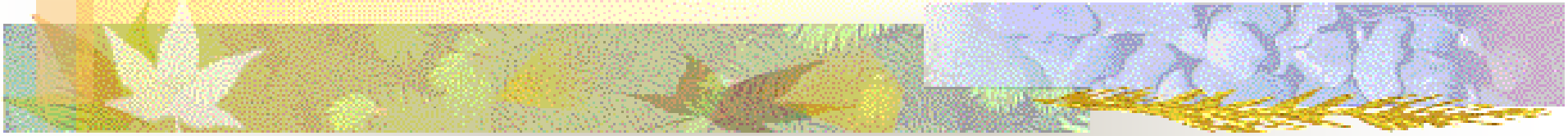
AERIAL PHOTOGRAPHY

AIR BORNE PLATFORM



AERIAL PHOTOGRAPH

- Aerial photograph is a set of photograph taken by a special camera placed on the aircraft.
- Aerial photography is a science of making photographs from the air for studying the surface features of the earth.
- It is used for interpreting or observing earth features as it offers possibilities of detailed study of the terrain and its culture suited to the need of the investigator or the specialist.


LANGEN
BURG

- Information can be obtained at two levels:QUALITATIVE and QUANTITATIVE.
- **Qualitative**:PHOTO-INTERPRETATION: descriptive information about the photographed object.

  Precise measurement not needed

  photo-interpreter, however uses the measurements and information provided by photogrammatist

Quantitative: PHOTOGRAMMETRY:

measurement of linear distances, angles, height differences between terrain objects etc.

Precise measurements help in mapping

Also require information provided by interpreter along with accurate aerial measurements

PROPERTIES OF AP

- A good aerial photo should maintain-

a) Geometrical Properties
   a) scale,
   b) shape
   c) size

b) Tonal Properties

c) Image Quality (Contrast, sharpness, steadiness)

DIFFERENCE BETWEEN A MAP AND AN AERIAL PHOTOGRAPH

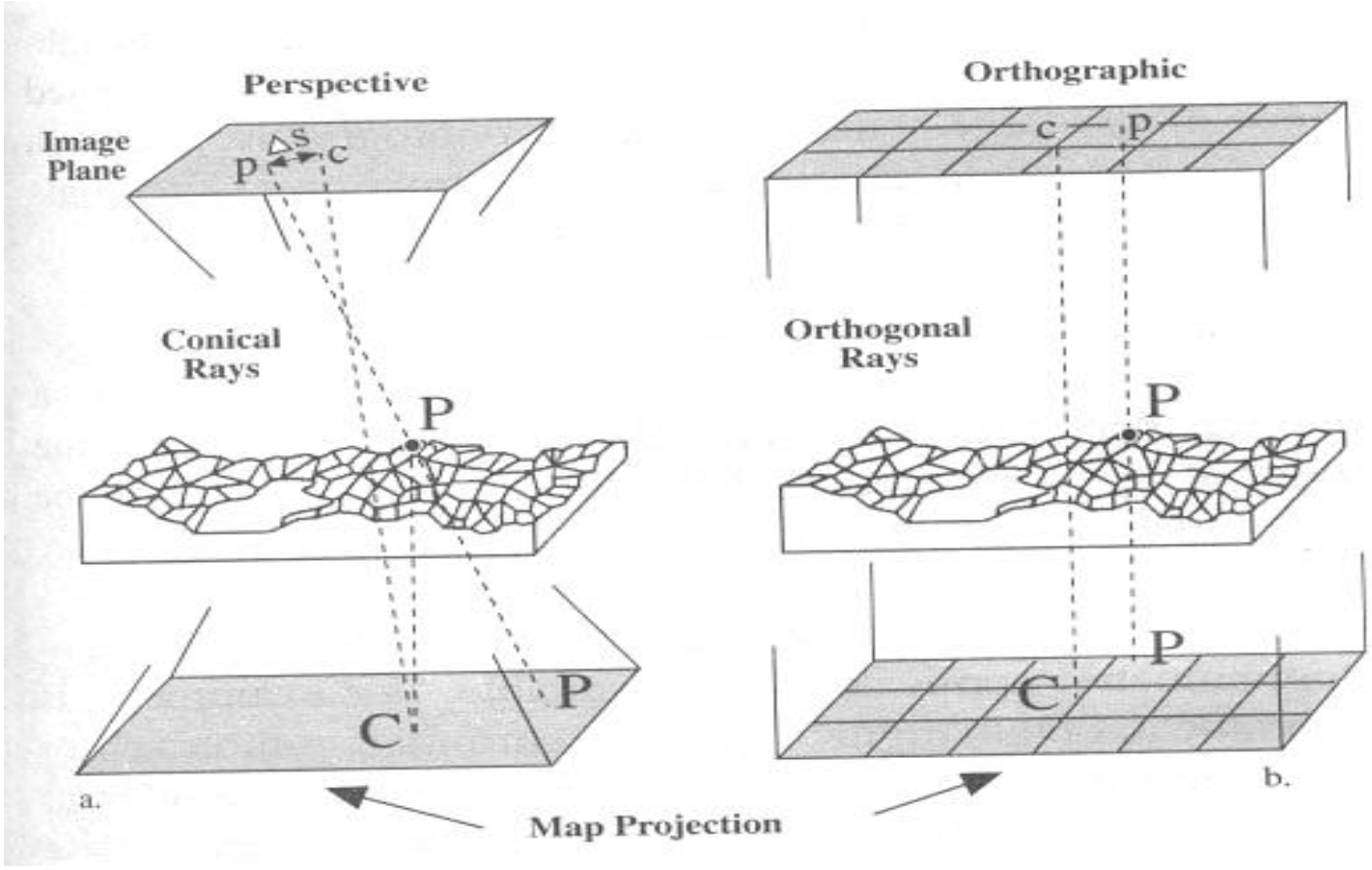
MAP

- Each point of the earth surface is projected perpendicular to the plane- distances, angles and areas in the plane are independent of the elevational differences of the objects.

AERIAL PHOTOGRAPH

- Projecting rays pass through a single point called the perspective centre(optical centre of the camera lens) which changes the arrangement of the objects of the earth surface on the photo plane.

MAP/ AERIAL PHOTO



- Maps have a constant scale, therefore ground distances can be calculated by measuring map distances.

- Maps show selective detail based on users requirement.

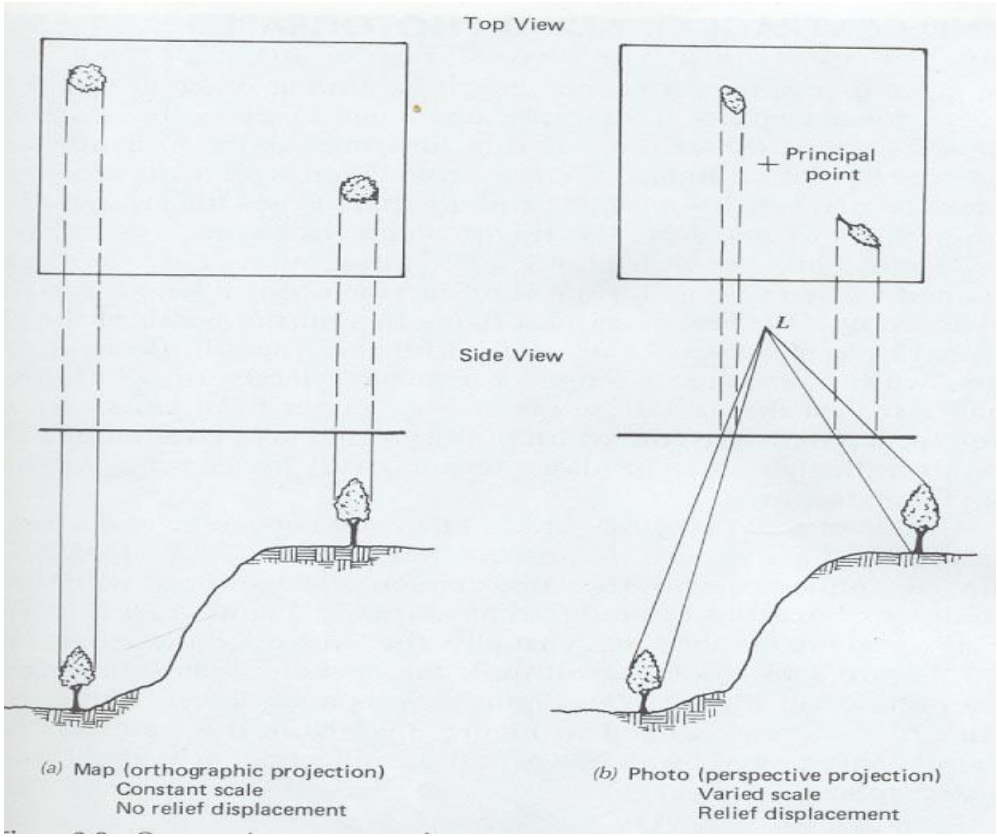
- Use of symbols- understood easily by a layman.

- Scale of the photo changes from point to point due to elevational differences (relief displacement).

- All details are shown.

- Actual features increases the complexity and needs specialized training to understand/ interpret the features.

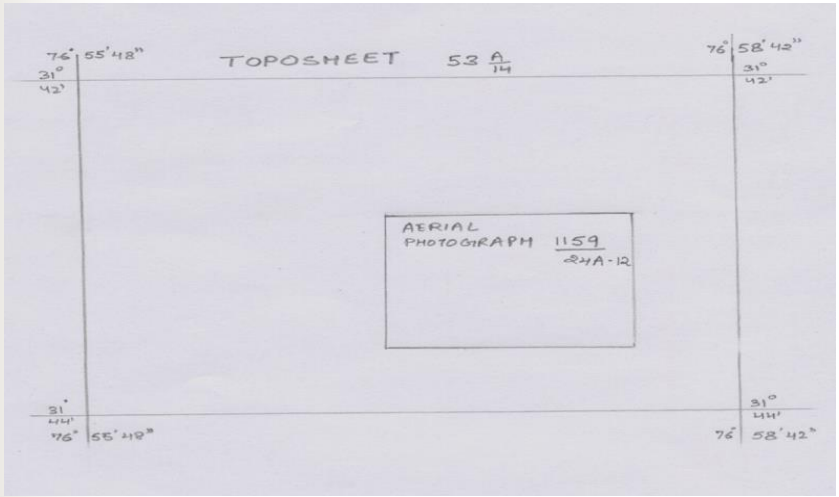
- Relationship between earth features cannot be built in absence of all visible details.
- All objects/ visible features can be seen simultaneously.

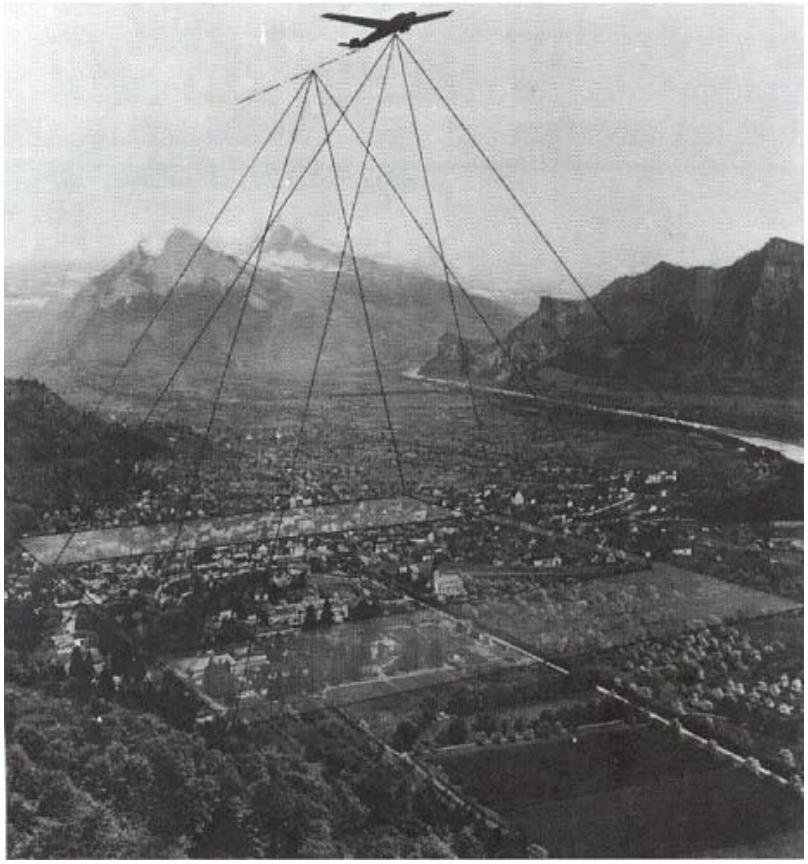


TECHNIQUES OF PHOTOGRAPHY

I. Photographic Mission

- Area to be photographed is demarcated on topographic sheets/maps





- On a topographic sheet, the north-south and east-west boundaries are demarcated according to location of study area
- In India, it is demarcated on a 1:250,000 toposheet
- The purpose of photography should be stated for better planning
- Scale of Aerial photographs should be specified as per requirement

- Type of photography should also be specified
  - Vertical/ oblique
  - B/W, B/W Infrared, Coloured or Coloured Infrared
  - In some cases, type of Aerial Cameras are also chosen in order to fulfill the quality of the photographs
  - Lenses and their focal lengths are mentioned
  - Time and season of photography based on user's requirement -

Time: Generally three hours before noon to three hours after mid-day. But according to needs of the user it is decided(long/ short shadow)

Avoid long and deep shadows as it obscures many adjoining details. At the same time very small shadows may result in loss of information as an interpreter cannot delineate certain elevated features in absence of shadows. Thus timings vary according to specific areas and conditions.

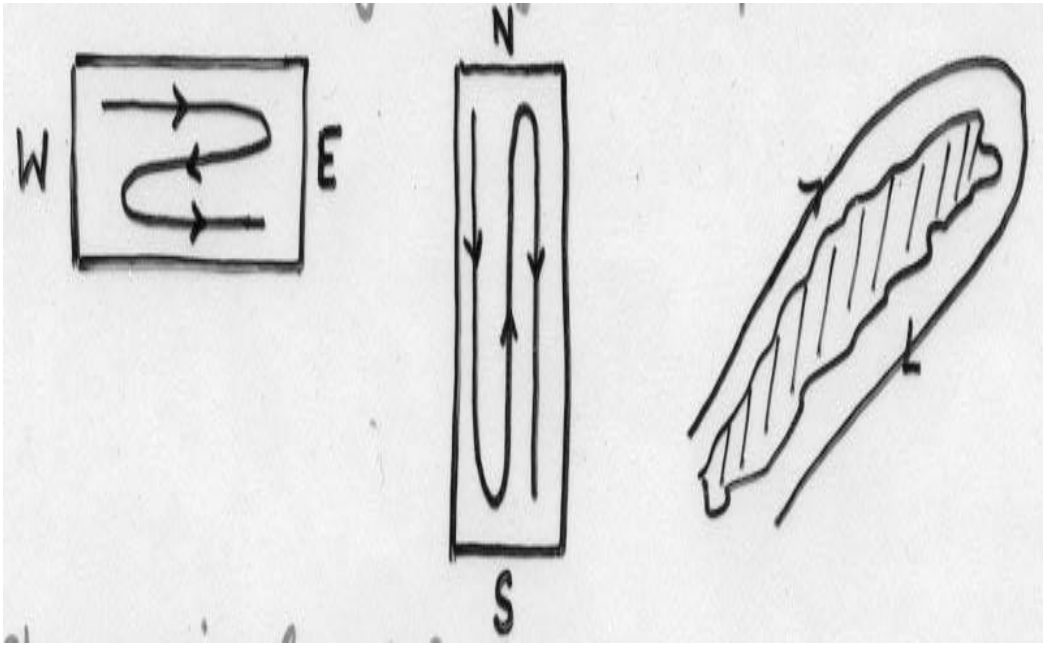
Season: Based on the type of information to be acquired, and the purpose, the season is decided.

E.g., soil condition during the season when trees shed their leaves, or it is best after the harvesting season. While for forest information photography done during the time of full foliage

For study of cropping pattern it is best when standing crops are visible.

Best time: during the dry and clear season to derive maximum information

- *Flight direction to be stated*: Aerial Photographs are taken in **strips** to cover the designated area. The flight direction is kept along the length of the area or along a particular natural feature. The photographs are numbered consecutively along the strip/ flight direction. (fig)



- *Stereoscopic coverage in photography*: Aerial Photographs are taken continuously maintaining **overlaps** between consecutive photographs. A pair of photograph known as a stereo-pair can generate 3-D image(stereoscopic appearance). Overlaps are of two types:

  Forward overlap:the overlapping is in the direction of flight and should be atleast 60% of the photo format(for generating 3-D).

  Side overlap: overlap between the strips. It should be atleast 20% for matching the common details and allow for slight deviations in the path of the Aircraft.

Stereoscopic Coverage

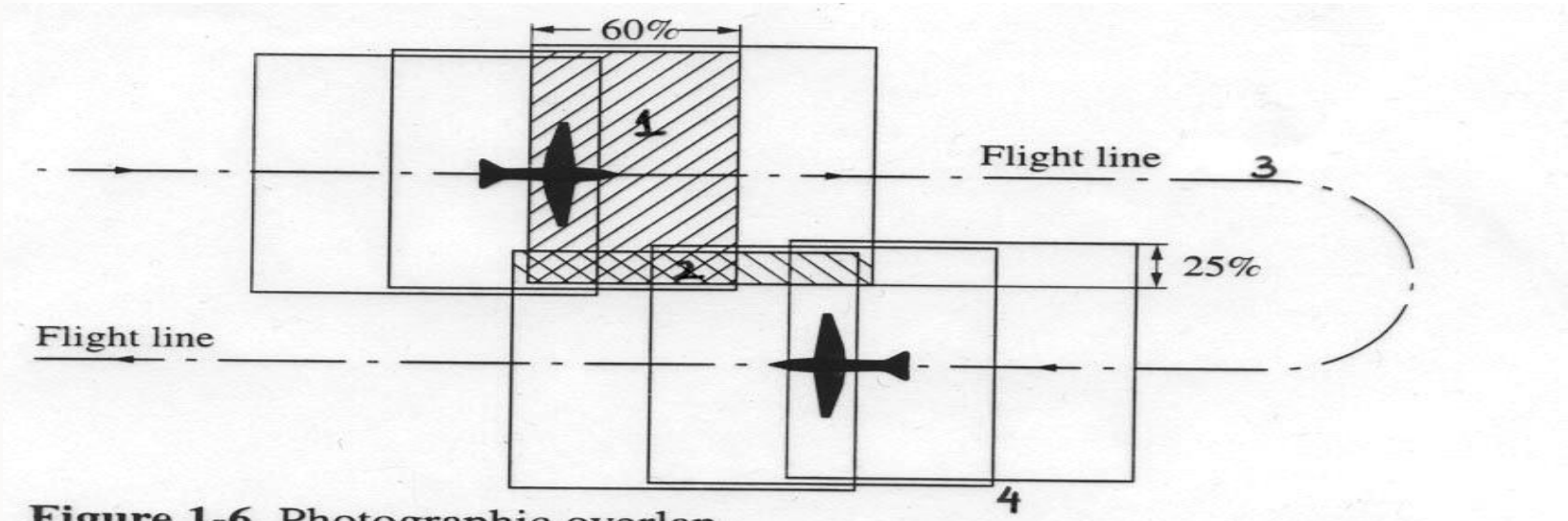


Figure 1-6 Photographic overlap.

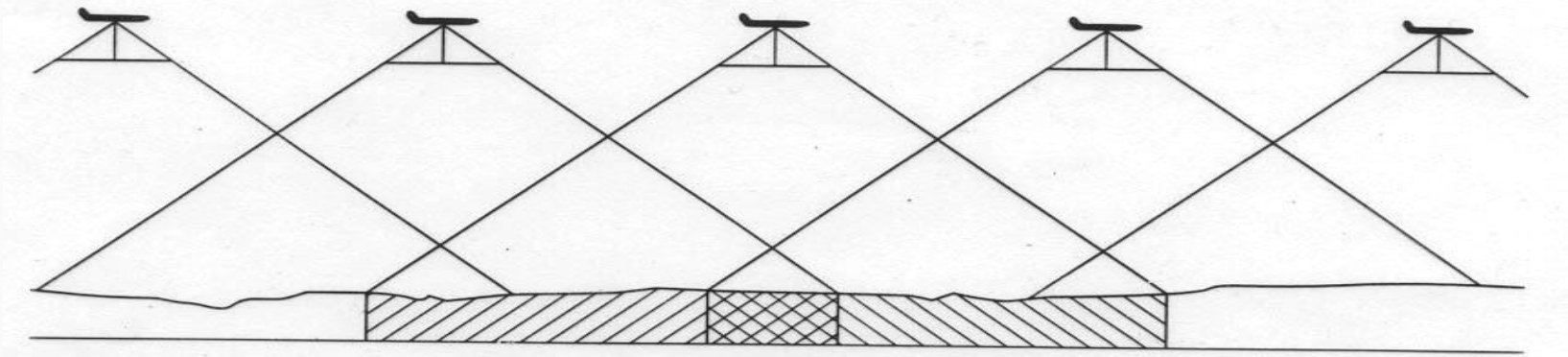
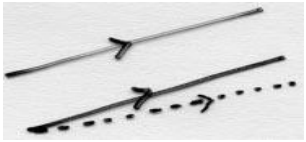


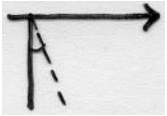
Figure 1-7 Overlap along flight line.

- Overlaps may slightly increase or decrease acc to terrain condition to avoid navigational limitations/ for better identification
- Water bodies and high terrain areas

- *Flight lines* : All flight lines should be parallel. Deviations/ drift up to 5 degree of the given cardinal directions are allowed. Due to this drift, edges of consecutive photographs often do not match (crab).Allowed up to permissible limit of 3 degree.

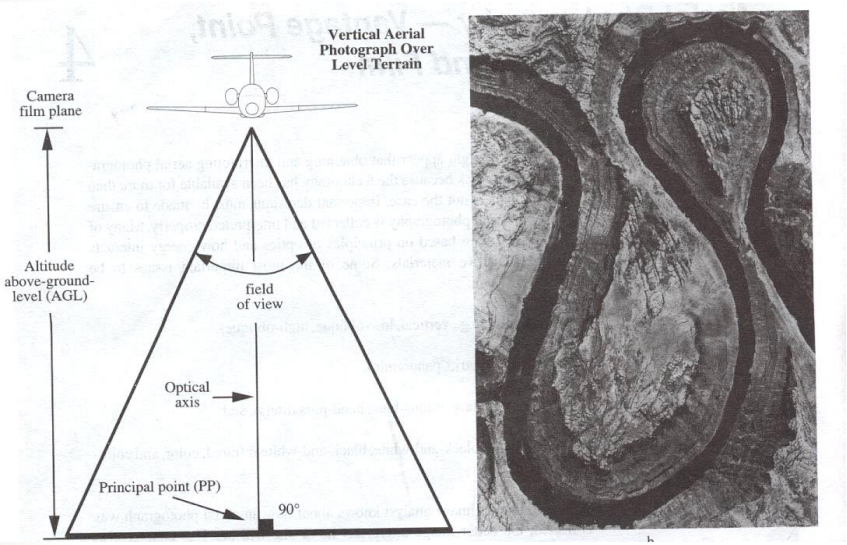


- *Verticality*: The camera mounted on the aircraft should be vertical. But it often gets slightly tilted. Tilt is allowed up to 2 degree.



- Displacement due to heights of the object may obscure the adjoining details known as dead ground
- It can be avoided by flying higher but it may result in poor 3-D effect
- Balance between 3-D and low dead ground by choosing the optimum flying height
- E.g., high rise buildings in urban areas/ mountainous areas

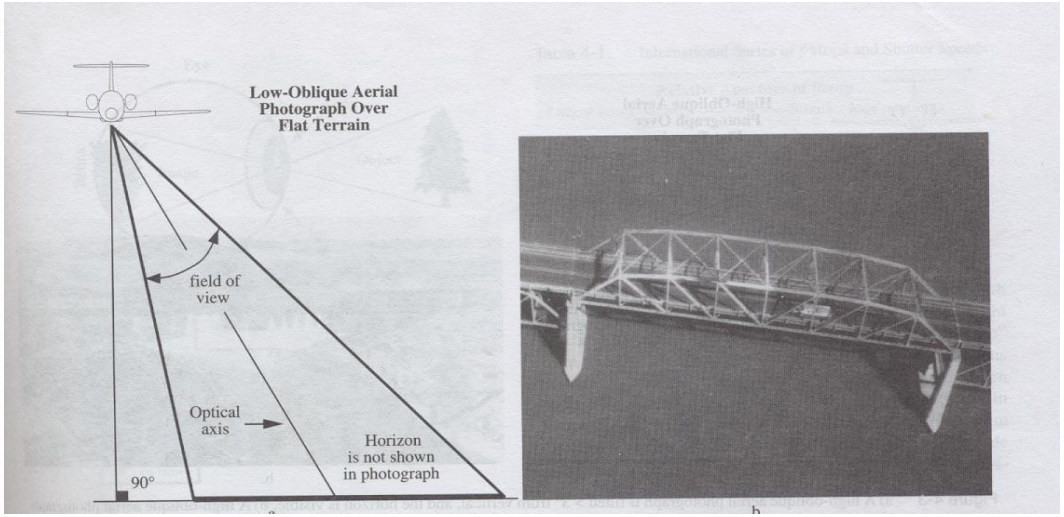
TYPES OF PHOTOGRAPHS

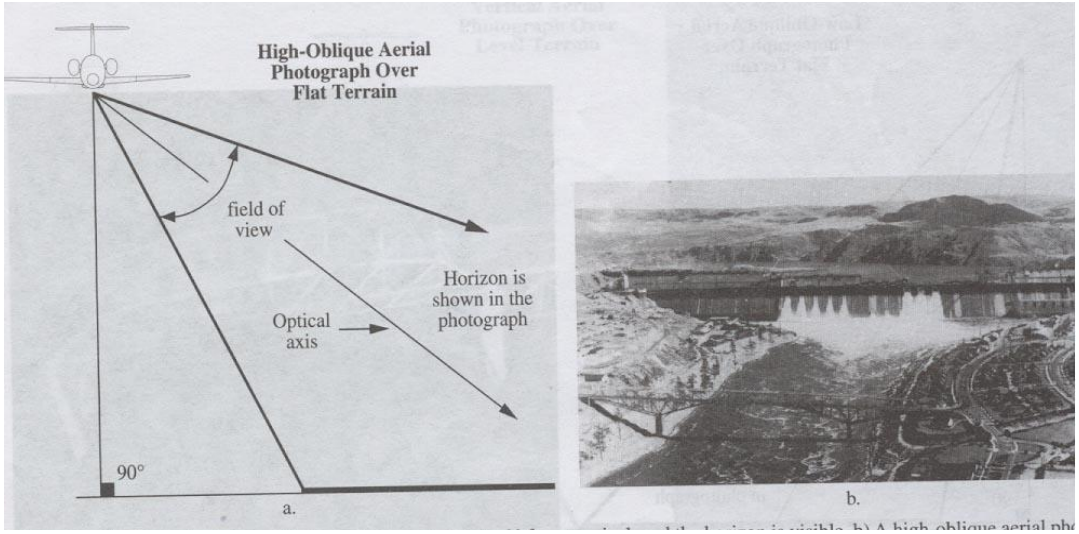


1. Based on direction of camera axis

- Vertical photographs: The axis of the Aerial Camera is vertical or near vertical
- Oblique photograph: The optical axis of the camera is tilted from vertical(low-horizon does not appear/ high-horizon appears.

OBLIQUE PHOTOGRAPH (LOW & HIGH)





2. Based on type of film used

- Panchromatic: B/W film-shades of gray
- Coloured: features appear in their true colour.
- Infrared: spectral sensitivity extends beyond the visible wavelength of the spectrum(extended vision)

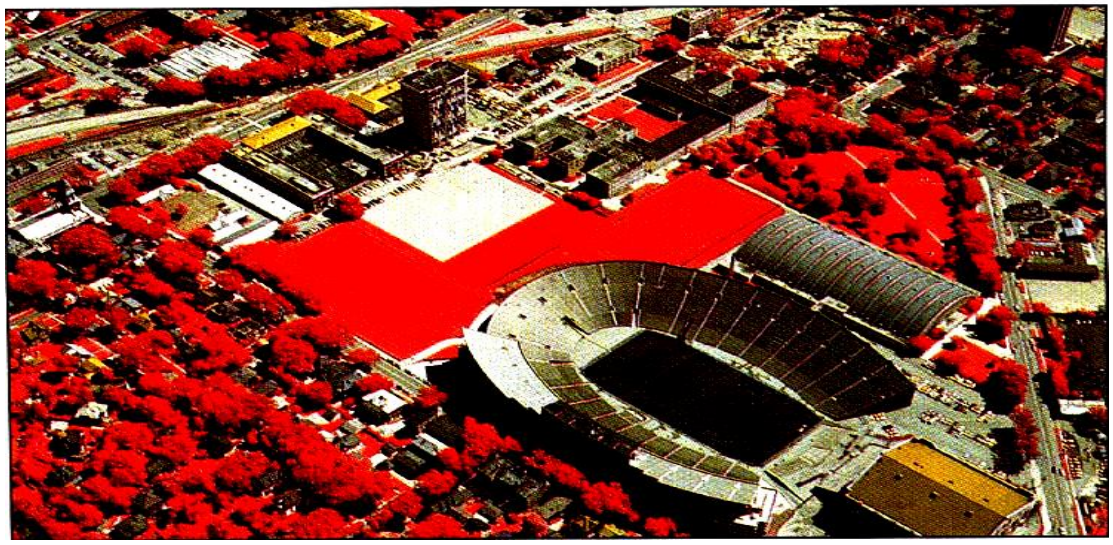
- Infrared B/W
- Infrared colour- false colour composite(fcc) as colour shift takes place(since IR has no colour)

  IR--- R R----G

  G----B B----BL

PANCHROMATIC(B/W) & B/W INFRARED

COLOURED AND COLOURED INFRARED



- PANCHROMATIC:
  - Predominantly used in Aerial Photography
  - Sensitive to wavelength of visible light
  - Features distinguished according to grey tonal characteristics
  - They have more sharper features
  - Best for topographic mapping
  - Cheaper to take, process, print and procure

- COLOURED PHOTOGRAPHS
  - Exceedingly attractive but does not give any extra information
  - Problem of haze dilutes the colours and changes their hue
  - Should be large scale
  - Easier to detect large no. of shades

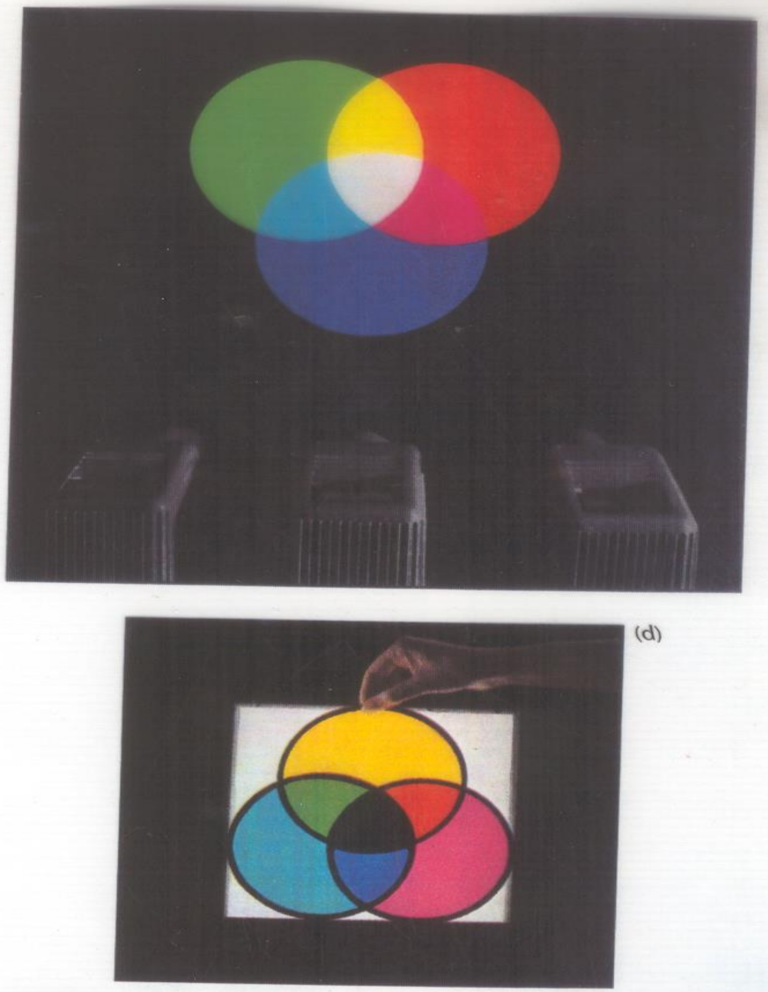
Concept of colour

- Use of primary colours blue, green and red, with wavebands 0.4-0.5, 0.5-0.6 and 0.6-0.7um to represent the surface features
- These colours are made by mixtures of three complementary colours- yellow, magenta and cyan
- Each of these colours absorb one third of the wavelength in white light while transmitting the other two
- Yellow absorbs blue- called minus blue filter

  Magenta absorbs green- called minus green filter

  Cyan absorbs red- called minus red filter
- White is absence of any colour that is, all colours are transmitted
- Black is mixture of equal quantities of yellow magenta and cyan

- Three emulsion layers made sensitive to one-third of the spectrum
- Produce dye in each emulsion layer
- Mixing of colour known as additive colours, not used in the production of coloured film as colour reversal take place.
- The subtraction process relies on dyes made of comp colours into the film. These dyes absorb one primary colour and transmit the other two



(a)

(b)

Plate 2 Color-mixing processes. (a) Color additive process—operative when lights of different colors are superimposed. (b) Color subtractive process—operative when dyes of different colors are superimposed. (Courtesy Eastman Kodak Company.) (For major discussion, see Section 2.7.)

- B/W INFRARED
  - Similar characteristics as panchromatic B/W
  - Spectral sensitivity increases beyond the visible wavelength into near infrared region of 1.0 um
  - Record more details
  - Added applications

- COLOURED INFRARED
  - Built around three emulsion layers each sensitive to a particular wavelength
  - It uses yellow to record green, magenta to record red and cyan to record infrared. No blue light is allowed to reach the film as a yellow filter is used in front of the lens to absorb it
  - Results in colour shift-spectral signature changes

- FILTERS

  they are coloured plates of glass or dyed gelatins placed over the camera lens to absorb certain colours to cut out unwanted light to reach the camera lens