

Low Level Aerial Photography for Archaeology

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A brief review of low level Aerial Photographic methods employed in the recording of archaeological evidence



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“One ought to be a bird in order to be a field archaeologist” said John Peere Williams-Freeman to O. G. S. Crawford, sometime in the years before the Great War (Daniel, 1969 (Preface)). Indeed all modern field archaeologists can surely appreciate what Williams-Freeman meant, the need to see the evidence on the ground from a birds eye point of view. Since then with the development of aircraft and cameras during the pioneer years of Crawford, colossal amounts of data have and still are being gathered and added to the archaeological record. A look at any available aerial photography is of course now standard practise when investigating sites for Desk Based Assessments and is a very valuable tool in the field archaeologists’ box of tricks.

Aircraft borne cameras do yield a fantastic amount of information over large areas of the British landscape and for the discovery of new archaeological sites, aerial survey is ideal. However they do have their limitations particularly when trying to record in detail the excavated features in a relatively smaller area. Conventional aircraft - fixed wing or helicopter, are limited by altitude regulations, so in general terms they can fly no lower than 500 feet above ground level (For more specific guidelines see the CAA UK minimum altitude regulations). There are of course alternative methods that have proved less problematic and far more effective in raising cameras in the air for the more site specific, detailed and low level aerial photography.

In 1906 2nd Lt Philip Henry Sharpe RE photographed Stonehenge from the basket of a tethered Royal Engineers’ hydrogen balloon (British Archaeology Issue 89 July/August 2006). With the relatively stable and static position at a low altitude, detail of the monument and its low earthworks were recorded for the first time.

Since then many other non-aircraft methods have been employed with varying degrees of success, although again, have their limitations and more importantly considerable problems with camera equipment control/damage and health & safety. These raised platforms include extensible ladders, scaffolding towers and cherry pickers. The main factor, which in my opinion makes these methods less desirable, is the unwieldy nature of the equipment. Manoeuvrability around an excavation area is for some cherry pickers quite difficult and for the other methods, particularly the scaffolding, requiring considerable effort as well as the need to have a qualified person to check the structure as safe before use each time it is re-erected (see The Work at Height Regulations 2005).

So far the methods discussed have involved the photographer actually holding the camera to operate it from whatever platform is being utilised and from personal experience I know that this can be quite a hair raising experience. Occasionally we hear stories from the good old days of even more dangerous platforms being used in an attempt to get those all important over head shots, such as balancing on top of vehicles, being elevated in machine buckets as well as scaling the nearest high tree, wall or building. With the increasing concerns for Health & Safety in all that we do and in particular on excavations, most of these methods are not possible.

Remote camera operation is possible with the use of unmanned aerial vehicles (UAVs), from the low tech and reasonably inexpensive kites and blimps to the much more costly remotely controlled aircraft derived from either adapted models or vehicles specifically designed for the purpose with both civil and military applications in mind. Although excellent results can be achieved with this type of equipment the health and safety factor is of considerable concern. Particularly when a motorised UAV has to be flown by an operator who is at the same time attempting to take the photographs required. The fact that the camera is attached to a moving and vibrating object can also lead to image quality (camera shake) issues, unless very fast shutter speeds and a stabilising system are employed. In most cases with this type of equipment, payload is restricted, meaning that only compact lightweight cameras can be used, thus restricting the photographic potential of using the inevitably heavier professional standard cameras and lenses. As archaeological excavation is a destructive process and in a lot of cases the evidence will only be available for recording for a relatively brief window of opportunity, I feel it is very important to ensure the photographic record is of the highest quality possible. Hence my insistence on using the best cameras available!

Between 1970 and 1979 the Royal Commission on the Ancient and Historical Monuments of Wales employed a new method in the form of telescopic mast system called the "High-Spy" camera. This was mounted on the back of a Land Rover and enabled safe remote operation of various cameras at heights equivalent to scaffolding towers. One of the main benefits of this system was the ease in which camera positions could be changed in a matter of minutes, being part of a 4 x 4 vehicle also gave access over rough terrain to the subject sites. When the "High-Spy" system needed renewing the RCAHMW decided it was too costly and came to an agreement with the Royal Commission in Scotland who used a trailer mounted mast, this continued until ca. 1982.

During my time as a field archaeologist working for commercial units, rarely was there a safe and practical method for my photography of the excavations from over head. Scaffolding towers were rarely used and this led me to investigate all the methods that might be suitable for the job. In 2006 after some experimentation I settled on the telescopic mast option and set up Aerial-Cam to specialise in a low-level aerial photography service, delivering very high quality images taken from a variety of heights using a telescopic mast mounted on a Land Rover. Aerial-Cam is a safe, low-cost and accurate method of aerial photography and differs considerably to photography taken from aircraft. Greater detail and accuracy is achieved at heights up to 22 metres above ground level. Moreover the equipment allows for precise photographic recording due to the stability and control of the camera mounted on the mast. The mast acts as a very large monopod in still weather and a tripod (when guyed) in windy conditions. Camera set-up locations can quickly be changed and multiple angles can be achieved on excavation sites or around buildings.

During extension the mast is secured to adjustable brackets at the rear nearside corner of the Land Rover, the vehicle then provides a very solid base for the mast and also an undercover work area for

operating the camera. If required the vehicle can be stabilised and made level by using two jacks and specially adapted brackets at the rear corners. In addition the mast is set in a vertical position by using spirit levels at the base and by adjusting the mounting brackets. This then helps to ensure the camera is level when the mast is extended. The mast extends telescopically, each section being connected by cable to the next with the bottom sections cable connected to an electronic winch. This differs from some other mast types where compressed air is used to pneumatically extend them and having to top up pressure to keep erect. I find the winch operation less fiddly than the compressed air versions and does away with the possible spring effect of a compressed gas, hindering smooth extension and accurate height adjustment.

High resolution (12.3mp) Nikon digital SLR cameras are used and positioned via a motorised pan and tilt head connected by wire to a monitor control box at ground level. The camera has a second spy camera fitted into the viewfinder, which feeds the lens view to the monitor for composition framing prior to releasing the shutter. Via a long boosted USB connection the camera settings (focus area, shutter speed, aperture etc.) are controlled with tethered shooting software on a laptop. The ability to control the camera on manual settings, as if it were in my hands, is very important, particularly when trying to pick out subtle changes in the colour of the soil by adjusting exposure, contrast and colour saturation on the fly. Images are recorded in RAW format with a duplicate JPEG file being created each time the shutter is released; these files are then downloaded directly on to the hard disk of the laptop. The resulting photographs can be assessed for quality by viewing the JPEG files on the laptop, while the camera remains in position. Depending on the subject to be photographed, the camera can be positioned for oblique or near vertical shooting, with fine adjustment via the pan and tilt head, once the mast has been extended to the height required. Also 35mm film SLR cameras can be used if required and a Sony video camera, which is particularly useful for building maintenance surveys.

Where vehicle access is an issue I employ a lightweight tripod mounted mast system, which can be easily carried to remote sites or erected inside buildings, such as churches. This has all the advantages of the Land Rover mounted system (with a similar camera control equipment) but with slightly less potential for height and stability in windy conditions. I will be taking a portable mast system to aid with my photography work as part of a project on Easter Island in January 2009.

In just under three years since setting up the Aerial-Cam system and providing the service to commercial archaeologists, Universities and special projects we have worked on a range of sites from prehistory to industrial. In this time consistently excellent results and an invaluable record of the evidence on excavation sites, historic buildings and ancient monuments have been achieved. The system has proven itself as safe, versatile and cost effective as well as delivering invaluable results. One of the advantages which I feel has really helped is the ability to fully involve the project director or supervisor in the capture process. With the live feed and full control at the base of the mast, the communication and direction of people and the accurate positioning of ranging poles etc. makes a world of difference to the more candid or fly-by results of other methods. Close study of the images as they are taken has in some cases led to the discovery of features that have previously not been noticed. Usually a CD containing the JPG files is written and given to the site supervisor at the end of the day on site. This then enables review of the day's work and comparison with site plans etc. for on-site management and interpretation. In due course the RAW files are processed a day or so later into high resolution JPGs for reports and TIF files for archive, all formats being delivered on DVD to the project manager.

Further reading:

Deuel, Leo. 1969. Flights into Yesterday – The story of aerial archaeology. Macdonald, London. Preface by Glyn Daniel.

Barber, Martyn. 2006. Palaeolithic contrivance over Stonehenge. British Archaeology magazine Issue 89 July/August 2006

Dorrell, G. Peter. 1994. Photography in Archaeology and Conservation. Cambridge. Cambridge University Press.

Photographs:



An old slide by Mike Farley showing an early photographic mast system called the “High-Spy” camera, in use by the RCAHMMW at, possibly Caerwent in c1971.



Stonehenge at sunrise, taken from aprox. 20m above the Avenue with Aerial-Cam, March 2007.



Barrow Ring ditches near Andover for the Museum of London Archaeology Service.



The Ballowall Barrow and coastline near St. Just Cornwall, taken with Aerial-Cam at aprox. 17m.



Medieval building foundations in Coventry for Birmingham Archaeology.



The Aerial-Cam system at full height on top of Bredon Hill while photographing Kemerton Camp, Worcestershire.

Adam Stanford is available for all aspects of archaeological photography, eg. ground level working/record shots, stratigraphy and finds, but his speciality is low level aerial photography using the Aerial-Cam telescopic mast system. A safe platform to operate very high quality cameras from multiple positions on site at heights up to 22m, the main mast system is mounted on a Land Rover for access just about anywhere throughout the UK. Adam has over 20 years of photography experience which began before becoming a field archaeologist, during his 10 years serving in the Royal Engineers, visiting heritage sites around the world. Adam also conducts field trips through his company Archaeology Safaris Ltd and his own research area is prehistoric Rock-Art.

For more information please do have a look at the website:

<http://www.aerial-cam.co.uk/>

Some of his latest work on the Stonehenge Riverside Project is also online:

<http://www.aerial-cam.co.uk/srp-gal.htm>

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