooth and dry, care being taken to completely cover the area of the chart. The corresponding colour

negative is then locked in registration to the colour proof, using the Harris punch system, and is placed in a vacuum frame. The combined negative and dyed plastic sheet is then exposed to a xenon arc light source which light-hardens the colour which is visible through the open portion of the negative. After exposing for the required number of minutes, which varies with each colour, the excess unexposed colour is washed off under running water and the sheet dried. The proof can now be re-coated with another colour and the next image exposed. This process is repeated as often as required until a faithful reproduction of what the printed chart will look like is obtained.

What we have created is a visual communication link between the customer who is seeing for the first time what he has requested, the cartographer who is seeing what he has created, and the printer who is seeing what he will be required to produce on his printing press.

#### 4. Diazo Whiteprints

At some time or another, every manager receives requests for multiple prints of a particular document or project drawing. This service has been no exception and because of the tremendous number of such requests we purchased a large diazo whiteprinter.

Like other machines of this type, it is semi-automatic and designed to be operated after a very short training period. It is fairly rugged and dependable, and is capable of producing same-size prints up to 54" in width. It can also duplicate copies on either paper or film at speeds of up to 75 feet per minute.

Strangely enough, like so many other modern innovations, the first successful diazo reaction was produced as long ago as 1853, but it was not until the Second World War that its potential as a cheap efficient method of copying documents was realized. As an example of the impact this had on one segment of the engineering industry, it has been estimated that if all the blueprints used in the construction of the Saturn moon-rocket were loaded aboard, it would require the combined efforts of 10 such rockets to get them off the ground.

When you request diazo prints, remember that the copy must be either translucent or transparent. Therefore, when duplicating an item like a printed chart which is on heavy paper stock, first prepare a film intermediate such as an autopositive.

The following is a step by step description of what happens when the technician operates the machine:

- a. The original document is placed in contact with the sensitized material, with the original on top.
- b. The two sheets are then fed into the machine where they are kept in close contact to each other by means of revolving rubber belts.
- c. Both the original copy and sheet of diazo material then pass around a glass cylinder where a high intensity ultra-violet light makes the exposure.
- d. The original then separates automatically from the diazo sheet and is returned to the operator.
- e. The exposed diazo sheet continues its travel into the developing cell where it passes through an ammonia vapour bath and is then returned to the operator.

The final appearance of the reproduction is governed by the light exposure not the developing. Developing is more or less a constant and will not make an image lighter or darker, only the exposure speed will.

You will have noticed that copies made by this method often have a strong odour of ammonia. This is the result of the vapour clinging to the paper fibres. It will usually disappear quite quickly when exposed to the air.



The operations which I have just described are the most widely used of the cartographic support services.

There are probably a dozen others which could be included, but generally they fall into one of the four mentioned categories.

I realize that a verbal description of technical procedures is more apt to be confusing than enlightening. Partly for this reason there will be an openhouse tomorrow afternoon for anyone who is interested in seeing our facilities at first hand.

One important point I would like to stress, is that success in the support areas does not depend solely on the quality of the materials and the skill with which they are processed.

The requisitioner must communicate his requirements clearly and precisely.

This is true in any business or situation, and we are in a business to supply you the customer with the service you require, with the least possible delay.

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