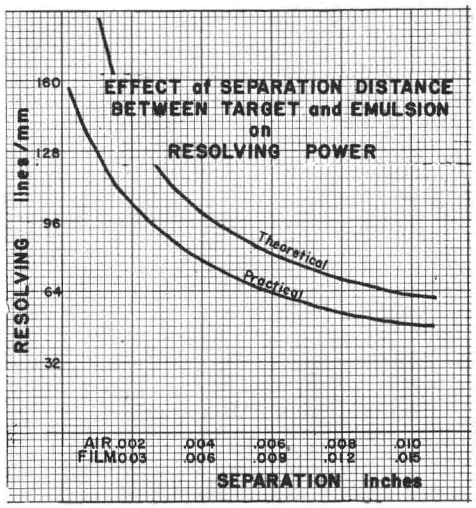

FIG. 7

size and distance of the light source, the exposure time and developing time. A change in developing agent gave no significant changes in resolving power. The data show that the simple-point light source printing set-up described will give excellent results compared to the estimated resolving power which might be possible with a 1:1 to magnification projection printer.

For the preparation of stereoplotter diapositives by contact printing through a 0.006 inch film base the following data were obtained:

Maximum possible resolution	80 lines/mm.
Optimum developing time with glycin developer	3–4 minutes
Desirable size-distance ratio of light source	0.02 or less

MINIATURE AERIAL PHOTOGRAPHY

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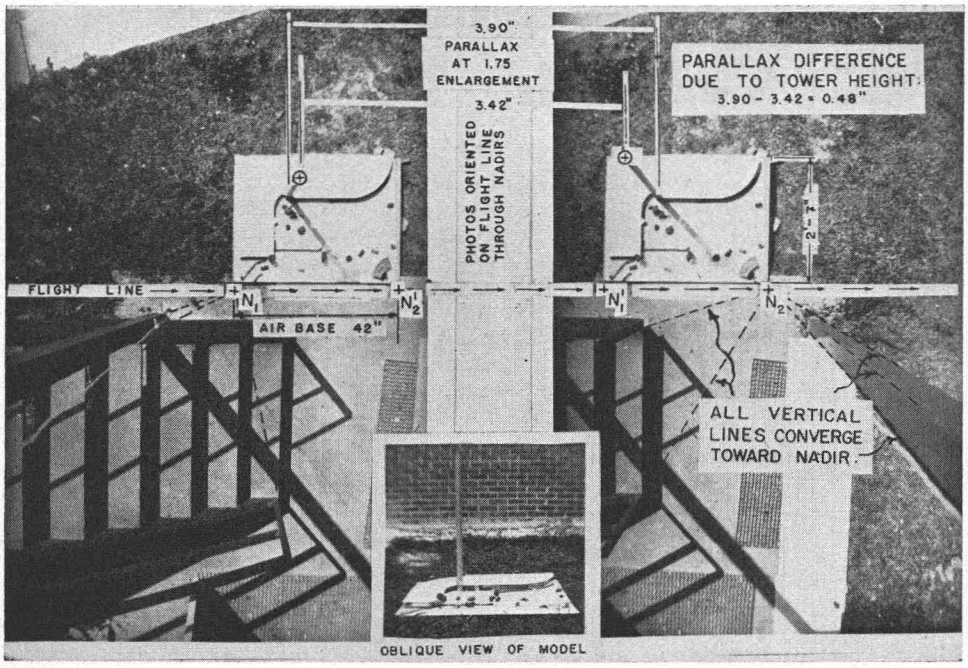
MINIATURE aerial photography can be a project-activity for students of elementary photogrammetry, or for anyone who is interested in taking a closer look at the manipulations of basic photogrammetric principles. Such miniature photography may promote better understanding through the use of exaggerated relief models which emphasize displacement and permit reasonable accuracy of measurement with ordinary engineers' scales, yard sticks, or metallic tapes. Of course, an error in measurement will become magnified approximately in the ratio of photo size to model size, but not to the extent encountered in true aerial photography where an error of 0.01 inch may represent scores or hundreds of feet on the ground.

In the example shown in the illustration, the materials and objects employed consisted of a 3′ 6″ by 2′ 7″ scale model of a community center. A 36 inch mailing tube served as a chimney or tower of exaggerated height, and a box kodak elevated 168 inches on a fire escape was used to take overlapping pictures above each of the two lower corners of the model. The vertical members of the fire escape were intentionally included to provide data for locating the nadir point beneath the lens, regardless of the tilt of the hand-held camera.

The resulting photographs, oriented along the flight line through the nadir points, illustrate an exaggerated effect of relief as a component of image displacement. In true photogrammetry, relief is generally provided by gently rolling ground and the base of a hill cannot be seen. Nevertheless, a hill top, unless directly beneath the camera, is displaced relative to its correct map position. The direction of relief displacement is radial with respect to the nadir point regardless of intentional or accidental tilt of the camera; this is a fundamental concept of photogrammetry and as such it is clearly illustrated by the convergence of the vertical member of the fire escape toward a common nadir point in each of the photographs.

PHOTO ENLARGEMENT NECESSARY

The scale of an approximately vertical photograph at a designated datum level depends upon the relative height values of similar triangles in which "*f*" (camera focal length) and "*H*" (camera height) are the controlling factors. Hence, the scale of a contact print is proportional to the focal



length of the camera. However, in miniature aerial photography, the contact print from an ordinary camera is too small for practical measurement with accuracy and considerable enlargement is usually desirable. Photographic enlargement at a ratio "m" has exactly the same geometric effect on an aerial photograph as taking the photograph with a camera whose focal length is "m" times f; but, if there are elevation differences, the effect is not identical to taking the photograph from a different height.

HEIGHT OF TOWER CALCULATED

Assume that it is desired to calculate the height of the tower by means of parallax measurements of the tower base and tower summit. The term parallax refers to the apparent displacement of the position of a body with respect to a reference point caused by a shift in the point of observation.

Given: A photo enlargement of 1.75.

Parallax difference of tower base and summit: 0.48″

$f=4''$, effective $f=4\times1.75=7''$. $H=168$ inches

Photo Air Base "b" (distance between projected nadirs on a single photo): 1.75″

The Parallax Formula:

$$P_x = \frac{Bf}{H-h}$$

Where P_x represents the air base "b" plus the parallax difference due to positive relief. (Disregarding tilt)

$$1.75 + 0.48 = \frac{42 \times 4 \times 1.75}{168 - h}$$

Solve for "h." $h=36.2$ inches.

In regard to error it is probable that if several persons were to make independent calculations based on rough scaling of distances, the resulting tower height may vary several inches greater or less than 36 inches. Other spatial relationships that could be investigated are the degree of tilt and the radial displacement of the tower summit on each of the two photographs.

General Reference

Manual of Photogrammetry, American Society of Photogrammetry, Washington, D. C.