1000 Applications & Uses

67 Major Applications

Topics

1. Introduction
2. Principles of Photogrammetry
3. Types of Aerial Photographs
4. Geometry of Vertical Aerial Photograph
5. Scale & Height Measurement
6. Fundamentals of Stereoscopy
7. Parallax Measurement

Remote Sensing

Remote Sensing is the acquisition of information about an object or phenomenon without making physical contact with the object and thus in contrast to on site observation.

Remote Sensing

"The acquisition of physical data of an object without touch or contact"
- Lintz and Simonett, 1976

"The observation of a target by a device some distance away"
- Barrett and Curtis, 1982

"The use of electromagnetic radiation sensors to record images of the environment, which can be interpreted to yield useful information" **- Curran, 1985**

"The use of sensors, normally operating at wavelengths from the visible to the microwave, to collect information about the Earth's atmosphere, oceans, land and ice surfaces" **- Harris, 1987**

Remote Sensing

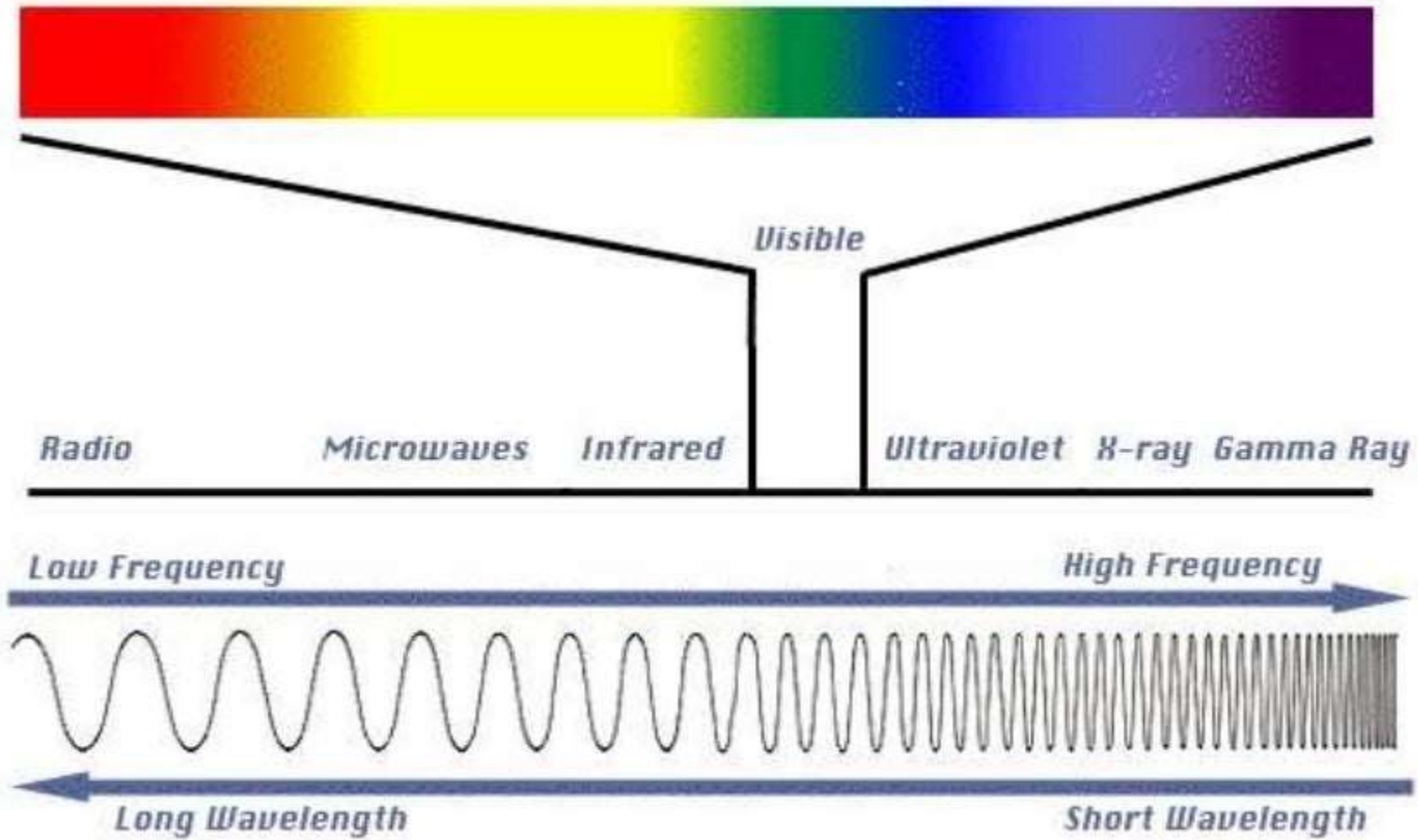
Device to sample and measure radiation

Medium = electromagnetic radiation

Target is the terrestrial environment
(atmosphere, oceans, land surface)

LISS – III
Camera

Device to sample and measure radiation (sensor)



Medium = Electro Magnetic Radiation (EMR)

Introduction to Photogrammetry

Definition of Photogrammetry:

The art, science, and technology of obtaining information about physical objects and the environment by photographic and electromagnetic images.

Categories:

1. **Metrical Photogrammetry:** obtaining measurements from photos from which ground positions, elevations, distances, areas, and volumes can be computed and topographic or planimetric maps can be made.
2. **Photo Interpretation:** evaluation of existing features in a qualitative

Types of Photogrammetry

1. **Aerial** – series of photographs of an area of terrain in sequence using a precision camera.
2. **Terrestrial** – photos taken from a fixed and usually known position on or near the ground with the camera axis horizontal or nearly so.
3. **Close range** – camera close to object being observed. Most often used when direct measurement is impractical.

Photogrammetry for Engineering

Photogrammetry is the process of measuring images on a photograph.

Modern Photogrammetry also uses radar imaging, radiant electromagnetic energy detection and x-ray imaging – called ***Remote Sensing.***

Origins of Remote Sensing

Remote Sensing began with Aerial Photography

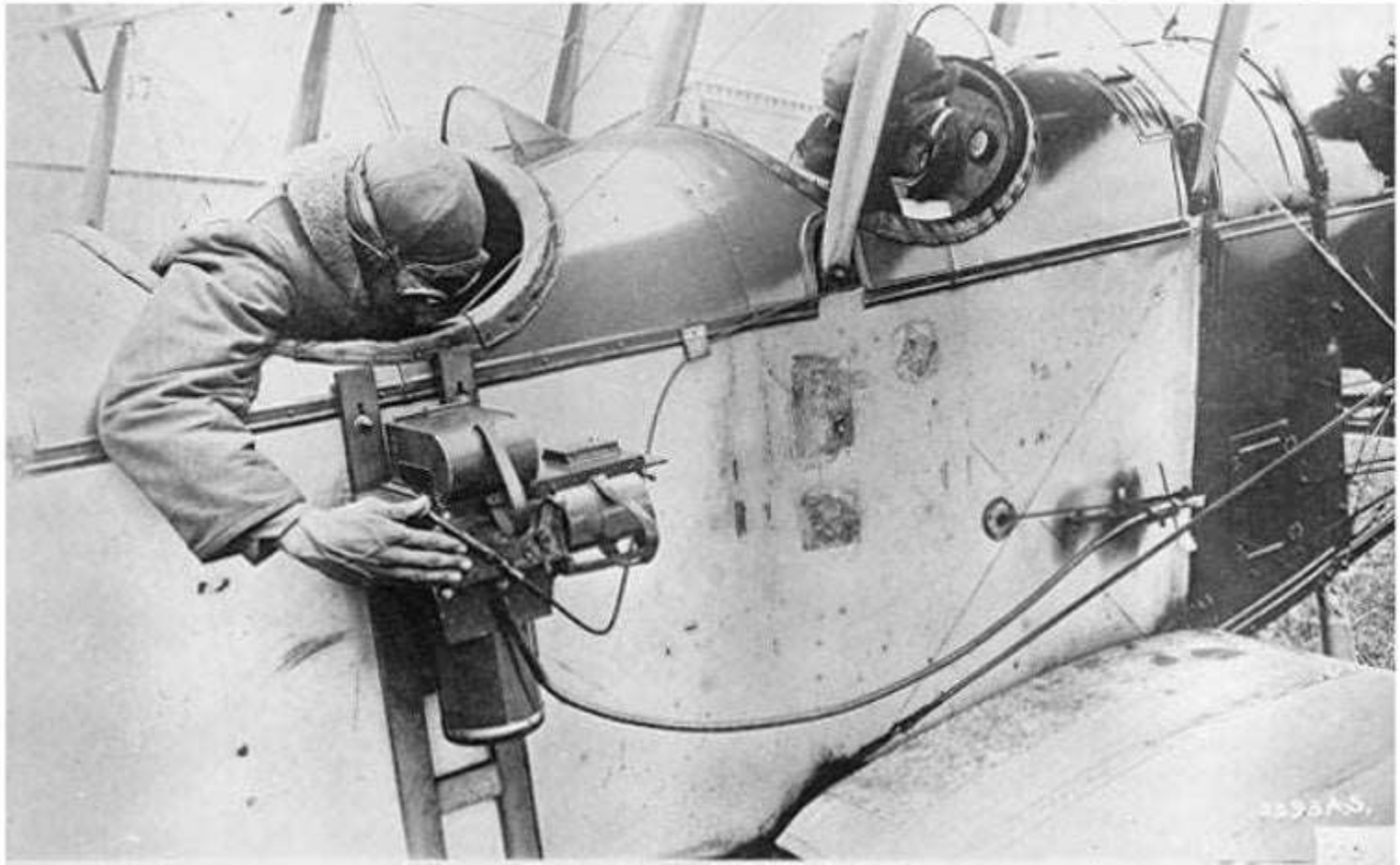
First photographs taken in 1839

In1858 Gasper Felix Tournachon "Nadar" takes photograph of village of Petit Bicetre in France from a balloon

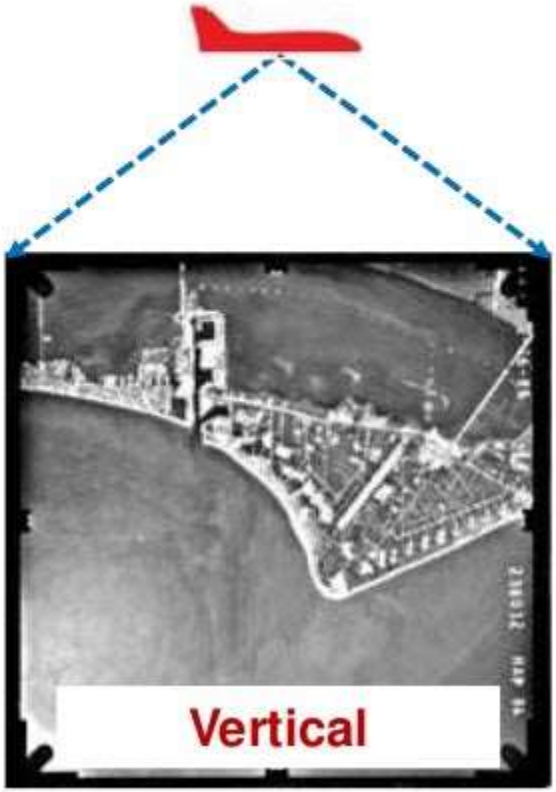
Paris by Nadar, circa 1859

Boston by Black and King (1860

World War One was a major impetus to development of aerial photography



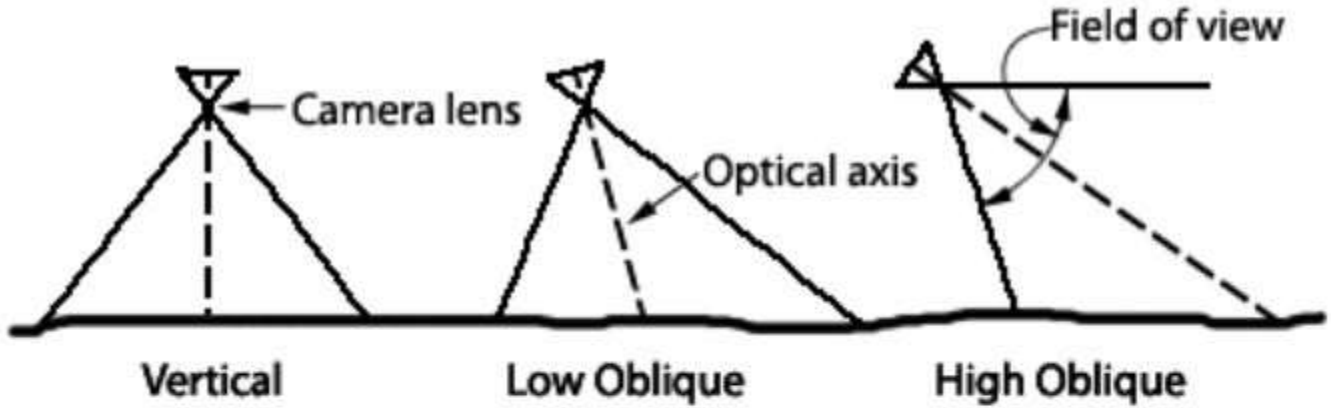
Types of Aerial Photographs



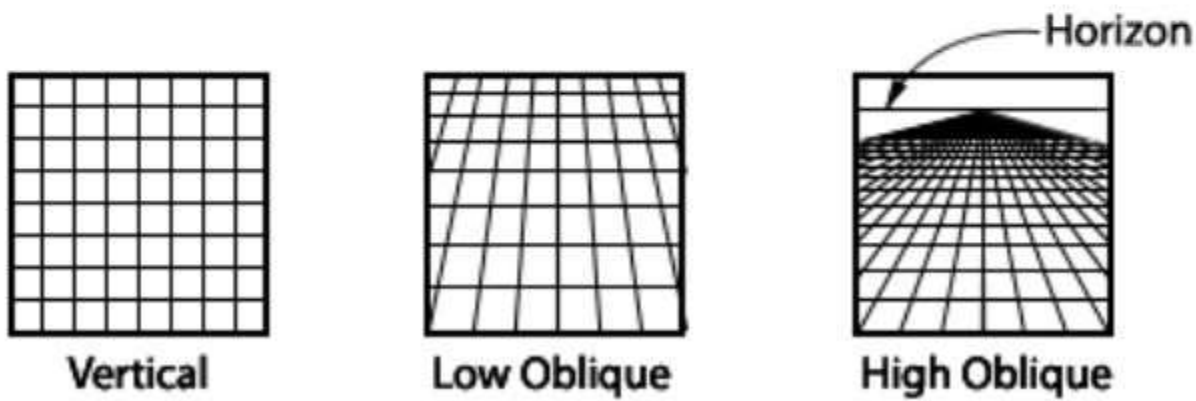
Vertical

Low Oblique (No Horizon)

High Oblique



Camera orientation for various types of aerial photographs



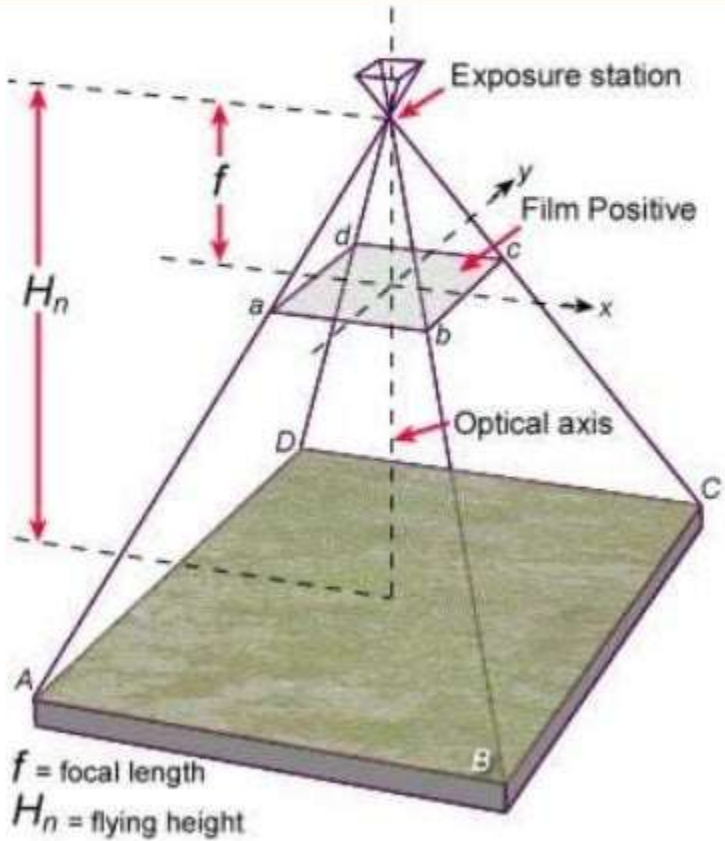
How a grid of section lines appears on various types of photos.

Vertical Aerial Photograph

Vertical is most important as it has minimum distortion and can be used for taking measurements.

Characteristics:

- Tilt <= 3^0 from the vertical
- Scale is approximately constant throughout the photo
- Most common format is 9” x 9” photograph

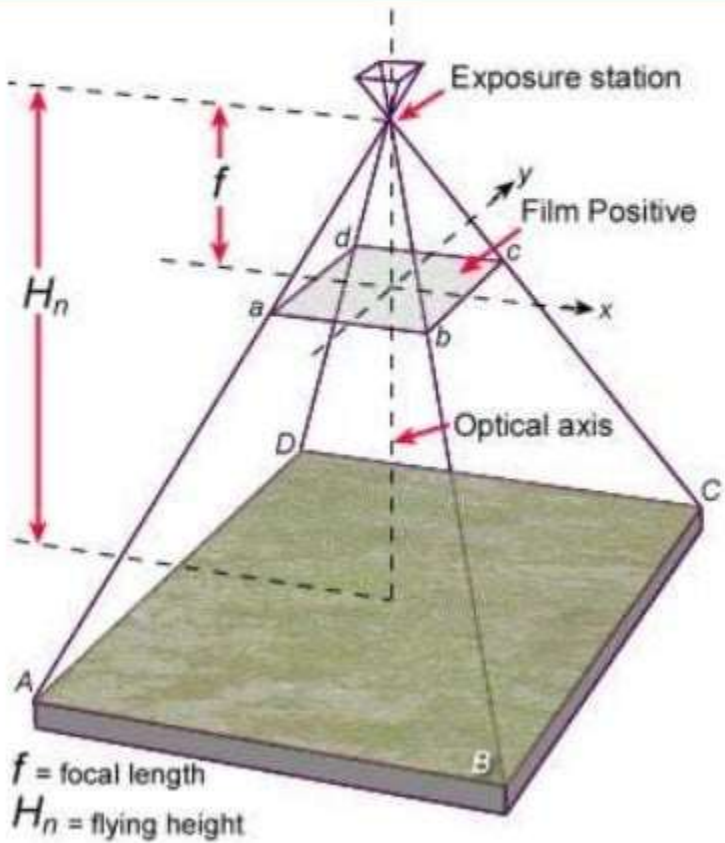


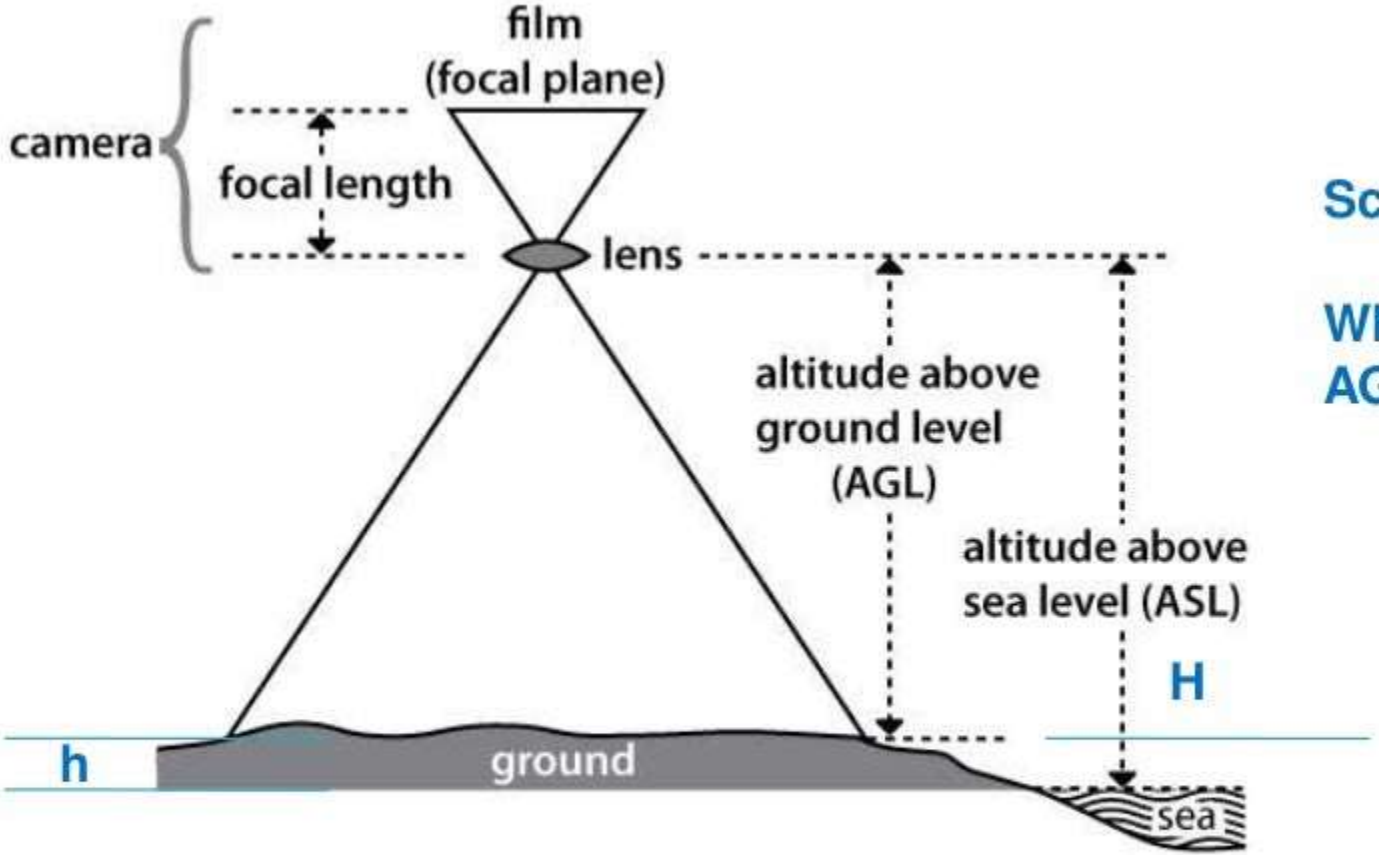
Scale Measurement

If you know focal length of camera and height of aircraft above the ground you can calculate the scale of the photograph.

Scale = f/H-h

f = focal length (distance from centre of lens to film surface)
H = flying height of aircraft above sea level
h = height of ground above sea level





Scale = focal Length/AGL

Where
AGL = H-h

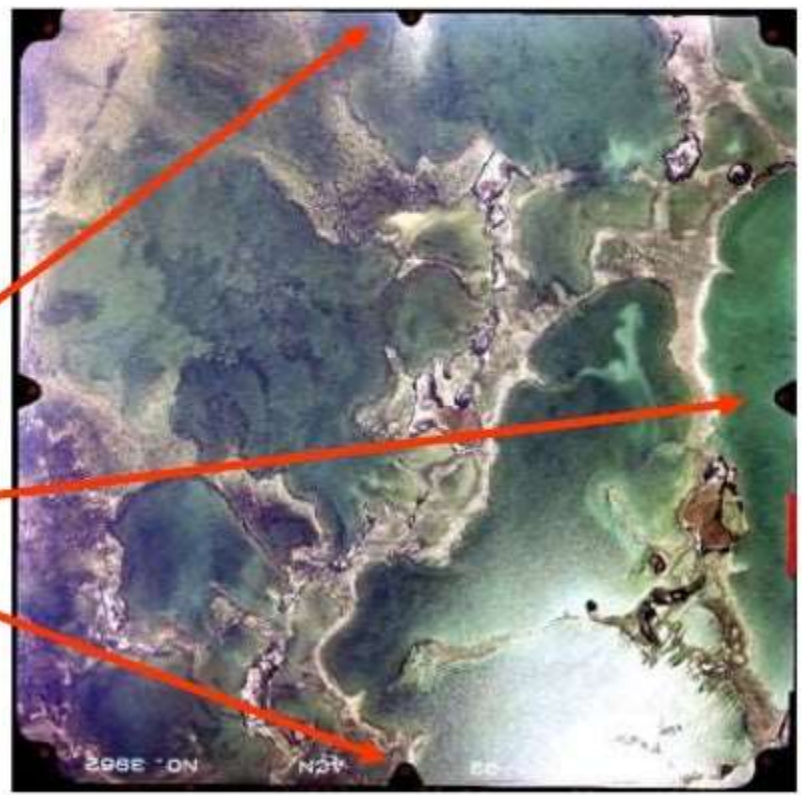
When you know the scale you can take 2-D measurements from a photograph (e.g.
horizontal distance, horizontal area, etc.)

Terminology

Fiducial marks is a set of marks located in the corners or edge-centers, or both, of an aerial photographic image.

These marks are exposed within the camera onto the original film and are used to define the frame of reference for spatial measurements on aerial photographs.

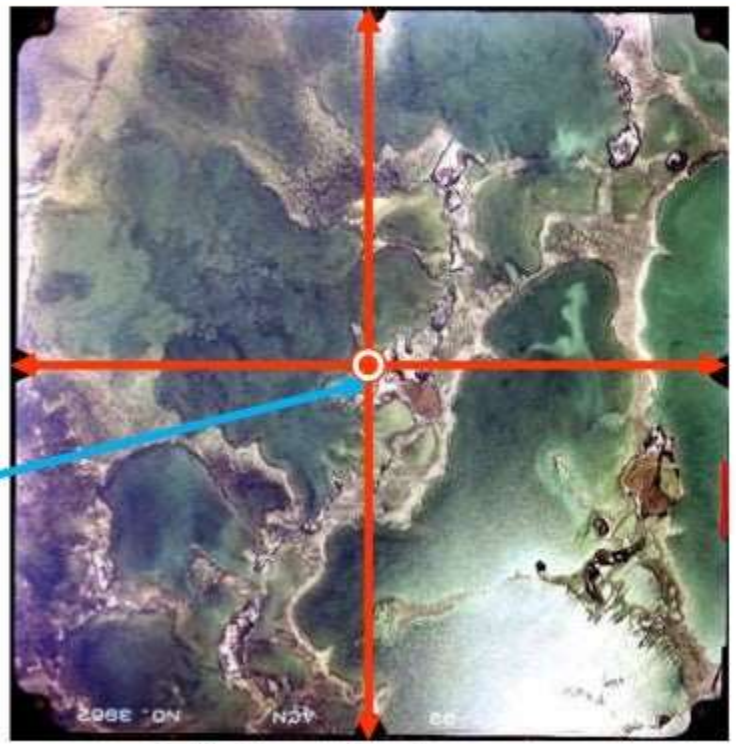
Fiducial marks



Terminology

Opposite fiducial marks connected, intersect at approximately the image center or principal point of the aerial photograph.

The principal point is the geometric center of the photograph



Principal point

Fiducial

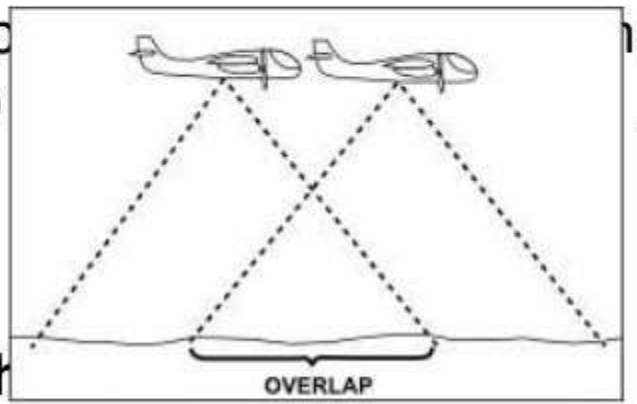
Flight Planning

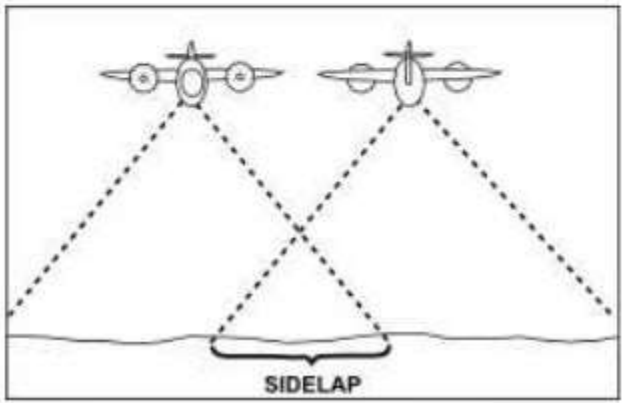
Aerial photo projects for all mapping and most image analyses require that a series of exposures be made along each of the multiple flight lines.

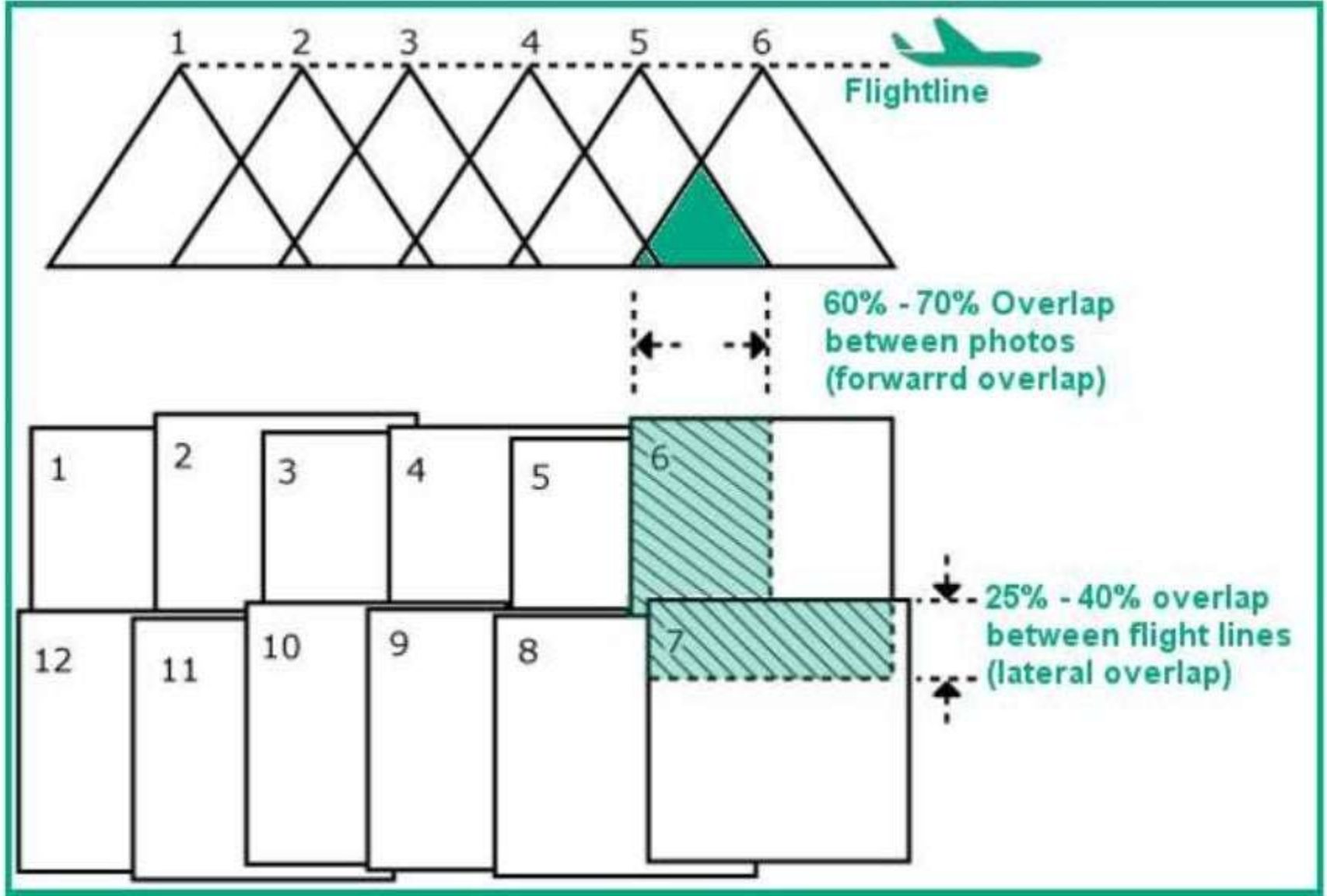
To guarantee stereoscop…hout the site, the photographs must overlap

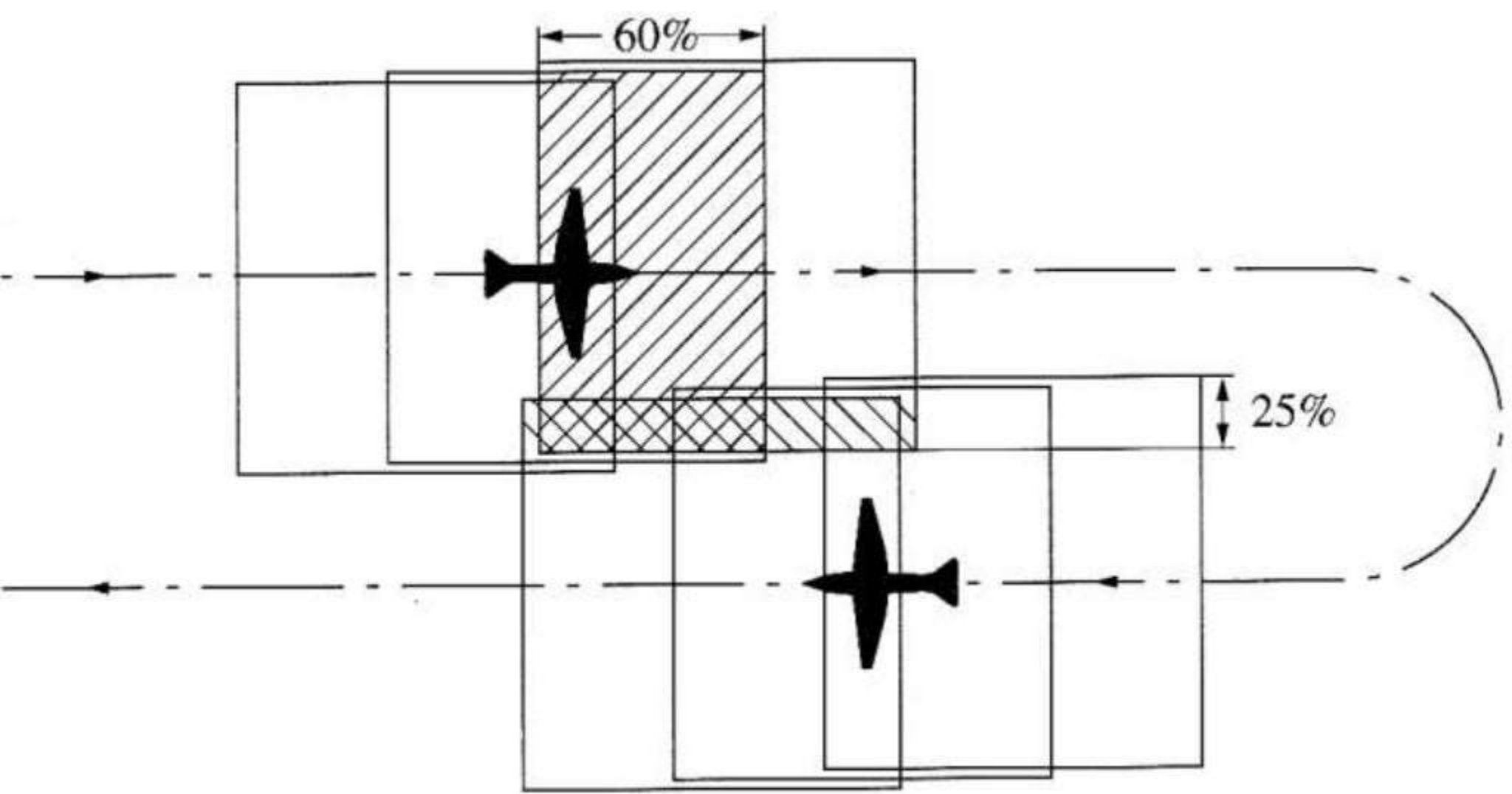
a) **in the line of flight**
(Overlap)
needed for parallax

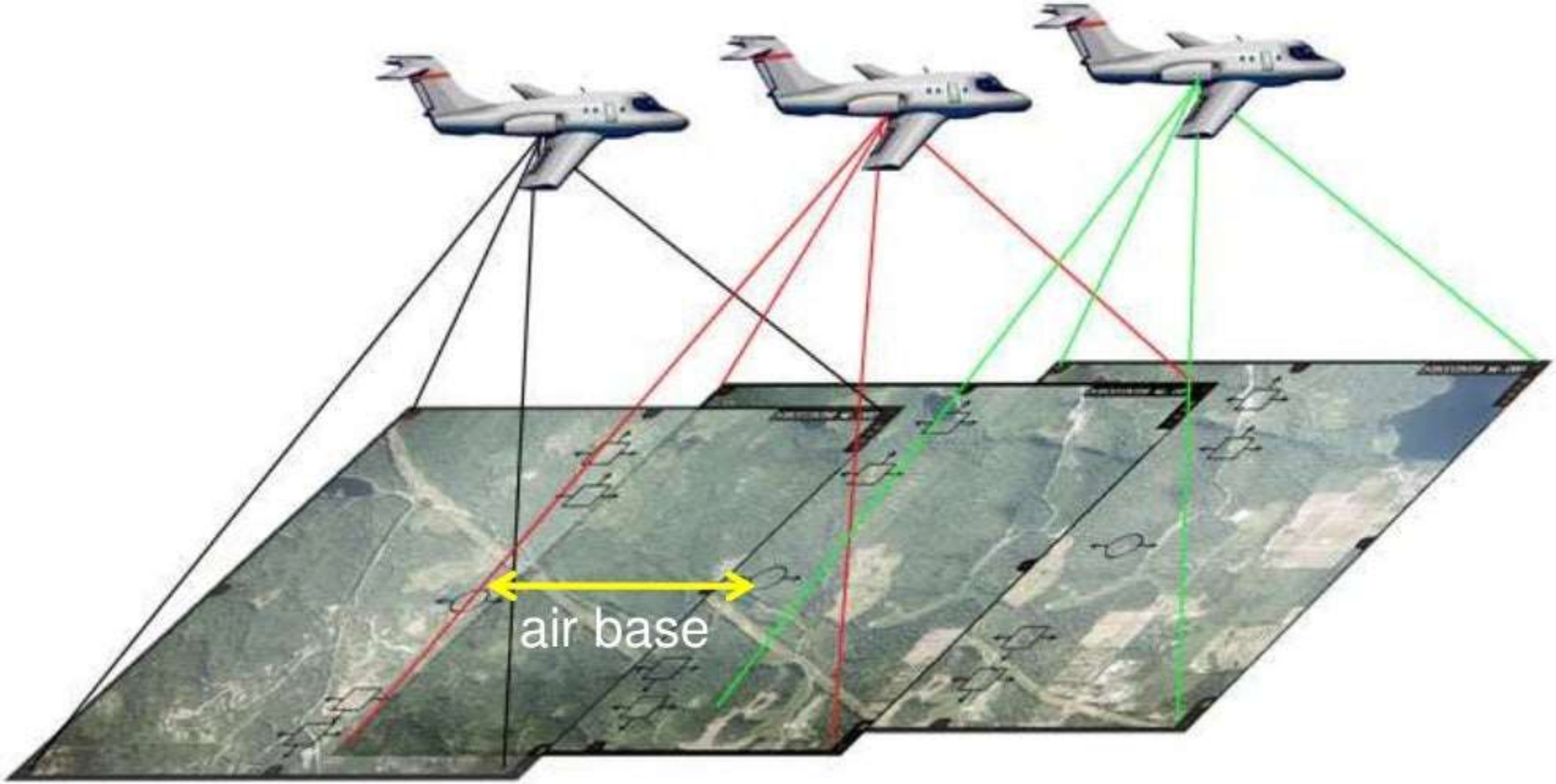
a) **between adjacent fligh**
(Sidelap)
to avoid missing bits






1
2
3
4
5
6
Flightline
60% - 70% Overlap
between photos
(forwarrd overlap)
1
2
3
4
5
6
7
8
9
10
11
12
25% - 40% overlap
between flight lines
(lateral overlap)


60%
25%



Distance between principal point of adjacent photographs is known as the **“air base”**