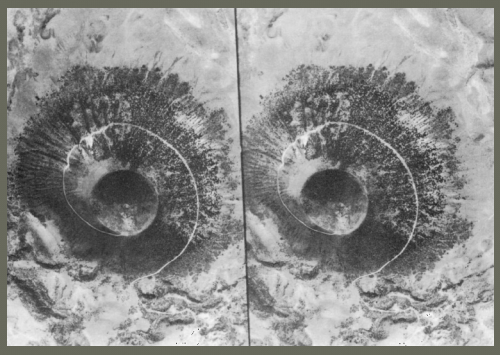
Remote Sensing

Topic 6: Principles of Stereoscopic Vision

Chapter 3: Lillesand and Keifer
Chapters 2 and 3 Avery and Berlin
Chapter 3: Paine (also on reserve in Map Library)

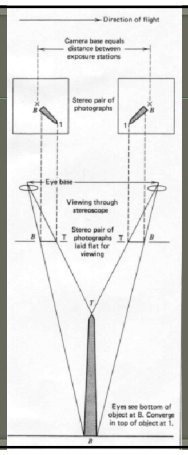
Stereoscopy

- Science that deals with the use of binocular vision to achieve a 3-D effect
- Observation from two different perspectives
  - e.g. two adjacent photos (aka stereo-pair)
  - or a stereogram

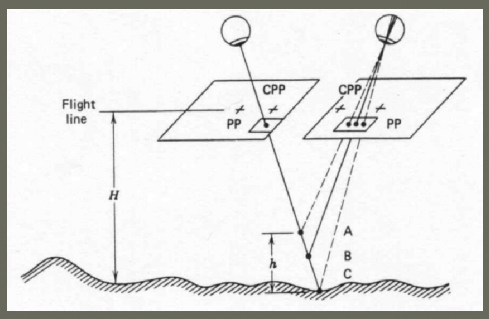


Parallax

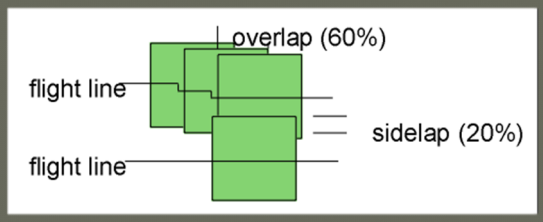
- Refers to apparent shift in position of object
- Result of change in viewing position
- Amount depends on height!



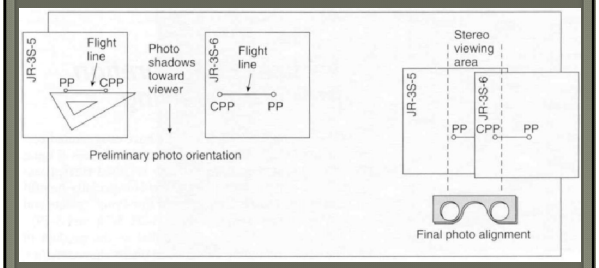
Parallax Height Determination



Stereo-coverage

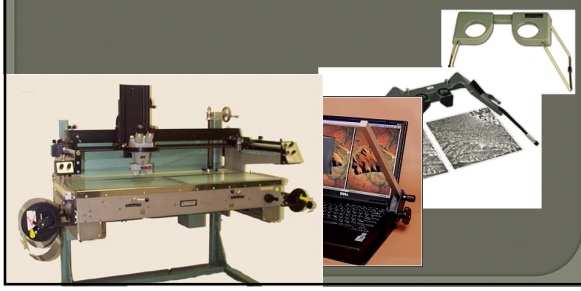


Alignment of Stereo Model



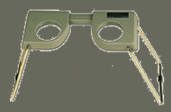
Pseudoscopic Vision

Stereoscopic Viewing



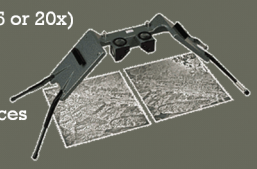
Pocket Stereoscope

- Advantages
  - Adjustable inter-ocular distance
  - Frame fixes distance from stereogram
  - Small/portable
- Disadvantages
  - Low magnification
  - Overlapping photos



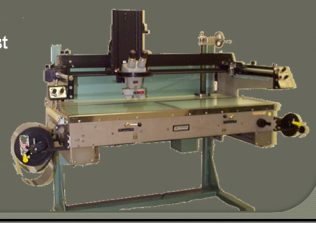
Mirror Stereoscope

- Mirrors enable entire area to be viewed without overlap
- Variable magnification (3 - 15 or 20x)
- Individually focused eye-pieces
- Scanning mirror stereoscope allows you to roam over the image without readjusting the stereo-pair



Zoom Stereoscope

- Higher magnification (2 - 64X)
- Usually designed to work with rolls of photo transparencies and incorporating a light table
- Each eye-piece rotates independently to adjust for crab



Vertical Exaggeration

- Objects have exaggerated vertical distances
- Due to exaggerated distance between successive photographs
- Varies slightly for everyone

Calculating VE

$$VE = (AB/H)\ (h/EB)$$

where: AB = air-base H = aircraft height
h = distance b/w eyes and plane of stereo model
EB = eye base

- h/EB is difficult to determine so is generally considered a constant equal to 6.5
- Therefore, this formula may be rewritten as:

$$VE = (AB/H)\ (6.5)$$

where: (AB/H) is referred to as the base-height ratio

Calculating VE

VE = (AB/H) 6.5

where: (AB/H) is referred to as the base-height ratio

Example:
Brandon Photoset Roll Number 18658 (15 photos)

VE = (1630 m / 3048 m) x 6.5 = 3.47

Note : AB can also be estimated by (1-%Endlap) x Photo Width
example:
(1-60%) x 9 in x PSR = 0.40 x 9 in. x 20000/12 = 6000 ft or 1829 m
VE = (1829 m / 3048 m) x 6.5 = 3.9
at 80% endlap AB = 0.20 x 9 in. x 20000/12 = 3000 ft or 915 m
VE = (915 m / 3048 m) x 6.5 = 1.9