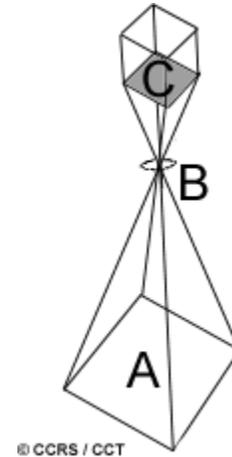


4. Concept of Aerial Photography---

Cameras and their use for aerial photography are the simplest and oldest of sensors used for remote sensing of the Earth's surface. Cameras are **framing systems** which acquire a near-instantaneous "snapshot" of an **area (A)**, of the surface. Camera systems are passive optical sensors that use a **lens (B)** (or system of lenses collectively referred to as the optics) to form an image at the focal plane **(C)**, the plane at which an image is sharply defined.

Photographic films are sensitive to light from $0.3 \mu\text{m}$ to $0.9 \mu\text{m}$ in wavelength covering the ultraviolet (UV), visible, and near-infrared (NIR). **Panchromatic** films are sensitive to the UV and the visible portions of the spectrum. Panchromatic film produces black and white images and is the most common type of film used for aerial photography. UV photography also uses panchromatic film, but a filter is used with the camera to absorb and block the visible energy from reaching the film. As a result, only the UV reflectance from targets is recorded. UV photography is not widely used, because of the atmospheric scattering and absorption that occurs in this region of the spectrum. Black and white infrared photography uses film sensitive to the entire 0.3 to $0.9 \mu\text{m}$ wavelength range and is useful for detecting differences in vegetation cover, due to its sensitivity to IR reflectance.



Colour and false colour (or colour infrared, CIR) photography involves the use of a three layer film with each layer sensitive to different ranges of light. For a **normal colour photograph**, the layers are sensitive to blue, green, and red light - the same as our eyes. These photos appear to us the same way that our eyes see the environment, as the colours resemble those which would appear to us as "normal" (i.e. trees appear green, etc.). In colour infrared (CIR) photography, the three emulsion layers are sensitive to green, red, and the photographic portion of near-infrared radiation, which are processed to appear as blue, green, and red,

respectively. In a **false colour photograph**, targets with high near-infrared reflectance appear red, those with a high red reflectance appear green, and those with a high green reflectance appear blue, thus giving us a "false" presentation of the targets relative to the colour we normally perceive them to be.

Cameras can be used on a variety of platforms including ground-based stages, helicopters, aircraft, and spacecraft. Very detailed photographs taken from aircraft are useful for many applications where identification of detail or small targets is required. The ground coverage of a photo depends on several factors, including the focal length of the lens, the platform altitude, and the format and size of the film. The focal length effectively controls the **angular field of view** of the lens (similar to the concept of instantaneous field of view discussed in section 2.3) and determines the area "seen" by the camera. Typical focal lengths used are 90mm, 210mm, and most commonly, 152mm. The longer the focal length, the smaller the area covered on the ground, but with greater detail (i.e. larger scale). The area covered also depends on the altitude of the platform. At high altitudes, a camera will "see" a larger area on the ground than at lower altitudes, but with reduced detail (i.e. smaller scale). Aerial photos can provide fine detail down to spatial resolutions of less than 50 cm. A photo's exact spatial resolution varies as a complex function of many factors which vary with each acquisition of data.

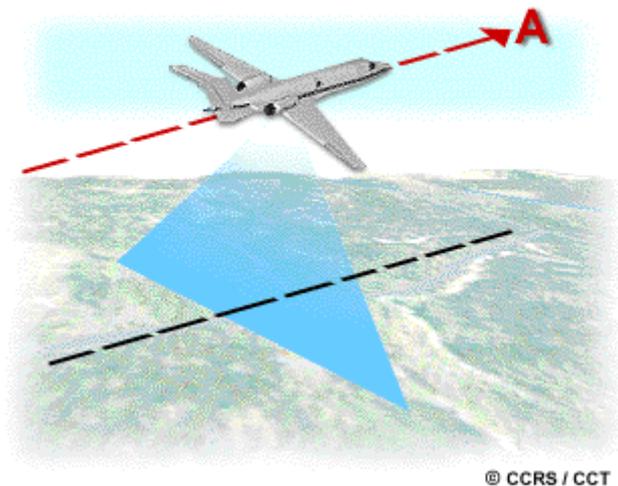
B. Classification of aerial photographs--Most aerial photographs are classified as 1.**oblique** 2.**vertical**, depending on the orientation of the camera relative to the ground during acquisition.

1. Oblique aerial photographs are taken with the camera pointed to the side of the aircraft. High oblique photographs usually include the horizon while low oblique photographs do not. Oblique photographs can be useful for covering very large areas in a single image and for depicting terrain relief and scale. However, they are not widely used for mapping as distortions in scale from the foreground to the background preclude easy measurements of distance, area, and elevation.

2.Vertical photographs taken with a single-lens frame camera is the most common use of aerial photography for remote sensing and mapping purposes. These cameras are specifically built for capturing a rapid sequence of photographs while limiting geometric distortion. They are often linked with navigation systems onboard the aircraft platform, to allow for accurate geographic coordinates to be instantly assigned to each photograph. Most camera systems also include mechanisms which compensate for the effect of the aircraft motion relative to the ground, in order to limit distortion as much as possible.

Questions.1. What is Flight line ?

Answer:--When obtaining vertical aerial photographs, the aircraft normally flies in a series of lines, each called a **flight line**. Photos are taken in rapid succession looking straight down at the ground, often with a 50-60 percent overlap (A) between successive photos.



2.Stereoscopic viewing;--

The overlap ensures total coverage along a flight line and also facilitates

stereoscopic viewing.

Successive photo pairs display the overlap region from different perspectives and can be viewed through a device called a **stereoscope** to see a three-dimensional view of the area, called a **stereo model**. Many applications

of aerial photography use stereoscopic coverage and stereo viewing.

●Application of aerial photographs;--Aerial photographs are most useful when fine spatial detail is more critical than spectral information, as their spectral resolution is generally coarse when compared to data captured with electronic sensing devices. The geometry of vertical photographs is well understood and it is possible to make very accurate measurements from them, for a variety of different applications (geology, forestry, mapping, etc.). The science of making measurements from photographs is called **photogrammetry** and has been performed extensively since the very beginnings of aerial photography. Photos are most often interpreted manually by a human analyst (often viewed stereoscopically). They can also be scanned to create a digital image and then analyzed in a digital computer environment