

Photogrammetry

Need a Map?

What happens when a land surveyor retains the services of a photogrammetric firm to produce a 1" = 200' topographic map with 5' contours of a 100-acre parcel?

Obviously, the area to be mapped must be defined; this can be done by lot and concession or some other means which pinpoints the location. Once the site is known, the photogrammetric firm checks its photo library as well as those of other agencies (both private and governmental) to ascertain whether photo coverage exists. Sometimes coverage may exist but it may be too old and out-of-date for the surveyor's needs. If adequate photos can be found, the surveyor will probably be charged a fee for the use of the photography.

If photo coverage is inadequate, aerial photo must be flown. This is a fairly expensive proposition because it will often cost \$500.00 to fly an airplane to the site. For this reason, the photogrammetric firm will often ask the surveyor to wait until they get a few more requests for photo in the same general area. If the surveyor consents to obtaining new photography, the photogrammetric firm must plan the flight line and photo scale. Usually these are marked on a small-scale map for the flight crew; it is best to choose a flight line which enables the pilot to align the plane with landmarks on the ground. For 100 acres to be mapped at 1" = 200', a photo scale of 1" =

1000' would probably be selected.

Horizontal and vertical control must be established to control the scale and level of each stereo model (i.e. the overlap area of 2 successive photos) from which the map is to be compiled. In our case, the area would only be a couple of square inches at the photo scale of 1" = 1000' and so the mapping area should fall within one model. For this one model, the photogrammetric firm needs at least one distance between 2 points which are conspicuous in the photo and this is used to scale the model. The distance should be as long as possible and it is preferable to have several distances to other points to check the scale. If a grid is to be shown on the map, the horizontal control must be co-ordinated with respect to the desired map projection system. To level the model, a minimum of three conspicuous points must have elevations with respect to the datum desired (generally mean sea level). Again, several more points should be established vertically to provide more precision for setting the level of the model. The horizontal and vertical control may be targets which appear in the photo or they may be photo identifiable detail such as sidewalk intersections.

Once the overlap has been scaled and levelled in a stereoplottting instrument, a true three-dimensional model of the terrain now exists. The plotter operator traces out the detail and contours using a "floating" mark which he keeps on the surface of the stereo model. The tracing movement which the operator imparts to

the "floating" mark is transmitted to a precise plotting table. This table may be directly under the stereo model or set outside the stereo instrument per se, in which case the movement is transmitted through a mechanical gear linkage.

The stereoplotter yields a topographic map on a sheet of stable-base material and this is known as the "pencil manuscript". In many cases, the "pencil manuscript" is all the surveyor needs. It is fairly neat but the lettering is done by hand and the line thicknesses may vary slightly. If the surveyor needs a topographic map for presentation or if he must produce several stable-base transparencies, he should have the photogrammetric firm draught a scribed copy of the pencil manuscript. The scribing is done using cutters which are machined to a precise thickness. Consequently the linework is much more uniform than that produced by pen and ink. The lettering is done using stencils and quite often the surveyor's standard title block or logo may be inserted into the scribe sheet.

The scribe sheet is then laid flat on top of a sheet of photographic stable-base material in a darkroom and it is then exposed to light. The developed material will be a positive copy of the scribed original. Any number of positive stable-base copies may be produced now or years later as the quality of the scribe sheet does not deteriorate with time or usage.

Briefly, this was an outline of the photogrammetric operations involved in producing a scribed topographic map.

—D. M. LEVER