

solved for in the Graphical Pyramid Method, it can be considered in the light of scale checking along the ground pyramid lateral edges. In lieu of placing a scale,  $La/LA$ , at the control point, the effective focal length induced by tilt,  $La(H-AA')/LA$ , is used.

It is not to be presumed that usage of the Graphical Pyramid Method is recommended for all tilt solutions regardless of the magnitudes of tilt and relief. When tilt and relief are fairly moderate, the "Dropped Perpendicular Scale Point"<sup>7</sup> method is recommended for economical reasons or, more to the point, the Graphical Pyramid Method is recommended for all cases requiring more than two or three successive determinations by the Dropped Perpendicular Method.

The Graphical Pyramid Method may be used to good advantage in cases of relatively high tilt and relief, and in cases of low tilt and relief when the scale points are extremely close to each other or when they fall on or nearly in a straight line.

In discussing a graphical pyramid method of tilt determination it is appropriate to refer to a similar method by Lt. Col. James W. Bagley.<sup>8</sup> In this method the ground pyramid is developed using the horizontal ground distances in place of the slope ground distances. This accounts for the author's statement "The method is affected adversely by excessive tilt and relief." The method referred to also requires successive determinations when relatively high degrees of tilt and/or relief are present.

As a final comment it has often been stated that anything that can be drafted can be computed. The entire graphical pyramid method can be computed analytically to as many decimal places required and will be precise as the trigonometric functions used. If this were accomplished for academic purposes, it is suggested that the ground pyramid lateral edges be computed by use of the cosines of the base angles as presented by Professor Underwood.<sup>9</sup> These analytical computations would be lengthy indeed, and for practical purposes the graphical method is suggested.

## COMMENTS ON "TILT BY THE GRAPHICAL PYRAMID METHOD"

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Mr. McNeil's paper, "Tilt by the Graphical Pyramid Method" is clearly written, the numerical example is concisely demonstrated, and the basic principles are graphically illustrated. The paper is of interest to members of the American Society of Photogrammetry.

I was impressed with the nearly identical development of the five elements of exterior orientation in Mr. McNeil's paper with those in my "Space Resection," paper. He determines  $X$ ,  $Y$ ,  $Z$  semigraphically, while I develop  $X$ ,  $Y$ ,  $Z$  analytically. The principle underlying the determination is the same in both papers. Mr. McNeil's method of determining tilt is identical with the fourth method described in my paper, both in principle and solution. In all other parts the papers are radically different.

Since two persons have developed two identical ideas independent of each other, I feel that in the interest of the Society and in fairness to both Mr. McNeil and myself, both papers should be not only published in the same issue but also placed next to each other for ready comparison.

<sup>7</sup> Anderson, *loc. cit.*

<sup>8</sup> Bagley, *loc. cit.*

<sup>9</sup> Underwood, *loc. cit.*