

# AERIAL ARCHAEOLOGY RESEARCH GROUP

**Annual Meeting, Bournemouth University, 13-15 September 1999**

The following notes summarise papers presented in four formal, and one informal, sessions.

## "Recent Projects"

**Pete Horne (EH) chair.**

- West Yorkshire Landscapes: recent multidisciplinary investigations in the east of the county. Alison Deegan, Independent air photographic consultant.
- A sample of recent developer-funded work in England. Rog Palmer and Chris Cox, Air Photo Services.
- Using aerial photography in the management of the historic environment of Exmoor National Park. Verlyn Heal, Exmoor National Park Authority.

## "Technical and practical sessions"

**Davy Strachan (ECC) chair.**

- Interpretation and mapping of vertical and oblique photographs using digital photogrammetry and GIS. Michael Doneus, Institute of Prehistory, University of Vienna.
- Men in black come down from the sky: air photography from a Robinson R22 helicopter. Chris Musson, Aber Photo Services.
- Irwin Scollar's AirPhoto program. Rog Palmer, Air Photo Services.
- African Legacy: Rapid large-area survey in Africa. Patrick Darling, African Legacy.

## "Recent developments in European aerial survey."

**Anthony Crawshaw (EH) chair.**

- A motorway from the air: Archaeological air reconnaissance over the planned A2 motorway in Mid-Western Poland. Andrzej Prinke and Wlodek Raczowski, Institute of Prehistory, Adam Mickiewicz University, Poznan.
- Augszeme (Latvian) hillforts from air and land. Juris Urtans, Inspection for Heritage Protection of Latvia.
- Jerash and the Wadi Zarga: Jordan the next step. Bob Bewley, English Heritage Aerial Survey.
- Aerial survey in England: some thoughts for the future. Damian Grady, English Heritage Aerial Survey.

### **Heritage Management and 'new' heritage topics.**

- The ups and the Downs: the Avebury World Heritage Site management project. Melanie Pomeroy, Avebury World Heritage Site Officer.
- Industrial landscapes in Cumbria. Mark Bowden, Archaeological Survey, English Heritage.
- Concrete Evidence from Aerial Photographs: the analysis, interpretation and preservation of 20th Century military remains in England. Mike Anderton, English Heritage Aerial Survey.
- Behind the Frontage - Aerial Archaeology and Urban Conservation. Kate Clark, English Heritage.
- Power of image: some ideas on post-processual aerial archaeology. Wlodek Raczowski, Institute of Prehistory, Adam Mickiewicz University, Poznan.

### **Informal evening papers.**

- Agnieszka Dolatowska, Jolanta Goliasz and Lidka Zuk: Aerial Archaeology Workshop Leszno (Poland) 1999 - the view from behind..
- Ioana Oltean: Some results from the 1999 aerial survey of the Mures Valley, Romania.
- Jacek Nowakowski: Winter and summer reconnaissance in the Poznan area of Poland.
- Chris Musson: Recent reconnaissance in Herefordshire, England.

**Field Trip to Hambledon Hill, using a variety of vertical photographic sources, and Down farm and the Dorset cursus.**

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**"Recent Projects": Pete Horne (EH) chair.**

***West Yorkshire Landscapes: recent multidisciplinary investigations in the east of the county.***

Alison Deegan, Independent air photographic consultant.

E-Mail: [alison.deegan@virgin.net](mailto:alison.deegan@virgin.net) (see also [www.alisondeegan.co.uk](http://www.alisondeegan.co.uk)).

An account of recent multidisciplinary investigations in West Yorkshire, England, including the role which aerial photography played in mapping archaeological features over a large area impacted upon by a major road construction. The M1-A1 Link Road project (with an £800,000 excavation, and £300,000 post-excavation budget) was carried out by Archaeological Services WYAS and Babtie Group archaeologists, with aerial photographic mapping being carried out as part of the post-excavation stage. This mapping provided context for the features identified during observe and record, trial trenching and excavation, and was itself enhanced by results from the field. The project looked at the importance of soils and land-use to the cropmark distribution, and AutoCad MAP was used to combine excavation data, geophysical data and aerial photographic data. The cropmark plots allowed the features excavated along the narrow road corridor, to be put into some larger landscape context.

***A sample of recent developer-funded work in England.***

Rog Palmer and Chris Cox, Air Photo Services.

E-Mail: [rog.palmer@dial.pipex.com](mailto:rog.palmer@dial.pipex.com)



*Limes Farm, Cambridgeshire. Site mapped from aerial photographs to guide trenches placed for a training excavation run by Cambridgeshire Archaeology in summer 1999. This plan was made using Irwin Scollar's program, AirPhoto, to transform and mosaic overlays of interpretations from four prints. For those interested in archaeology, the site produced mostly poor-quality middle Iron Age pottery, possibly indicating a peasant community which continued in Roman times. Source: Rog Palmer, Air Photo Services.*

An account of developer-funded, pre-excavation assessment work. The aim of which is to use all (easily) available aerial photographs to provide the excavator with information about the features which they will encounter when the topsoil is stripped (including geological and "modern"). Typically housing and extraction developers realise late in the process that they have to take archaeology into consideration and this can often result in only short time-scales being available for the pre-excavation work. AirPhoto and AutoCad Map are used for mapping from oblique and vertical sources and prove an efficient and rapid tool when mapping to dead-lines. While the most usable end-result is an accurate plot, in good time, to the developer, they also want multiple copies of the results in nicely presented packages (i.e. from digitised input via AERIAL 4). It is suggested that wherever possible feedback should be sought from the excavator about what was found in the excavation, in order to enhance interpretation skills.

***Using aerial photography in the management of the historic environment of Exmoor National Park.***

Verlyn Heal, Exmoor National Park Authority.

Tel: 01398 323665 Fax: 01398 323150.

The area has received relatively little archaeological attention in the past. An archaeologist post was appointed in 1991, however, and an SMR was developed for the park, which is an upland environment consisting of heather and grass moorland and low wooded valleys. The National Park, a "consumer" in aerial photographic terms, have contracted false colour vertical coverage since 1977. These are taken

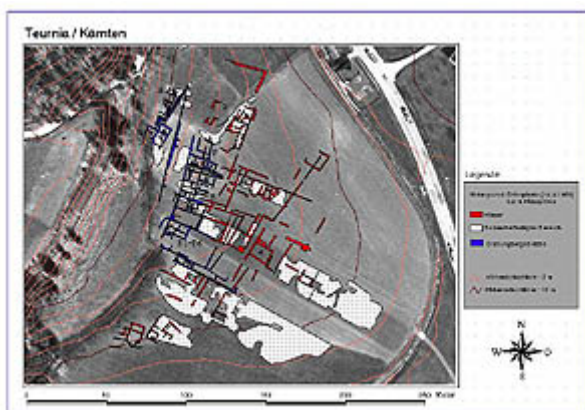
at high summer for vegetation studies and as result are of little or no use for viewing archaeological earthwork features which are covered by the bracken at that time. One run, from 1996 is quite useful, however. MARS high-lighted the National Parks as an important source of preserved earthwork landscapes, and both oblique and vertical NMR sources are consulted to both put sites in their wider context and to monitor erosion and threats to sites. These include both human and natural sources, with increased visitor access and agricultural activities being the most destructive. Aerial photography also plays an important role in the presentation of sites to the public and landowners, the overview enabling an understanding of individual monuments that are difficult to appreciate on a ground visit.

**"Technical and practical sessions": Davy Strachan (ECC) chair.**

***Interpretation and mapping of vertical and oblique photographs using digital photogrammetry and GIS.***

Dr. Michael Doneus, Institute of Prehistory, University of Vienna.

E-mail: michael.doneus@univie.ac.at



A demonstration of an advanced rectification system which is currently being used for aerial archaeology. From a vertical stereopair, a digital terrain model is measured, and then oblique and vertical aerial

photographs are rectified and georeferenced using digital photogrammetry. Using the method of bundle-adjustment, even photographs with a bad distributed ground control can be involved in the process. This can be achieved using so called tie-points, which are object points, that can be measured in more than one photograph. The resulting digital photomosaic can then be enhanced using digital image processing techniques and interpreted on screen in a GIS environment. This was demonstrated at the Roman town of Teurnia, Austria, where the interpretation drawing was combined and counterchecked with plans from excavations. Air photo interpretation enabled preparation of an accurate and detailed map of an extensive area in a fraction of the time that it took to excavate other parts of the town.

***Men in black come down from the sky: air photography from a Robinson R22 helicopter.***

Chris Musson, Aber Photo Services.

A humorous outline of the advantages and disadvantages of summer and winter aerial reconnaissance in a light helicopter, as opposed to the traditional Cessna platform. The cost, in many instances, can be as economical as Cessna hire and in every other way it appears to offer better suitability (lack of circling is far more economical and hovering also saves on time-consuming turning). The conclusion is that they are an ideal platform for oblique aerial photography. One notable disadvantage being that the "bowl" windscreen appears to create far more reflection from people and objects inside the aircraft - leading to the suggestion that black attire can help reduce the problem (hence the title).

***Irwin Scollar's AirPhoto program.***

Rog Palmer, Air Photo Services.

E-Mail: rog.palmer@dial.pipex.com

An introduction was given to this inexpensive Windows-based program which transforms scanned images to match maps via a choice of flat plane or DTM algorithms. Details of the software, including a downloadable demonstration copy can be found at <http://super3.arcl.ed.ac.uk/baspmirror/> (or alternatively in AARGnews 16, 1998).

***African Legacy: Rapid large-area survey in Africa.***

Patrick Darling, African Legacy.

The paper began with a description of the huge scale (both in extent and physical size) of earthwork systems in pre-European Nigeria. A description of the current state of heritage records in West Africa (basically non-existent) and landscapes containing thousands of miles of large-earthworks which divide large tribal areas. Much of these are under heavy vegetation and only a very small percentage of them have been recorded in any way (most "Western" map-makers ignored monuments of African culture). After outlining the many problems facing a photo interpreter working in Africa, the speaker asked for guidance on suitable methods, including use of high-resolution satellite imagery, that may allow extensive and rapid transcription of features on a country-wide scale. While much vertical photography exists at Greenwich (in the form of unlocated verticals); prohibitive costs of access currently make study of these sources unfeasible. In addition, there is often little (or no) control and very poor quality mapping. It was suggested that satellite imagery could be used to

locate these verticals. Available 20m resolution is not good enough to allow mapping from EarlyBird etc., however, it may be that when the NASA make available the 5m resolution imagery which their satellites currently collect, then there will suddenly be enough material available to allow mapping of entire landscapes for the first time. The presentation continued as a practical demonstration of methods so far used by the speaker.

**"Recent developments in European aerial survey." Anthony Crawshaw (EH) chair.**

***A motorway from the air: Archaeological air reconnaissance over the planned A2 motorway in Mid-Western Poland.***

Andrzej Prinke and Wlodek Raczkowski, Institute of Prehistory, Adam Mickiewicz University, Poznan.

Perhaps the largest development which Poland has ever seen. While aerial photography began to develop well from the 1930s in Poland (witness the astounding balloon aerial taken in the late-1930s of the huge water-logged site of Biskupin) the war, and subsequent political regime had completely halted the use of the technique. In recent years, however, Otto Braasch and Martin Gojda have carried out a number of flights to assess the potential of the various landscape zones. The AARG-led Leszno training workshop has trained a small group of interpreters and flyers and this is leading to new relationships being formed between University archaeologists and Planners. Around 300 sites were affected by the road scheme. A Soviet MI-2 helicopter was used for reconnaissance, and the line of the development was flown twice west-to-east and twice east-west. GPS was used as a method of locating photography, but in general mapped features were common enough to allow easy identification of position. There remains greatly discussion between archaeologists, however, about the value of air photography, as many archaeologists think that the work must be very expensive and does not produce results. This problem evolves from the lack of systematic survey at the best times of the year.

***Augszeme (Latvian) hillforts from air and land.***

Juris Urtans, Inspection for Heritage Protection of Latvia.

The speaker illustrated some of the problems of aerial survey in an extensively wooded country (currently around 470 such sites are recorded). These generally appear as large, tree-covered, mounds constructed in strategic positions. Aerial photography had been banned until the collapse of the Soviet regime in the 1990s. A number of flights were carried out by a Swedish aerial archaeologist in 1995,

and in May 1999, four flights were carried out, funded by the Latvian Government, using a Cessna 152, which photographed each hillfort. Other sites were also recorded, although Soviet drainage schemes, had destroyed many areas and also left a number of confusing landscape marks. GPS was used. Many hillforts are under heavy woodland, although these can often still be seen as a raised area of trees in a woodland area. The survey could not reach many of the sites on the Latvian/Belarus border as pilots refused to fly the area as a balloon had been shot down the previous year! The results represent the beginning of modern aerial work in Latvia and show that, despite those problems, there is good potential for this method of survey and recording.

***Jerash and the Wadi Zarqa: Jordan the next step.***

Bob Bewley, English Heritage Aerial Survey.

E-Mail: bob.bewley@rchme.co.uk

Some results from the second season of reconnaissance primarily aimed at recording Roman landscapes and sites in Jordan, while recording some prehistoric sites en route. Eight hours of flying were carried out. Around 50 international projects (mainly excavation) are carried out each year in the country, contacts were made with some of these. JADIS (Jordanian Archaeological Data Information System) has the majority of the main sites, although the number, and quality, of new sites being discovered is still impressive. These included a detailed record of Jerash, which may assist the French ground survey of the Roman town, and many other new, or newly photographed, sites in the north-eastern part of the country. The urgency comes from agricultural improvement, involving large-scale drainage schemes, which could be destroying sites which are not yet recognised.

***Aerial survey in England: some thoughts for the future.***

Damian Grady, English Heritage Aerial Survey.

E-Mail: damian.grady@rchme.co.uk

This paper outlined both the official (English Heritage) and personal views on how the practice of aerial survey in England may evolve in the near future. Themes discussed included the need to develop skills and continue to train the next generation of flyers and interpreters; and how to address weaknesses (both thematic and geographical) in the National Monuments Record (such as "the coast"; buildings; urban landscapes; in addition to areas which have received little survey work in the past). A piece based on the paper will appear in the forthcoming AARGnews.

**Heritage Management and 'new' heritage topics.**



***The ups and the Downs: the Avebury World Heritage Site management project.***

Melanie Pomeroy, Avebury World Heritage Site Officer.

E-Mail: melanie.pomeroy@kennet.gov.uk



Stonehenge and Avebury World Heritage Site (WHS) was designated in 1996. WHS is an internationally recognised status of international importance, which requires a) a management plan and b) legislation

to preserve and protect the site. The management plan has a difficult task in that "travellers", residents, archaeologists and "spiritual groups" all have conflicting interests about how the site should be presented and managed. This summer, for example, some of the standing stones on the sanctuary were painted red (rather oddly) as a protest against GM foods. Aerial photographs have been interpreted to produce a map of the Avebury WHS and its close environs, and are also used as a method of monitoring erosion and damage. They also continue to reveal new sites and enhance our interpretation of known features, as with the discovery in 1996 of a number of parchmark circles inside the main henge at Avebury. Recent excavations have shown the spread and complexity of neolithic sites within the WHS but many of these, as well as the greater proportion of the 22.5 sq km area, are currently in arable fields and therefore under threat. A management project, combining field work and air photo interpretation, will provide a baseline view of the present situation and so allow monitoring of future change.

***Industrial landscapes in Cumbria.***

Mark Bowden, Archaeological Survey, English Heritage.

E-Mail: mark.bowden@rchme.co.uk

Industrial monuments and landscapes often involve a number of factors which make them complicated to map and interpret. They usually contain a combination of buildings, earthworks and buried remains, often linked by transport systems which cover extensive linear areas. Many have power systems, associated housing and complex social processes to be considered. In addition to this, they are also usually very dynamic in terms of their usage, often resulting in

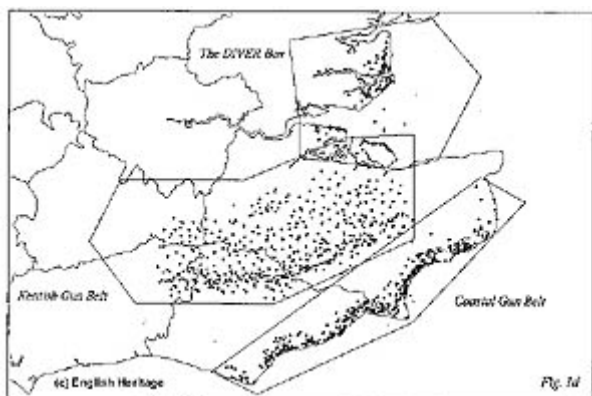
continuing change on the same site. For many industries in the UK there is no MPP Step 1 report and as a result no national context within which to define regional or local studies. All of these factors are additionally complicated when occurring in a mountainous landscape such as Cumbria. Both vertical and oblique sources are used to produce plots which can then be annotated in the field. Interaction between photographers, mappers and field staff is important, preferably on site, to discuss matters such as control. Examples were given of how mapping from aerial photographs could provide a valuable guide for the field surveyor, and also helped show industrial sites, often formerly thought of as unrelated and scattered machinery, in their full context.

***Concrete Evidence from Aerial Photographs: the analysis, interpretation and preservation of 20th Century military remains in England.***

Mike Anderton, English Heritage Aerial Survey.

E-Mail: [mike.anderton@rchme.co.uk](mailto:mike.anderton@rchme.co.uk)

The project providing a rapid assessment of certain type-sites of military remains in England through the use of both vertical and oblique photographs from the National Monuments Record Centre archive. Funded by the Monuments Protection Programme this survey is looking at Heavy and Light Anti-aircraft sites, Anti-V-weapon sites, Bombing Decoys, Coastal Batteries and Radar installations (pillboxes, air-raid shelters, etc. are covered by the Heritage Lottery Fund (HLF) funded Defence of Britain Database and Archive based at Duxford Airfield). Establishing the location of the sites from Dr Colin Dobinson's CBA published volumes (originally gained from documentary sources in the Public Record Office) the current survival-state of the site-types was noted. Based on a classification system that ranged from 1-5 (completely survives to totally destroyed) figures for the survival-rates of certain site-types have now been produced (as set out below). Other sites are still to be examined, but the overall impression is that within a short time-span (i.e. 50-55 years) a great deal of this irreplaceable archaeological material has already been lost to any further study.



*The distribution of sites in the Dover box, the Kentish Gun Belt and Coastal Gun Belt batteries.*

Site Type.	No of sites.	Worthy of further study by % (i.e. class 1-2).
Heavy Anti-aircraft batteries	965	5.6
Light Anti-aircraft batteries	897 (excludes airfield defences)	0.3
Diver sites	1,257	0.71
Decoy sites (uncompleted)	?	Estimated around 5

The selected types of site were described and used to show how fifty years of post-war landuse has left very few examples in good preservation.

### ***Behind the Frontage - Aerial Archaeology and Urban Conservation.***

Kate Clark, English Heritage.

This paper followed two themes to demonstrate how oblique aerial photographs, often specifically taken, can enhance the recording of standing buildings. In one case they can show the densely concentrated workshop areas that still exist in some towns, in the other they help provide context to single buildings or small parcels of earlier development. The speaker warned of the necessity to preserve 'context' as well as 'site'.

### ***Power of image: some ideas on post-processual aerial archaeology.***

Wlodek Raczkowski, Institute of Prehistory, Adam Mickiewicz University, Poznan.

In AARG's first theoretical paper we were given a very different view on aspects of past practice and given explanations as to how aerial archaeology has been able to maintain a balance with academic archaeology by creating the need for specialists. The paper also

included comment on how suitably presented publications can influence the acceptance of aerial archaeology by the public. The paper can also be found in AARGnews 19, 1999.

### **Informal evening papers.**

Agnieszka Dolatowska, Jolanta Goliasz and Lidka Zuk: *Aerial Archaeology Workshop Leszno (Poland) 1999 - the view from behind.*

Cataloguing photographs taken by students during the Leszno Workshop has led to a number of suggestions that may help to improve such future events. The need for good and accurate flying notes was stressed and it was seen to be important for students to work on their own photographs so that any problems may be dealt with in later flights.

Ioana Oltean: *Some results from the 1999 aerial survey of the Mures Valley, Romania.*

Wet weather earlier in the year had evened out crop growth, and aerial survey concentrated on recording earthwork features, including discovery of an unexpected hill fort.

Jacek Nowakowski: *Winter and summer reconnaissance in the Poznan area of Poland.*



*Bonikowo:site 1, comm. Koscian.*

Comparison of photographs of the same sites under different

conditions showed the advantages of slightly flooded conditions for recording slight topographical changes that were crucial to the location of stronghold sites.

Chris Musson: *Recent reconnaissance in Herefordshire, England.*  
New work in this county was discussed by way of the maps used for flying and the speaker's policy to take a set of oblique photographs that will show the context of a site as well as its details.

**Field Trip to Hambledon Hill, using a variety of vertical photographic sources, and Down farm and the Dorset cursus.**

A day was spent visiting Hambledon Hill, Dorset which has earthwork examples of neolithic causewayed enclosures and long barrows and, arguably, the most beautiful iron age hill fort in southern Britain. The trip later went to Down Farm - situated mid-way along the Dorset cursus - where Martin Green showed us his museum and some of his recent excavations.