

## Photogrammetric Brief\*

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# Reflections in the Water

OCCASIONALLY THE REFLECTED images of buildings or trees standing near the water can be seen on aerial photographs, but this observation is rarely used. One of the few exceptions is described in the fascinating story of how measurements were made on a sea wall in preparation for the amphibious landing at Inchon (Katz, 1951). However, the relationship between an object and its reflection leads to other applications.

A straight line drawn through a point image and its reflection on a horizontal reflector will pass through the nadir. This holds true for oblique and vertical photographs. Figure 1 is a good example of this phenomenon. The reflections of the trees leaning out from the shore provide the necessary image and reflection combinations. The lines are drawn according to the preceding conditions and their intersection is the nadir. This can be verified for Figure 1 because it shows the reflected image of the aircraft which, of course, lies at the nadir.

Practical use can be made of reflected images. As one application, in checking supposedly vertical photographs one can quickly determine if specifications regarding tip and tilt have been obeyed. For example, the above photograph was taken with a 12-inch lens; it was readily proved that the principal axis of the camera deviated by

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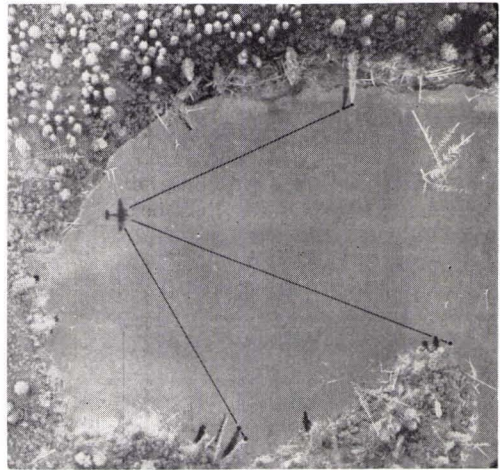


FIG. 1. Image, reflection, and nadir (1.5X enlargement from 1:2,000; Mackenzie Delta, Northwest Territories).

about 3 degrees from the vertical. A rapid method of determining the position of the nadir, and thus the angle of tilt is particularly useful in exploiting oblique photographs.

Incidentally, an aircraft's reflection allows a final check on the attitude of a camera for vertical aerial photography before photographs are taken. If one sights through the camera while flying over a calm lake, one should see the aircraft's reflection in the centre of the field of view, if the camera is vertical. Level-bubble adjustment could also be checked.

#### REFERENCE

Katz, H. A. 1951. A problem at Inchon. *Photogrammetric Engineering*, Vol. 17, No. 1.