Some popular derived products:

Digital Terrain Models

A Digital Terrain Model (DTM) is a representation of the 'bare' earth's surface. A DTM can be created from data collected from manual or automatic measurement of the aerial images. The DTM is presented as a series of points on the surface with known easting, northing and height coordinate. The points are often interpolated into a square grid of points although other formats can be produced for specific applications.

Digital image products

There are a number of image-based products that can be produced from aerial images. These may be a more appropriate product for a particular application than a traditional line (vector) map.

Geo-rectified imagery is derived from vertical aerial imagery with existing mapping to provide a geographical reference. A 'best mean fit' of the image is provided to a selection of 'control points' which are clearly identifiable features in the mapping and image.

The accuracy of the product is reliant upon the accuracy of the mapping and displacements of the features in the image due to variations in height are not specifically removed; as a DTM is not used during production.

Ortho-rectified imagery is created by using a DTM to remove the effects in the image of variations in terrain height. Points coordinated by field survey and visible on the imagery are often used to 'control' the imagery and further increase the quality of the product.

3D modelling

By combining digital models of the landscape with digital image products a 3D 'photo realistic' model can be produced. This can be visualised as a single view or even through a stereo or virtual reality system. 'Augmented' reality products are increasing in application and availability.

This client guide is one of a series from the MAPP Panel of RICS geomatics, the full series and professional guidance can be downloaded from www.rics.org/mappp

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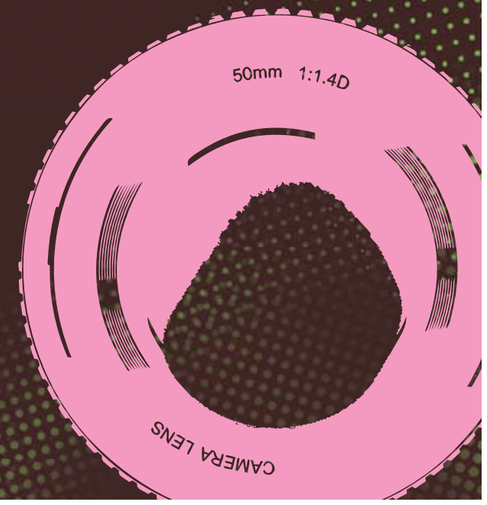
Geomatics client guides

Applications of aerial photography and imagery

Using 'off the shelf' and commissioned products



Aerial photography provides a record of the landscape at a moment in time and may be used in, or to support:

- Land use surveys
- Monitoring changes in the landscape
- Change detection and intelligence collection
- Property/boundary disputes
- Strategic planning
- Planning enforcement
- Property development
- Archaeology and conservation
- Estate management
- Mineral extraction
- Mapping
- Environmental management
- Engineering surveys.

Aerial photography and imagery

Conventional aerial photography for survey, mapping geospatial data collection is taken with a specially designed film camera. Colour film provides not only photography suitable for mapping but also for interpretation for a whole range of landscape activities and studies.

Digital air survey cameras are now being used to collect digital images. However, conventional film photographs are made available in digital format by scanning the negative. For precision work, “photogrammetric” quality scanners must be used.

For specific applications infra-red, thermal, and multi-spectral imagery is also available, and can provide data and information beyond traditional colour film and digital images.

Types of aerial photography

Oblique photography is taken at an angle to the ground from an aircraft or helicopter, and most often using a “medium” format camera. Normally taken at a low altitude it provides a record of the landscape or of specific features and structures. Such photography may be commissioned or is taken in a ‘speculative’ way for onward sale to the public. There are now some digital camera systems using clusters of cameras providing oblique images.

Vertical photography normally refers to photographs taken within 3 degrees of vertical, most often using a “large” format camera to enable high quality measurements to be made.

Stereoscopic vertical photography is normally taken with each consecutive photograph having a 55 – 65% fore and aft overlap and a 15 – 30% lateral overlap. This ensures every point on the ground can be imaged on at least two photographs, ‘a stereo pair’.

Through the use of a stereo viewing system, which enables each eye to see one of the stereo pairs of photographs, a 3D ‘model’ of the landscape can be viewed. Using the principles of photogrammetry the 3D ‘model’ can be measured to collect 3D information to be presented on a map or input into a CAD or GIS system.

Characteristics of the aerial photography/images determine the quality of the information that can be collected.

Collecting aerial photography and mapping quality

Conventional vertical air survey film cameras, are normally mounted in a fixed wing aircraft, and are used to produce negatives with a 230mm x 230mm (9 inch) square format. Forward Motion Compensation (FMC) systems inside the camera reduce image blur due to the movement of the camera (speed of aircraft) over the ground.

The focal length of the lens, typically 150mm and the flying height determine the scale of the photography and the quality of the calculated heights that can be achieved.

Scale of Photography and typical precision expected:

Photo Scale	Map Scale	Estimates Plan	
		Plan (m)	Height (m)
1:3 000	1:500	0.15	0.06
1:5 000	1:1 000	0.30	0.10
1:10 000	1:2 500	0.75	030
1:25 000	1:10 000	1.50	0.50

(Assuming the use of ground coordinated point for control and the use of a camera with a 150mm focal length lens.)

The tendency now with digital data is that rather than quote scale of photography is to state the resolution, or ground sample distance (GSD) of the imagery (actual area covered by a pixel on the ground). In comparison with conventional film, a GSD of 5cm would be used to capture data suitable for 1:500 mapping; a 10cm GSD would be suitable to capture data for 1:1 000 scale mapping.