Using Air photos

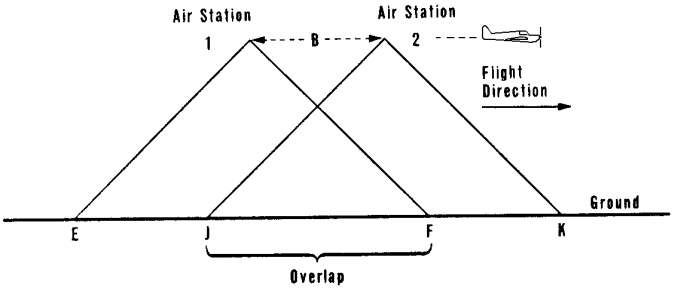
Background.

Aerial photography is a powerful tool for visualising land forms, and recognising and mapping landforms, vegetation, soils, land uses etc...
Air photos are also useful for navigation in the field, and for plotting of field locations. Unfortunately they tend to be expensive for large areas, and the best detail is in the large scale photos, which can add up to a large number of photos to cover the area of interest.

They are usually supplied as 'contact prints' about 10 inches square, but you can order enlargements if you wish to see more detail. At a typical scale (1:25,000) one air photo will cover an area about five kilometres square.

Air photos are taken from a plane that flies in a series of parallel lines back and forth across the country. Each line is called a "run". Runs are usually east-west, occasionally north-south, but in coastal areas they may be parallel to the coastline. As the plane flies the camera is clicking at a regular rate that gives a 60% overlap in coverage between each photo. This overlap of photos taken from a different part of the sky gives us the stereoscopic effect that allows us to use the photos in pairs to see vertical relief - the landforms.

Each photo within a run is numbered in sequence. For stereo viewing you need every photo. If you do not need stereo you can probably manage with every second photo. But for landform studies stereo is essential.



Information on each photo
At the edge of the photo you should find some annotations: The name of the photo set (often the name of the relevant map sheet), the run number and photo number (this last is commonly shown as a counter). There should be a north arrow (not always obvious!). To calculate the scale of the photo you need to find two things: the elevation at which the plane flew (in metres ASL, old photos may be in feet) and the focal length - the last can be a bit cryptic. It is usually given in mm, but in fact the cameras are actually emulating old footric standards of (approx) 12, 6 or 3 inches. So look for a number such as 303.98 (about 12 inch), 151.82 (6 inch) or 88.36 (3.5 inch). Six inch is the most common.

Calculating the photo scale
To work out the scale we need the focal length of the camera (f), and the elevation of the camera above the ground (E). The latter is the flying height minus the average height of the ground (indicated by the topographic map for the area).
Photo scale = 1: E/f. So for a focal length of 152.76mm and an elevation of 5554m in an area where the ground elevation is about 1250m we get:
Scale denominator = (5554-1250) / 0.15276 = 28175 i.e. 1:28,000 approx.
That example was for Cooleman Plain, where the 'nominal' scale of the photos was actually stated as 1:25,000 - so it is worth checking if you are intending any sort of accurate mapping.

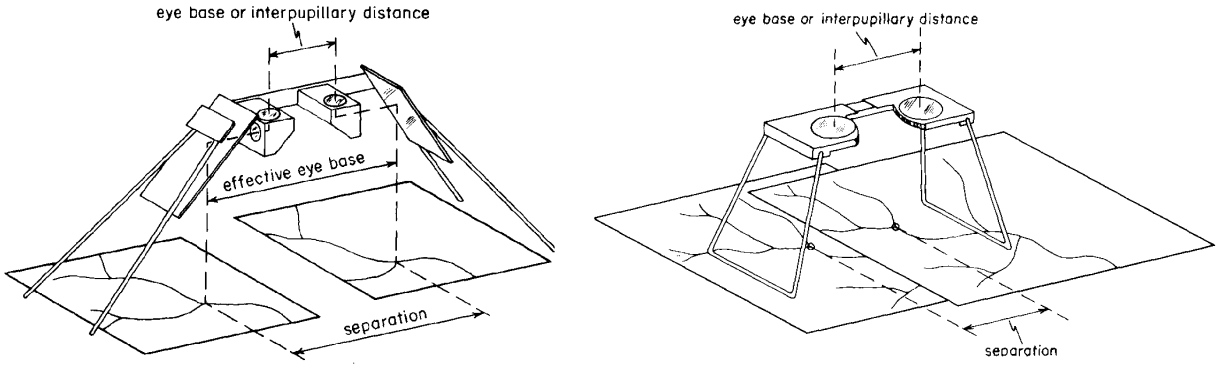
NB the terms 'large scale' and 'small scale' cause confusion for many people. They refer to the scale ratio (eg 1:100,000 which means the same as 1/100000, i.e. 0.00001). Thus a "large scale" photo or map has a large ratio (eg 1:100, which means 1/100 ie 0.01) and shows a lot of "large" detail. A "small scale" map (eg 1:100,000 or 0.00001) shows less ("smaller") detail, but covers a broader area.

Viewing stereoscopic photos

This is normally done with a stereoscope, though one can train ones eyes to look skew-wise at the photos independently (most geologists learn this trick, it saves carting a stereoscope around in the bush).

What one is doing is viewing one photo with one eye, and the other with the second eye - the brain fuses the images into a 3-D effect, the hills seem to stand up and the valleys drop down.

The ***mirror stereoscope*** directs the images to the separate eyes without any effort on your part - you just have to jiggle the photos a bit at the start to get them aligned.



- Place one photo under each mirror; make sure they are both facing the same way (e.g. north up).
- Locate an obvious spot visible on both photos (the white scar of a quarry, or a river/road junction perhaps).
- Put a finger tip of your right hand over the point on the right photo, and your left hand finger over the corresponding point on the other photo.
- Look through the lenses. You will see your two fingers. Move them (and the underlying photos) until the finger tips seem to overlap. At this stage the surrounding photo images should also fuse and jump into stereo (you will know when this happens, and probably exclaim in surprise, the sudden 3-D effect is quite obvious). You might have to jiggle or rotate the photos a bit to get a comfortable view.

You will find that the 3-D effect is exaggerated - the slopes appear steeper than real life - this is deliberate and is an advantage when looking for subdued landform features (including subtle dolines).

To scan over the photo either move the stereoscope (safest when learning) or move both photos together beneath it. You might loose the stereo effect as you move and have to use your fingers to get it back again - it gets easier with practice.

For serious work, you will attach a plastic overlay over the photos and trace soil or vegetation boundaries onto this. Special air-photo overlay film is available that has a slightly rough surface that will take a pencil line. Be cautious about marking the photo direct - especially if you borrowed them and especially colour photos, they can be difficult to clean without damage to the emulsion.

Using a ***pocket stereoscope*** is similar, except you have to overlap the photos and bend up one edge as you look. It is more awkward, but a pocket stereo is quite cheap and easy to carry, a mirror one is very expensive!