

## VERTICAL EXAGGERATION

Many stereo models have vertical scales, which are greater than their horizontal scales; their relief is exaggerated; the effect is referred to as **vertical exaggeration** (Miller, 1961; Verstappen, 1977). Vertical exaggeration can be defined as the extent to which the vertical scale exceeds the horizontal scale in stereoscopic viewing of two overlapping images with parallax differences or in simple words it is the exaggeration of vertical heights with respect to the horizontal distance. Stereoscopic perception varies from person to person. It is a matter of common experience that stereo model does not appear in its natural proportions. The topographic forms appear much higher and sloped much steeper. This phenomenon is much more perceptible in large-scale photographs with high relief. Vertical exaggeration is present universally in all stereo models.

### Effects of vertical exaggeration

As far as the photo-interpretation is concerned, the vertical exaggeration does not seriously affect the stereo model as each point constituting the topography is uniformly exaggerated. Thus, the relative topographic expression is not disturbed; rather, the vertical exaggeration produces a much more prominent model of the terrain. In the region of low relief such as peneplained areas, vast plains etc, the vertical exaggeration has proved to be of great help. Due to vertical exaggeration subdued topographic features appear more prominent and thus, help in better photo-interpretation. Because of exaggeration of relief, low, rounded, and subdued topographic features, which would normally be overlooked in the field and which may be indicative of geological structures may be observed and plotted. Vertical exaggeration is therefore an advantage in geology.

When the quantitative estimations are to be made from the stereo model, such as the determination of angle of slope, dip of beds and measurement of height of some feature, then instead of correct values we get exaggerated values.

At times very unnatural look of the terrain may be very deceptive and may lead to wrong photo-interpretation. The effect of vertical exaggeration should always be kept in mind by the photo-interpreter, and it would be a good practice to keep on comparing the stereo model of the terrain with the corresponding topographic maps as well as the actual topography of the area observed during the field visits.

### Causes of vertical exaggeration

The vertical exaggeration results due to wide spacing of the camera position (air base) at the time of photography, in contrast to the narrow spacing of the human eyes with respect to the normal viewing arrangement. Thus it is fundamentally related to the base-height ratio ( $B/H$ ) which is the ratio of the air-base distance to the flying height. As this ratio increases the vertical exaggeration also increases.

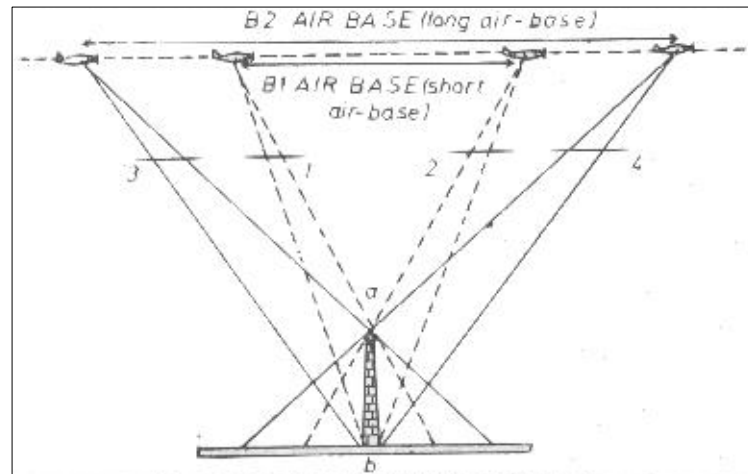
### Factors affecting vertical exaggeration

Factors that affect the vertical exaggeration can be categorized in two groups.

A) PHOTOGRAPHIC FACTORS: The factors involved at the time of photography are

- 1) Air-base: There is a direct relation between air-base and vertical exaggeration. It increases with the increase in air-base. Since the air-base decreases with the increase in overlap, vertical exaggeration has inverse relation with the overlap i.e. when the

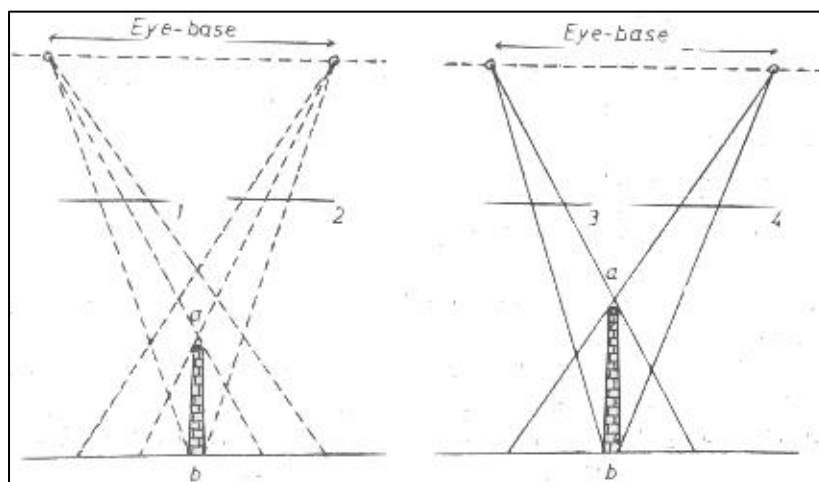
overlap increases the vertical exaggeration decreases. Following figure shows the relationship of air-base and vertical exaggeration.



- 2) Camera height: Vertical exaggeration decreases with increase in camera height and increases with decrease in camera height i.e. it has inverse relation with camera height.
- 3) Focal length: There is a direct relation of vertical exaggeration with the focal length. Greater the focal length large the scale.

B) **STEREOSCOPIC FACTORS:** These involve those elements, which are involved and vary during viewing the photographs stereoscopically. The elements are:

- 1) Stereoscopic viewing distance: The distance between the photographs and the eyepiece of the stereoscope. Vertical exaggeration increases as the viewing distance increases. It can be very well experienced by slightly raising the stereoscope during stereoscopic viewing of photographs.
- 2) Eye-base: Eye base is the interpupillary distance, which for an individual is fixed. Vertical exaggeration increases with increase in eye distance.



- 3) Photographic separation: For each person there is an optimum separation of photographs of stereo pairs at which the eye strain is minimum. Vertical exaggeration is directly related to the photographic separation.