

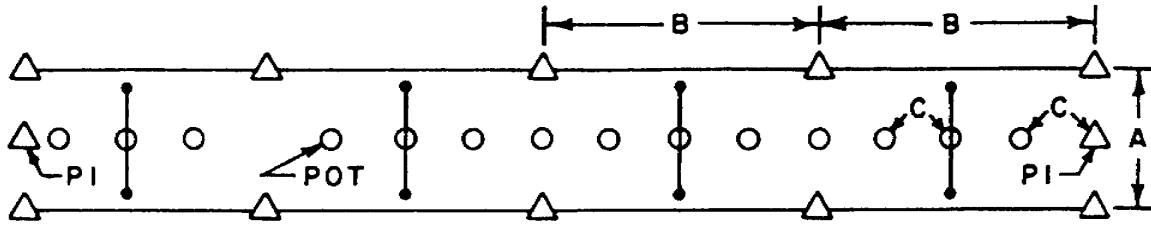
**CHAPTER 5**  
**PHOTOGRAMMETERY SURVEYS**

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**A) GROUND CONTROL INSTRUCTIONS**

The Central Office Survey Crew is responsible for all of the project control work for aerial surveys using GPS methods.

Horizontal and Vertical Control Points are required right, left, and on centerline for the first and last model in each flight strip and every fourth model in between. The points are spaced so that at least two and possibly three are visible in each model. The diagram below shows the layout of panels for a basic ground control survey.



△ Horizontal and Vertical Control Point

○ Vertical Control Point

Photo Scale	Map Scale	Distance A	Distance B	Distance C	Centerline to A
1" = 1000'	1" = 200'	5600'	14000'	3600'	2800'
1" = 500'	1" = 100'	2800'	7200'	1800'	1400'
1" = 400'	1" = 80'	2400'	5700'	1440'	1200'
1" = 250'	1" = 50'	1400'	3600'	990'	700'

NOTE: The above distances are near maximum and can be shortened by 10 to 15 percent without significant affect on the triangulation accuracies.

## ***A) GROUND CONTROL INSTRUCTIONS (CONTINUED)***

The necessity for survey accuracy is apparent. The photogrammetric mapping and ground point measurements are completely dependent upon the accuracy of the ground control. Every effort should be made to obtain second order accuracy. USC&GS standards for second order accuracy are as follows:

Unadjusted Horizontal Distances - 1:10,000

Unadjusted Vertical Distances - 0.035 feet times the square root of distance in miles

or

8.4 mm times the square root of distance in kilometers

If accuracy of this standard can be maintained, we can be assured that the photogrammetric measurements will be within acceptable tolerances, and errors can be corrected without returning to the field.

Many types of panels have been devised and tested for aerial mapping. The most used is the open center cross. The legs of the cross are made of cloth, plastic, or paint. The panels are usually white in order to contrast with the ground, however, on concrete pavements and extremely colored barren soils, it is best to use dark gray or black materials. The points that are used for both horizontal and vertical control only are marked with three legged panels shaped similar to a "T".

Control Points are to be located so that the panels will be plainly visible on the photographs. Deep shadows can make it difficult to find the panel. Also, if a pass point is placed too close to the far side of a tall structure or tree it will be obscured by the photographic displacement.

Occasionally it is necessary, for the sake of expediency, to photograph a project without setting control points. In these cases, the photogrammetrist selects points from the photographs that are easily identified on the ground as well as on the photos. These points are called picture points and the system is workable only in locations that have an abundance of identifiable detail in the photos. It is not a good practice to use the picture point system in prairie areas except for an occasional additional control point that may be needed to supplement the original ground control survey.

Wherever obstructions such as lakes, sloughs, etc. make it impossible to set the control points according to the diagrams, the points are to be moved back (nearer the last previous point) as far as necessary to avoid the obstruction. If it is a case of full ground control, and the obstruction is on one side of the centerline only, the pass points can be placed on the opposite side of the centerline until the obstruction is passed.

The Area Office field crews provide the information that cannot be determined from the aerial photographs. Field survey is necessary to differentiate between power lines and telephone lines, locate and describe all underground utilities, give dimensions of all drainage structures, provide invert elevations of manholes and drop inlets and show location of wells.

## ***B) COMMON PHOTOGRAMMETRIC TERMS***

Ground Control	Field survey made for the purpose of providing horizontal and vertical data for photogrammetric mapping.
Model	That portion of a pair of stereo photographs that can be observed in three-dimension relief.
Neat Model	The portion of a model which is considered usable for mapping. Generally considered being the area model between the photographic centers and approximately the centerline of the photographic coverage in width.
Diapositive	A glass plate with a positive photographic image printed on one side. Used in the stereoplotter.
Planners	Markers made of cloth or other materials for producing an identifiable image on aerial photographs.
Pass Points	Vertical control points placed at appropriate distances right or left of the base line or project centerline. Also referred to as wing points. Usually marked with a three-legged panel.
Flight Strip	A straight line of flight over the project or portions of the project for the purpose of taking aerial photographs. The number of flight strips is determined by the project alignment and the flight height.
Analytical Triangulation	A mathematical method of developing Triangulation supplemental control through the use of precise photogrammetric measuring instruments.
Base Line	Survey control line run longitudinally through the center of the strip to be photographed. The project centerline is generally used for the base line.
Stereoplotter	An instrument used to plot topographic maps and read cross sections from aerial photographs.