Characteristics of aerial photographs pdf

Depending on availability and purpose, archaeologists can use different types of aerial photographs. Their characteristics, which are due to many factors, including the ways in which they were taken and during the day, have a direct impact on fitness for purpose and application. So-called vertical photos are taken using an aircraft or satellite whose cameras or sensors point directly to the ground. They are usually taken for non-archaeological purposes, including planning, cartography and military intelligence, but can record very valuable information about an archaeologist. True vertical view is rare and is usually achieved only in the center of the image with a growing inclination towards the edges. Vertical photos are usually taken during surveys to cover areas of the ground, and overlap between adjacent frames of 60% to allow them to be viewed stereoscopically. Planes and cameras for this work can be expensive and are usually supplied by specialized companies, although successful vertical studies can be done using basic techniques (e.g. . Orthophotographs in which photos are processed to eliminate both inherent distortions and those caused by different topography provide a spatial image similar to a map. Oblique photographs are usually taken by an aerial observer using a handheld camera aimed at the ground at an angle of up to 60 degrees from a horizontal (i.e. with a wing to the ground), but usually between 30 and 45 degrees. The photos are usually for specific purposes, although the areas of the earth can be covered completely, and numerous photos taken in orbit around the target are common practice. Oblique aerial photographs are the usual means of recording during reconnaissance stereoscopic viewing of appropriate aerial photographs allowing the brain to create a three-dimensional picture of the ground. This allows the interpreter to see the height differences that are otherwise flattened into vertical or close vertical pictures, so it reades landscape and archaeology more efficiently. Vertical photos taken with an overlap between adjacent frames of 60% allow stereo-viewing, and haired photos can also be viewed this way if they are made with appropriate overlap. The format of available photos may include printouts (contacts and expansions), negatives (sometimes microfilm) and digital (digitally born and scanned). Older photographs will be black and white, and colour photography is only universally routine after the introduction of digital cameras over the past decade, especially the accessible digital SLR cameras that are at the centre of modern aerial reconnaissance. The negative size ranges from 35 mm to 18x9 inch format, and together with the height of flying can have a direct impact on the recorded details (see scale below). Sensors in digital cameras are also size and thus affect the resolution in such size enlargements where, where the on the screen or as printouts. The scale of the photographs varies greatly, but regardless of the camera used, the original negative or digital image is proportional to the flying height and focal length of the lens. Stamps from vertical photos are often made on a contact scale (i.e. on the scale in which they are made), while those from smaller and medium-sized sloping cameras usually zoom in or out on the screen at different zoom rates. Vertical photos are available regularly on scales ranging from 1:3,000 to 1:60,000 and smaller (e.g. satellite), while low-pressure platforms (e.g. kite and UAV) can achieve much larger scales. Hair-dehydrated photos taken using a digital SLR using a normal focal lens (50mm) about 700 m above ground level will produce images with a maximum contact scale (or sensor) around 1:1400. This scale will increase when the image is enlarged on the screen or as a print. In general, large aerial photographs make it possible to see larger details and smaller features, while small photos are often more difficult to interpret due to low resolution and subsequent lack of detail. For example, function 5m in will be 0.5mm, or for the size of a dull pencil point, in 1:5 000, while in 1:10 000 the same function will be 0.5 mm, and on smaller scales (for example, 1:25 000, 1:100 000) will be disappearing a little. The assessment of the suitability of the photos depends on the user's experience and knowledge of the context in which they should be applied, but some general principles can be considered. There are many factors and variables that influence whether archaeological data will be recorded in an aerial photo, and users will soon learn that a photo is never enough. These factors include season and time of day, farming practices and the type of soil or rock. It should also be noted that what works in one country will not necessarily work in another, so changes in the environment and climatic zone also play their parts in hiding or revealing buried archaeological remains. It is vital to assess the type of characteristics that can be expected and the means by which they are visible. In this way, the scale of the images will affect the size of the features that can realistically be expected to be visible, while the time of year will determine whether plough-burying objects have the potential to be visible as marks or soil marks, or whether earthworks and other expressions of topography will be visible with clarity. Different vegetation covers during the seasons and the changing angle of the sun during the day or year, among other factors, will affect archaeological visibility, and thus the benefit of photographs taken under specific conditions. Introduction to photographs from aerial petgraphy Bibliography SECTION 8 Aerial photographs are an invaluable source of information about characteristics of the coastal and terrestrial environment. Vertical aerial photographs can be to update existing base cards and create new base cards in the form of individual photos or multiple photos in assembled formats known as mosaics (see section 8.9). Various simple transfer tools (master sketch and scale transfer range) are available to correct the horizontal distortion (x and y) inherent in aerial photographs, and can be used to transfer the necessary photo information to align the cards with a reasonable degree of accuracy. The amount of information extracted from these aerial photos depends on the skills of the photo translator. To adjust for height displacement (z), a complex and expensive photogrametric drawing tool, such as Wild AIO, is required. 8.1 Types of aerial photographs There are two main classes of aerial photographs: (i) Vertical: the observation camera lens points vertically downwards, indicating a view resembling a ground plan; (ii) Inclined: the lens axis of the camera of the test chamber points at an angle to the ground. If the horizon is turned on, the photo is defined as highly oblique; if not, it's low oblique. Depending on the necessary information about the photo, more than one type of film may be required. In this situation, the use of multiple surveillance camera installations will reduce the cost of flying. Figure 8.1 shows dual and triple camera installations. 8.2 Acquisition of aerial photographs Aircraft, which makes the systematic reflection of an aerial photograph of an area by making subsequent forward and backward passes in it, usually in the east-west direction. This flight line provides consistency in the orientation and angle of the sun, which helps with photo interpretation. The orientation of the prints is 90° relative to that of the flight lines. To allow stereoscopic and photogrammetric analysis, there is usually a 60 % forward overlap between successive shots in the same field line and 20-40 % lateral overlap between adjacent field lines (Figure 8.2). There are significant differences in the size of the shape of the photos, although the most common size is 23 × 23 cm (9 × 9). Scales can range from 1:1,000 to 1:80,000 depending on photo interpretation requirements. For example, forest inventory photography is usually 1:10,000, while geological analysis may require photography only at a scale of 1:50,000. The an notation, which is usually located in the southwest corner of the photos, must contain all relevant information, such as the roll number, stamp number, time and date of photography, etc. Figure 8.1 Twinning; (b) installations for sushi chambers. (After .C Dickinson, 1969) Figure 8.2 Lateral and forward overlap of aerial photographs. In the upper left corner of each photo is shown. (After G.C. Dickinson, 1969) 8.3 Terminology of aerial photographs The basic terminology associated with aerial photographs includes the following: (i) the size of the photo; (ii) Focal plane: the plane in which the film is held in the photography camera (Figure 8.3); iii) Main point point the exact centre of the photo or the point of focus through which the optical axis passes. This is established by joining the fidullans or collisions that appear in each photo (Figure 8.4); (iv) Conjugation of the main point: an image of the main point of an overlapping photo of a stereo pair; (v) Optical axis: the line from the main point through the centre of the lens. The optical axis is vertical relative to the focal plane (Figure 8.4); (ii) Focal length (f): the distance from the optical axis on the optical axis to the point of focus (Figure 8.3); (vii) Plane of the equivalent positive: imaginary plane with one focal length from the main point, along the optical axis, on the opposite side of the optical plane from the focal plane (Figure 8.3); (viii) Flying altitude (H): lens height above sea level at the time of exposure. The height of a characteristic above sea level is indicated by h (Figure 8.3); (ix) plumb (indira or vertical point): the point vertically below the optical glass at the time of exposure (Figure 8.5); angle of tilt: the angle infused on the lens by rays to the main point and the plumb point (Figure 8.5). 8.4 Properties of aerial photographs Most photogrametric techniques are based on the three main properties of aerial photographs: scale, displacement and radial property. 8.4.1 Scaling The scale of a truly vertical picture of perfectly flat terrain will be about the same as the exact map line (see section 3). However, the appearance of relief leads to variations in scale due to the perspective of the camera lens (Figure 8.6). These differences in scale prevent tracking information from photos directly to large-sized maps. However, the amount of displacement can be measured. Figure 8.3 The focal length, focal plane, plane of equivalent positive and flight height of aerial photographs. Figure 8.4 Main point, fidullatic markings and optical axis of aerial photographs. Figure 8.5 Plum point and angle of tilting of aerial photographs. Figure 8.6 The effect of topography on photoscale: photo scale increases with an increase in terrain relief. The overall scale is the ratio between the focal length of the camera lens to the elevation of the camera lens in relation to certain specific features of the landscape; it follows that this ratio will not be correct for other kittens, 8.4.2 Offset Relative to one level of terrain, the higher points are shifted from the center of the photo and lower points to the center. The size of the move increases with an increase in the height of the object and the distance from the center of the photo. As the camera height increases, the movement is less. This is the reason why high altitude vertical photography is used to build mosaics or as an effective and inexpensive substitute for the base card. The displacement of objects on aerial photographs produces parallax, which is due to a change in the point of observation. This apparent change in position is the main reason why our ability to view two pictures to create a third-dimension illusion. The algebraic difference of the parallax on two overlapping pictures is used to determine the relief using stereoscopic drawing tools. 8.4.3 Radial property In a vertical photo are true radial directions from the center. Thus, the bearings measured from the main point are correct until the distances are not. Photographs of the same scale or greater must be used to ensure that the resolution of the photo corresponds to the degree of accuracy required for the revised information. 8.5.1 Zoom determination There are four main methods for determining the scale of an aerial photograph, which in descending order of accuracy are as follows: (i) the relationship between two points on the ground at a certain distance and the same two points in the photo. (Note that the scale may vary for other places in the same photo, if there are significant relief variants); (ii) the relationship between two points on the map and the same two points in the photo; (iii) the relationship between an object on the ground, the dimensions of which are known and the same object in the photo; (iv) the relationship between the focal length of the camera lens and the altitude of the camera lens, e.g. focal length (f) = 15 cm, altitude (H) = 1500 m; 8.5.2 The effect of tilt displacement and height The scale of the aerial photo changes from point to point due to the tilting of the camera lens (i.e. the mindset of the aircraft) and changes in terrain height, unless the terrain is absolutely flat (Figure 8.7). The top of a high mountain, therefore, will be on a larger scale than a valley, because it is closer camera lens when shooting (unless the photo was taken). Figure 8.8(a) shows a rectangle of roads on an absolutely flat side, photographed with a perfectly vertical camera. There is no distortion, so they appear in the photo, as they would in a map of the line. Figure 8.8 b shows the distorted appearance of the roads in an oblique photo; Figure 8.8 c indicates the appearance of the information after removal, that is, the paths are restored in their correct form, but the seal itself is no longer a square. When a hilly side is photographed, there are no means to completely eliminate the effects of slope and differences in the height of the terrain in one photo. However, differential adjustment minimises these effects. 8.6 Application techniques The following simple techniques can be used to depict details of aerial photographs on line maps without the use of complex equipment (see section 7): (i) Sketching Eye transfer: If the line map shows significant details, this can be add additional information through visual references with a satisfactory degree of accuracy; (ii) direct transfer after reducing or extending the photo to the scale of the line map: The photo is projected into an appropriate scale on the line map to be revised; then a picture is displayed on the map. In order to minimise distortion, expansion/reduction factors should be calculated only for small areas at once. Tools such as the Kail projector and the O'Graph card can be used for this task (see section 7.6.6); iii) Transfer by grids, triangles, etc.:These are methods derived from the basic principle that a straight line of land will appear as a straight line in the photo if the terrain is relatively flat. However, height distortion will lead to small errors in vertical photos and excessive tilt errors. All methods require at least four points to be indicated in the photo and the existing line map (see section 7.6.6); 8.7 Variations in scale in terms of aircraft behaviour. (After K.H. Strantberg, 1967) Figure 8.8 Unbroced aerial photograph (a); point (b); corrected (c). (After P.J. Oxtobai and A. Brown, 1976) Figure 8.9 Grid for transferring details form aerial pictures of a map: (a) polar network; (b) polygonal grilles. (After G.C. Dickinsin, 1969) a) polar network (Figure 8.9 a): Identical grids are drawn on the map of the line and the photo: - the four points used can be A, B, C and D; - AD and BC expand to meet in E; - AB and CD are extended to meet in F; - Through G, the intersection of AC and BD are composed EGH and FGJ. The workpiece can now be copied from each triangle on the photo on the corresponding triangle on the map; (b) Polygonal grid (Figures 8.9 b): Where more than four common points can be identified on the map of the photo and the line, it is not necessary to draw expanded points, since in the polar network it is not necessary to draw. The dots are simply drawn on the map of the line and in the photo and the area in the resultant polygon, divided by joining each point to all the others. 8.7 Interpretation When using a normal view of the ground, an object may differ by a combination of the three monitoring processes: (i) size and shape; (ii) colour; (iii) characteristics to which it relates. The same processes are used by photo interpreters, but with different conditions and emphasis in each group: i) Size: can be a determining factor when distinguishing objects by shape. Measurement may be required; (ii) Form: the general form (which includes the three-dimensional stereoscopic view) may be the most reliable evidence of identification; (iii) Tone: variation in tone is the result of differences in the reflective qualities of objects, e.g. light, darkness, etc.; (iv) Structure: where the changes in tone are too small to be noticeable, the texture may for identification, e.g. grainy, grainy, coarse, smooth, etc.; (v) Shadow: gives a terrestrial view of the object, object, Idea. Shadow lengths can be used to determine the height of objects if the surrounding terrain can be considered flat; (vi) Model: the arrangement of the landscape of physical and cultural features is often distinctive and can be useful for recognition and evaluation; vii) Site: the location of the landscape can contribute to identification, for example, certain vegetation can appear only in certain places; (viii) Related characteristics: common near the site under investigation. They have a characteristic appearance and so immeasurably help photo interpretation, e.g. rocks and soil, water, vegetation (forests, pastures, crops), roads, railways, cities and historical sites. 8.7.1 The general rules for photographic interpretation The general photographic survey should be interpreted from the whole to the part, i.e. in the first place, the wide distinctions. Interpretation should be systematically approached: (i) The literary review is a necessary part of each study and as much information as possible must be obtained from these sources; ii) The photo must be oriented. This may be possible with the help of shadows. In the middle of the day, many pictures of the air are taken for optimal light conditions leading to shadows pointing between the northeast and north-west in the northern temperate latitudes; (iii) A pattern or figure must be selected in the photo, which will be easily identified on the line map, such as the coastline. A clear coincidence should be confirmed by supporting evidence; iv) Photographic keys or photos of files with significant functions are extremely useful as aids for ongoing investigation and as free-trouser memory in complex situations. 8.7.2 Stereoscopic and stereoscopic vision Aerial photographs create only a faint impression of relief, unless a stereoscope is used to create a three-dimensional image. The three-dimensional impression that occurs in normal vision is due to the fact that with two eyes located at a distance of about 6 cm, each eye is able to present to the brain a slightly different perspective of the object that is observed. From the differences in perspective between these two images, the brain is able to assess depth and build a three-dimensional picture. This is the basic principle associated with using two adjacent aerial photos with significant overlap (stereo pair) and stereoscope to obtain a three-dimensional image. There are a number of types of stereoscopes, including: (i) Pocket sterescope (Figure 8.10); (ii) Mirror sterescope (Figure 8.11): This type uses pairs of parallel mirrors to spread the line of vision, thereby increasing the three-dimensional area seen at the same time. Detachable binoculars give a greater increase; 8.10 Pocket Sterescope. (After G.C Dickinson, 1969) 8.11 Mirror Sterescope. (After G.C. Dickinson, 1969) iii) Twin Sterescope: This Modified Mirror Stereoscope two translators to look at the same photo at the same time, a significant advantage. Advantage. Orthophotographs The prospective image of a photo can be changed to an orthogonal projection using an orthophotoscope, which removes the curvature of the rock caused by the variation of height. All points are in their right relative places, the scale is constant and the angles are correct. The most common method of making an orthophotograph is as follows: the projection of a three-dimensional stereoscopic image obtained by a stereoscopic plotter is exposed to a photographic film through a very small opening that moves to a stereoscopic pattern. When the small opening moves along a narrow strip, the film remains stationary in a horizontal position, but is moved to the vertical dimension to keep the opening in contact with the surface of the three-dimensional image. After the aperture moves through the pattern once, it is moved sideways distance equal to the width of the hole, and the operation is repeated. Newer tools scan photographs electronically, and after a computer correction, they display the image of a video terminal. Due to the large volume of photo details, orthophotographs can be more useful than the topographic map of the compilation line in the field. 8.9 MosaicsThe photographs can be assembled in mosaics, which can then be printed with selected thematic information for creating photo cards. Since a photo is a perspective (projection), objects may not appear in their true horizontal position; this trend is accentuated and the object is from the photographic center. Therefore, only the central parts of the photos are usually used in mosaics to reduce the amount of error due to relief displacement. The central areas are carefully trimmed along the line functions, so that the joints between the components of the mosaic can be easily lured when mounting. Orthophotos can be assembled and form a mosaic that can be printed with thematic information to create an orthophoto map. Orthophoto map has the advantage of accurate scale, unlike photo maps drawn from mosaics of conventional photographs that suffer from displacement, therefore rock inconsistencies. Mosaics are of three types, according to the degree of geometric control: (i) Uncontrolled: the sections of the photos are placed in place by matching the images; (ii) Semi-control: mosaics constructed with limited control of the ground are mosaics with semi-control. Using a rectifiing projector, the characteristics of the line, such as rivers, are stretched or shortened for best compliance of an existing map; (iii) Controlled: before photography, precise horizontal places on the ground are marked and drawn on an existing accurate base map (thus providing control). The pictures are then positioned so that the photo images of the checkpoints coincide with the drawn checkpoints on the main card. Proportions and accurate printing are used to adjust perspective features. 8.10 Aerial photographic films There are numerous numerous photographic film available. Below is a partial list of films and some of their applications and advantages: (i) Color transparency film used for depth of penetration, location of sub-area characteristics, etc.: - cheaper than color negative film, which requires the production of paper prints; - good resolution (detail); - excellent help for visual presentation; (ii) Colour film used for ground typing, etc. The color prints produced by this film are: - easy to use in a stereoscope; - Excellent text illustration (iii) Colour infrared film used for coastline classification, vegetation analysis, etc.: - excellent for comparison with normal colour films; (iv) Colour film used for depth penetration, etc.: - quick reversal and relatively cheap; - suitable for monitoring dynamic parameters; (v) Black and white film used for typing land, etc. The black and white prints made from this film are: - less expensive than the colored ones; - useful for general coastal research; - Easy playback; - make excellent base cards. Cards.