CONTENTS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Editorial</td>
<td>3</td>
</tr>
<tr>
<td>The Derrick Riley Fund for Studies in Aerial Archaeology</td>
<td>5</td>
</tr>
<tr>
<td>Chairman's Piece by Marilyn Brown</td>
<td>6</td>
</tr>
<tr>
<td>Instructions for Operating P14 Cameras by Sqn. Ldr. D. J. Munro RAF (retd.)</td>
<td>7</td>
</tr>
<tr>
<td>Ground Cover Mapping from Multispectral Satellite Imagery by Martin Fowler</td>
<td>11</td>
</tr>
<tr>
<td>Pig Alignments – a New Class of Monument by Anthony Crawshaw</td>
<td>20</td>
</tr>
<tr>
<td>The Challenge: Defining Aerial Archaeology by Bob Bewley</td>
<td>21</td>
</tr>
<tr>
<td>Aerial Archaeology: the View from a small Continental Country by Martin Gojda</td>
<td>23</td>
</tr>
<tr>
<td>AARG Conversation N° 1: James Pickering and Rog Palmer: 9 August 1994</td>
<td>25</td>
</tr>
<tr>
<td>AARG 1993 – Oblique Aerial Photography: filters and things in front of the lens by Anthony Crawshaw</td>
<td>34</td>
</tr>
<tr>
<td>Bits and Pieces gathered by Rog Palmer</td>
<td>36</td>
</tr>
<tr>
<td>Managing the Archaeological Resource ‘Beyond the Ditch’: a curator’s view on aerial photography by Bob Sydes</td>
<td>39</td>
</tr>
<tr>
<td>Who Needs a Specialist..? by Rog Palmer</td>
<td>42</td>
</tr>
<tr>
<td>Royal Commission on the Historical Monuments of England, Air Photography Unit: Grants for Aerial Reconnaissance 1994/95 by Roger Featherstone</td>
<td>44</td>
</tr>
<tr>
<td>Books of Interest?</td>
<td>46</td>
</tr>
<tr>
<td>List of Contributors</td>
<td>50</td>
</tr>
<tr>
<td>Notes for Contributors</td>
<td>end cover</td>
</tr>
</tbody>
</table>
My respect for St J grew with time. Partly out of greater appreciation of his skills as an aerial photographer and partly as someone with whom I could discuss the occasional Fenny problem. He went to the nub of the problem on several such occasions – one being when I told him that field work by the Fenland Project had shown that the turbaries at Upwell (claimed as medieval in Beresford and St Joseph’s *Medieval England*) were silted by marine flooding during Roman times. “Have you taken foraminifera samples?” was his instant response (these, for the uninitiated, are wee beasties who live in salt water: no foraminifera = no marine flooding). He seemed to take an interest in what I was doing despite his initial reservations about use of the computer for mapping (“Why can’t you sketch it like the rest of us?”) and, unlike happenings to others (or were they all rumours?), there was only one time when photographs were ‘missing’.

One of my recent assessments, which included mapping Roman camps in the Greensforge area, gave me a chance, through his photographs, to see him at work in the air. Let him find a corner of a Roman camp one year and the next he was back to chase alignments and angles from which it ought to be possible to see missing sides. Despite any reservations about his concepts of what to photograph (‘sites’ rather than fragments) his pictures have left us with an unsurpassed collection of illustrations of our archaeological, recent historical and natural heritage.

Charles Leva gave me the news that in February this year Otto Braasch was presented with the Gold Award by the Minister of Culture of Baden-Württemberg. The reason – obviously – was for his outstanding contribution to reconnaissance and aerial photography for archaeology and history. Our congratulations too to Otto, not only for the visual part of his work but also for his efforts to publicise the subject and for the encouragement he offers.
It was Otto who suggested the idea of an ‘AARG interview’ to me and the result of the first of those is in this issue. Jim Pickering was an obvious candidate and, after a bit of persuasion, seemed to enjoy the session. I didn’t want to follow a standard interview route (name, how did you become interested, etc) and, not seeing myself as much of an interviewer anyway, decided to turn the thing into a ‘conversation – that way enabled me to have a say too! We are all familiar with Jim’s views and the fact that, as a so-called amateur he can, and does, say what he thinks. Get the two of us together and we are outspoken about many things, several people and certain establishments. I’ve made only one person anonymous but suggest that the conversation is not read by those of you who are easily offended. I’ve also left out the banging on the table – but I’m sure than some of you will manage to add your own!

As always with such things, there were a number of points that arose but were not pursued. Directions of the conversation were whizzing about like some people’s flight paths. Some of the more memorable items were:

That several years ago Pickering, Baker and Riley decided that an ideal training scheme would put 30 full time aerial archaeologists into Britain (which I think meant England). In their opinion, that was the minimum number of active photographers necessary to ensure effective cover of the country. No mention was made of the resulting post-reconnaissance numbers or of cost!

And two (oh-so-true) quotes by Pickering:

“No other form of research has made so little use of information as archaeology has of aerial photographs.”

“Archaeologists are not wanting what we have to give them because it doesn’t fit in with current practice.”

Elsewhere in this issue you have an unsurpassed collection of goodies from Anthony Crawshaw (who deserves Honorary Membership for the amount of time he gives to aerial studies and AARG) who sends me his contributions on disc as files named ‘AARGCON1, AARGCON2, etc. This batch comprises 7, 8 and 10 so what – we may wonder – is AARGCON9 and when will we read it? Anthony has discovered a live antiquity for us – someone who took aerial photos before Pickering!

We whiz from 1930s obliques to modern satellite imagery and a paper by Martin Fowler (who’s Stonehenge from Space was noted in AARGnews 7 (18-19). His demonstration of the ability to train a computer to detect grassland, in its various types, seems extremely useful – certainly for a lot of the developer-funded assessments which may need sound argument as to why certain areas show no evidence. As one who has laboured through heaps of air photos trying visually to classify arable and non-arable in an attempt to determine recent landuse history I’d welcome any easier way of doing it – providing that cost and speed and accuracy were practical. Those of you who go to AARG this year will have a chance to see his material on display.

Proof that some AARG members are alive comes in the package of two contributions to define ‘aerial archaeology’. Bob Bewley seems to include anything that gets within spitting distance of an aerial photograph while Martin Gojda slots it in as part of archaeological prospection and a good means of illustration. I know which one I prefer but will leave you to ponder on the vast differences between the two. Any more offerings – please? Martin Gojda also makes the point that photographs of attractive sites means more money for next year. I don’t think it happens over here (?is that a good or a bad thing...) but remember the concept so well from my digging days.

Uses of aerial photographs in the world of developer-funded archaeology are covered by two contributions. Bob Sydes (Senior Archaeologist (Development Control) Cambridge County Council) argues that interpretation of natural features can be as useful in a planning-cum-conservation debate as the archaeological information, and indicates the information he expects to be presented with to make curatorial decisions. I
follow this by getting quite cross about people who seem to think that the use of AERIAL makes them skilled photo interpreters. My concern is more for the bad name that aerial studies may be given as a result of these ineffective interpretations than for the inadequate product that goes to the people who have been daft enough to commission specialist work from non-specialists. Will things improve or get worse following the revelation at the end of our Chairman’s Piece of ‘the possibility of interpretation-free plans of cropmarks’. I remain silent on this awesome prospect other than to comment that our books and SMRs are already full of such things.

One of the guardians of the NLAP is Clare King, who also takes part in one of the more violent sports – judo or somesuch. Clare has been chosen to represent England later this year at an international meeting in Argentina. So, go and bash a few, Clare – and other good luck phrases. When she gets back perhaps we could send her round to collect subscriptions....

At one of the meetings of the AARG committee during the past year we pondered on subscriptions and how, and when, to obtain them. The outcome was that each September issue of AARGnews is to include a reminder to you that your subscription is now(±) due. We are not a large enough organisation to consider direct debits, so all cheques please to Gill Barrett whose address, along with details of subscriptions, is inside the front cover. We are, I believe, quite happy to accept subscriptions for more than one year.

THE DERRICK RILEY FUND FOR STUDIES IN AERIAL ARCHAEOLOGY

All AARG members should have bee sent details of the appeal for contributions to help establish this fund. Its stated purpose is to ‘foster and support the study of aerial archaeology by young scholars’ – something that Derrick, more than any of us, was always keen to encourage.

The fund will be managed through the Department of Archaeology and Prehistory at the University of Sheffield and it is to that address that contributions should be sent. Keith Branigan, head of that department, asked me to remind you of the fund – standing by mid-August 1994 at a measly [my word, not his!]£1500 – and ask, again, for contributions from those with the good intentions but who haven’t yet got round to doing anything. Donations can be either a lump sum or annual payments through Deed of Covenant.

Money to, or information from, Professor Keith Branigan, Department of Archaeology and Prehistory, University of Sheffield, Sheffield S10 2TN.
CHAIRMAN’S PIECE

Marilyn Brown

The sudden death of Kenneth St Joseph at the age of 82 occurred on 11 March of this year. His life-time's achievement in the field of aerial archaeology and his central role in post-war reconnaissance throughout Britain and Ireland (and latterly in Eastern Europe) will be familiar to AARG members. While the more middle-aged members of AARG will remember Professor St Joseph at the Department of Aerial Photography in Cambridge or in the air or (in Scotland) fieldworking, the younger members will recall his after-dinner tour de force at the conference in Dublin in 1992, a memory that will provide a link with the early days of aerial reconnaissance. Our sympathy has been conveyed to his wife, Daphne, and his family. My earliest memory of seeing an actual photograph taken by Professor St Joseph, as opposed to reproductions in books, was at an exhibition of photographs of the British landscape, held, I think, at the National Portrait Gallery in London about 1970, where characteristic hill and valley images, reflecting his early interests in geology, stood out among much more consciously artistic productions. His photographs, taken over almost fifty years, have achieved a cumulative value far beyond the recording of individual sites.

Summer cropmark flying in the United Kingdom proved extremely variable in 1994, certainly producing more extreme results in Scotland than any year since the RCAHMS began its programme of reconnaissance in 1976. Flying conditions were not particularly good, restricting the amount of reconnaissance possible. Results were very fair east of a line extending from Montrose in the north, via central Fife to Hawick, near the English border, the part of Scotland most consistently responsive to crop stress; in certain very limited areas the density and detail of the cropmarking was extraordinary. West of this line very little was visible. This remarkable contrast has been echoed in England to a lesser extent. Northumberland has had its most successful season since aerial reconnaissance began in that county; good results were achieved in Yorkshire and Lincolnshire, Cheshire and Merseyside and down through Northamptonshire, Bedfordshire, Oxfordshire and Gloucestershire to Somerset and Devon, with poor results in Wales, Cornwall and East Anglia, forming a NE to SW productive swathe across the country. The indications are that yet again the combination of rainfall, terrain and experience is producing a high proportion of new material in cropmark form. While the Soil Moisture Deficit figures broadly fitted the results, the totals in the north-east of Scotland would have seemed to predict a higher yield than the handful of sites recorded. Discussion with the Meteorological Office would suggest that the cold May may have held back crop development in this area resulting in damper soils and less crop stress than might be expected.

One of the workshops at the AARG conference in October will be given by John Haigh on image rectification, a subject during the last year. A demonstration I saw in July revealed the possibility of interpretation-free plans of cropmarks. Will it really happen?
INSTRUCTIONS FOR OPERATING P14 CAMERAS

Sqn. Ldr. D. J. Munro RAF (retd.)

This piece is extracted from a longer article on the history of the RAF Photographic Branch which appeared in 'Images', the RAF photographers magazine. Sqn. Ldr. Munro joined the RAF as a photographer and later trained as a pilot. In correspondence with Sqn. Ldr. Munro he wrote that "you may be interested in the fact that I was involved in archaeological surveys from Old Sarum, Wiltshire, in the 1920's, when targets were specified by the Ordnance Survey based in Southampton". Naturally I was interested and went to see him in July, when he kindly gave me some more details. The visit was fascinating - I was delighted to meet someone who had such a wealth of interesting experience. I will be happy to reach the age of 93, let alone be as alert and lucid as Don Munro is.

Enough of this introduction. Read on and never be heard to grumble about the difficulties of aerial photography again. Portions in italic are notes added by me, usually drawing on comments by Sqn. Ldr. Munro - Anthony Crawshaw.

It is assumed that low oblique photographs are required by an Army Co-operation Sqn., using Bristol Fighter aircraft (a WWI biplane with many struts and wires to get in the photograph). The Camera Operator would normally be a Sqn. trained Air Gunner, but it was often the case that these tradesmen could not be spared from their normal duty, in which case, first hope was that a photographer could be available from the Photo Section. Failing this, the fitter or rigger would be invited to demonstrate his confidence in his skills by flying in the aircraft he had just serviced! As far as possible, one flew with the same man as the whole success depended on very close team work.

It should be realised that the rear cockpit of the Bristol was fitted with a Scarfe Gun Ring (to carry a Lewis Gun - the ring not only supported the gun, but was arranged to prevent an over-enthusiastic gunner from shooting the tail off his own aircraft). This ring made it necessary for the photographer to stand up in the slipstream when using the camera as, when sitting down, he was too low to be in a position to take aim properly. The camera used would be the P14 plate camera. For the sake of brevity I have listed the points to be observed, not necessarily in the order of their importance (as neglect of quite a number could lead to an abortive sortie) and time does not permit going in to a great deal of detail.

Pre-Flight Briefing. The Pilot and Photographer must report to the photographic section. The Senior NCO (some of whom were given Instructors Courses at the School of Photography, Farnborough) was responsible for advising the pilot on the most suitable height and distance from the target to fly, having regard to the size and type, and the scale using the particular focal length. He is also responsible to ensure that the photographer fully understands the operation of the camera, and that sufficient unexposed plates are carried in a box with separate compartments for the unexposed and exposed plates. He will also supply a map with the targets clearly marked and identified by a number or letter. Also a reconnaissance report, or message pad with a pencil attached.

Practice in operating the camera, particularly noting that the self-capping shutter must be FULLY wound if exposures are to be consistent. In order to protect the lens from dust when running up the engine (particularly on desert landing grounds), the lens cap will be kept...
on until after take off. Before leaving the ground the pilot and photographer will agree on the signals to be used in the air, to mark each stage of the procedure.

**In The Air.** The aim is to obtain the best view giving the greatest detail. The most satisfactory results are from photographs of good composition. A three-quarter view, (ie not a flat end view of buildings etc.) with adequate coverage (no cut off) and including ideally a tie up to some easily identifiable feature, with a view of the horizon appearing about one quarter inch from the top of the sight, should be aimed for. It is seldom possible to meet all this criteria, but the best compromise must be looked for.

On arrival over the target area, the pilot should point out the target and circle round to decide the best approach and position from which to operate. The photographer will test the camera, remove the lens cap, wind the shutter fully, take a plate from the box, number it, insert it into the Mackenzie Wishart slide on the camera back, open the slide and fasten back, erect the sight, disconnect the Gosport Speaking Tubes, if provided (it was not possible to stand up with these connected) and finally, signal the pilot, that he is ready to take the first photograph. The Mackenzie Wishart slide was a device for uncovering a plate, held in a light flexible envelope, when placed in position on the back of the camera. It was described by another user as "a useful but awful invention". The Gosport Speaking Tube was a piece of hosepipe through which the crew spoke to each other. If a considerable difference of lighting conditions is noticed, this can be allowed for by adjustment of the Iris, in extreme conditions of low light the width of the slit in the shutter could also be altered, but providing that all the targets are fairly close this was not very frequently necessary.

On receiving the signal from the photographer, the pilot should circle the target, and at the right time throttle back the engine to revs. which produce the minimum of vibration (this was seldom achieved when throttled right back). He will of course be looking out for suitable places to force land if the engine does not pick up after the photo has been taken. Ideally, at the time of exposure, he will be gliding into wind, at the right height and distance, with the right direction of light giving a 'solid' effect, and always keeping in mind the need to ensure that any particular details of which information is required, will be seen on the resultant photograph. Some very experienced crews found that effecting a gentle side-slip towards the target was an advantage, as it cut out the effect of forward movement entirely. The camera operator must of course be warned of this intention if it is adopted.

The photographer will now stand up in the cockpit, and aim the camera, watching the target appear in the sight. In fact it is useful to think of this task as similar to firing a rifle. To offset vibration he must on no account rest his arms on the Scarfe ring or any part of the fuselage. He should hold his breath, and slowly squeeze the trigger (it must NEVER be snatched or jerked). In most cases he will hear the shutter snap across, and as soon as he is satisfied it has operated, he must signal the pilot (who is anxiously waiting to open up the engine again) to this effect.

The pilot will fly around whilst the photographer closes the slide and removes the envelope containing the plate, which will be placed in the EXPOSED compartment of the plate box. A note is made on the reconnaissance report, of the details of the slide used, the weather conditions, any unusual items occurring, etc.. The camera will be examined and tested, a new plate holder inserted, the pilot informed that all is ready, EITHER to repeat the attempt at the first target if there is any doubt at all regarding the first attempt, or to proceed to the next target, when the whole procedure will be repeated, until all targets are covered. *It could take up to five minutes (from start to finish) to take one photograph. The number of photographs taken per flight ranged from as few as 6 to as many as 40 - 50.* On conclusion,
the lens cap should be replaced on the camera, the lid of the plate box closed, and the report completed.

**Conclusion.** On landing, the camera and plates will be taken to the Photographic Section, and as much information given as possible. It must be remembered that most of the details will have to be titled indelibly on each plate in mirror writing, as labelling was on the emulsion side of the plate before final prints are made, and accuracy of time taken, map references, etc, is therefore essential.

It will be appreciated that the success of a mission depended absolutely on complete co-operation between the crew. However good the photographer, or exceptional the pilot, no good results could be expected if they did not appreciate each other's difficulties.

_Sqn. Ldr. Munro later added the following comments on the operational limitations of the P14 camera:-_

The introduction to the Service of the P14 camera was welcomed by all those who could thereby satisfy their requirements for oblique photography. There were two requirements which could not be satisfied:-

(a) The inability to take more than one exposure at a time. This usually resulted in longer flying time and difficulty in obtaining overlapping exposures at the same scale, needed to enable panoramic views to be matched.

(b) The inability to take vertical views to enable accurate measurements of the target or terrain to be taken, an essential requirement in many cases.

This latter requirement was met by using a P7 camera, which took vertical views using magazines of plates. In later models it was operated in the cockpit, which avoided the need to stand or lean over the side of the cockpit. Mechanical operation was achieved by the use of a windmill which was fixed to the side of the fuselage and pushed in or out of the slipstream, as required. On several occasions both cameras were carried, at the request of the Ordnance Survey, when larger targets, or a particular view of a target, were specified.

_In response to my enquiry about the early archaeological photography, Sqn. Ldr. Munro added the following:_

During 1928-33 I was stationed at Old Sarum, near Salisbury. I have looked at the Public Record Office for any records of this period at Old Sarum, but could not find any. The Unit was the School of Army Co-operation and their function was to train pupils for aircrew skills. In the case of Air Gunners and Bomb Aimers this included photography of targets using a P14 camera to provide photos of the area which were used for identification (and, if possible, to estimate the success and damage resulting from the attack!).

When I first arrived the targets selected were purely military (Railway stations, Shunting Yards, Bridges, Aerodromes, Large Factories, etc.). At this time Ordnance Survey were experiencing difficulties in obtaining photographs from the air and I believe it was O. G. S. Crawford who approached head of Photography at Air Ministry (Grp. Capt. Lawes) and obtained permission to ask Old Sarum to include some targets of interest for archaeological purposes and this was agreed.

The specifications of the requirements varied completely as we were asked to take the pictures on certain days at certain times, under certain lighting conditions and, if possible,
looking North, SE or W, and from a certain height. It will be realised that this was somewhat
different to what was required in war when we rushed in, took the 'snap' and retired. Not the
sort of thing we were training the pupils to do!

However we did our best and had friendly relations, both phone calls and letters, with
the various visitors. I believe a Major Hotine was my principal contact (though at 60 years
break, I wouldn't bet on it!).

You ask what were the targets. As you no doubt are aware Salisbury Plain is covered
in burial mounds (and a map reference given of a particular one of interest wasn't always easy
to recognise - however there are quite a few of these burial mounds close to Old Sarum!).

Of course, Stonehenge and the approaches to it often turned up and certain markings
between them and the river at Amesbury were thought to show the route by which they were
transported. Imber was another and areas around Fovant and Tisbury cropped up, also Porton
Down. At times we could only see a blank field, which was only suitable when the grain
reached a certain height.

In a way I welcomed a change of targets from the old milkround of railway junctions,
etc.. My only connection was to act as driver to the pupils trying to stand up in the back of the
Bristol fighters (left over from the first world war and on their last legs! *D.J.M. had six forced
landings in his first year in India*). Hang over the side in the slipstream, aim the camera at the
target, hold his breath and squeeze the trigger.

Some of the points described, e.g. photographic composition, are as pertinent today as
they were then - I am only thankful that the equipment has moved on. I am grateful to Sqn.
Ldr. Munro and 'Images' for permission to reproduce the original article.
GROUND COVER MAPPING FROM MULTISPECTRAL SATELLITE IMAGERY

Martin J F Fowler

Introduction

The use of multispectral satellite imagery in the supervised classification of ground cover is a well-established technique of remote sensing (Curran 1985 pp208-221). In this technique, the characteristic 'spectral signatures' of known cover types in a study area are determined from the imagery and used to train a computer to seek out like cover in the area. Whilst the technique has been extensively used for land use mapping, its potential for the support of archaeological studies in Britain has yet to be fully realised.

As part of a study aimed at addressing the utility of satellite imagery to archaeological studies in lowland Britain (Fowler 1993), LANDSAT Thematic Mapper (TM) multispectral imagery was obtained of an area around Stonehenge. This article describes the creation of a thematic map of ground cover using the TM imagery and briefly considers the potential use of the technique in archaeological studies.

Satellite imagery

LANDSAT TM imagery covering a 20km by 20km area near Amesbury was purchased from the National Remote Sensing Centre Ltd (NRSC), Farnborough. The imagery was an extract of scene 202/24 acquired on 8 May 1985 by the LANDSAT 5 satellite. Six image files were provided on floppy disk corresponding to the TM spectral bands 1-5 and 7. Imagery from TM band 6, the thermal infra-red band, was not purchased owing to its inferior pixel size of 120m compared with 30m for the other six TM bands.

Each image file comprised 800 lines of 800 pixels with each pixel value (data number) representing the reflectance of the ground sample on a scale from 0 (no reflectance) to 255 (maximum reflectance). The imagery had been geocorrected by the NRSC to the Ordnance Survey National Grid and resampled to give 25m square pixels. This allowed the image files to be directly imported into an image processing system (PC_Imega - described in Fowler 1994a) running on an 80286-based Personal Computer and geographically referenced without any need for rectification.

Ground truth

To train PC_Imega to classify the image, representative ground truth of the land cover on the date of acquisition was required. Since the imagery was acquired nine years ago, this could not be achieved by field survey and had to be reconstructed from historical records and other sources. Thus, for practical reasons the ground truth reconstruction was limited to the area of the National Trust Stonehenge Estate.
The sources used in the reconstruction comprised:

a. discussions with the National Trust warden;

b. correspondence with the tenant farmers;

c. a land-use map of Stonehenge and its environs published in the RCHM(E) survey of the area (1979);

d. a map of unploughed land (c. 1921-1988) published in a survey by John Samuels Archaeological Consultants (1992);

e. 1:25,000 scale Ordnance Survey maps of the area.

From these sources, four primary classes of cover were identified: *Grass* (three types: grass 1, grass 2 and grass 3); *Arable* (eight types: barley, spring barley, winter barley, spring wheat, winter wheat, winter rape, peas, unknown arable); *Trees*; and *Developed land*.

The three types of grass cover were discriminated as follows. Types 1 and 2 appear to represent grassland that may not have been ploughed in the last 70 years with the former corresponding to the grass surrounding the Stonehenge monument that has a distinctive 'spectral signature' (see below). Type 3 grass corresponds to more recent grass and includes arable fields that were in grass at the time of image acquisition.

Within the *Arable* cover class, two areas of unknown cover were identified. These fields were known by one of the tenant farmers to have been in some form of cultivation in May 1985 but were not farmed by him at that time. One field was found to have a 'spectral signature' that was distinctly different from those of the other arable cover classes; the other was subsequently identified as a field of either winter barley or winter rape.

**Classification**

Having identified the various ground cover classes in the study area, supervised classification of the imagery was performed broadly following the procedure of van Genderen & Uiterwijk (1987). From the ground truth, representative areas of each cover type were used as the training set for the preparation of statistical summaries of their 'spectral signatures'. Four of the arable cover types were combined, barley/spring barley and winter wheat/winter rape, since their signatures were similar and resulted in cross classification.

The signatures of the ten ground cover types, as plots of their average data number values, are shown in Figure 1. The different reflectances of bands 4 and 5 (the near infra-red and mid infra-red bands) for the three types of grass cover are particularly apparent. Whilst the grass surrounding the Stonehenge monument (Grass 1) has a low reflectance in band 4 and a high reflectance in band 5, in the other grass types this ratio is reversed.
Figure 1. Spectral signatures of ground cover classes.
Reflectance in band 4 relates to the plant’s internal cell structure that varies according to plant type whereas reflectance in band 5 relates to differences in the water content of plants (Curran 1985 pp 23-31). The different grass types identified on the imagery may therefore correspond to different species of grass and/or differences in the drainage of the underlying land.

The maximum likelihood classifier (Curran 1985 p216) of the PC_Imega package was used to produce a thematic map of land cover based on the training set. In the classification process, the red (band 3, 0.63-0.69mm), near infra-red (band 4, 0.76-0.90mm) and mid infra-red (band 5, 1.55-1.75mm) bands of the TM imagery were used since this has been suggested as the best combination for separation of vegetation types (Townshend 1984).

An extract of the thematic map covering the Stonehenge area is shown in Figure 2. Ideally, the map should be reproduced in colour as displayed on the monitor, however for clarity, a series of maps is shown in Figure 2 corresponding to the main cover classes. The classification accuracy of the map, based on the training set, is assessed to be 84%. Significant cross classification is observed between the Developed land class and the Grass, Trees and Arable classes and probably reflects the mixed nature of the Developed land pixels that have signatures from multiple ground cover types (Fuller and Parsell 1990).

**Archaeological potential**

The ground resolutions of current civilian remote sensing imagery, of the order of 10-30m, are considerably inferior to those of conventional air photographs. Thus the archaeological features that can be identified on satellite imagery are either large or have strong linear components. For example, whilst visual interpretation of a 10m ground pixel SPOT panchromatic image of the Danebury area failed to identify any of the smaller archaeological features that were visible on air photographs (Fowler 1994b), the main hillforts could be identified as could the courses of several Roman roads fossilised in the landscape as field boundaries and modern roads. Similarly, a medieval field boundary and a part of a probable Romano-British water feature were identified by Shennan and Donoghue (1992) on SPOT Panchromatic imagery of Morton Fen and the earthworks of the Figsbury Rings hillfort could be identified on near infra-red imagery from the lower resolution LANDSAT TM (Fowler 1994a). Small features, such as round barrows, are generally not identifiable on satellite imagery unless their spectral signatures are significantly different from the surrounding vegetation (Fowler in preparation).

Higher resolution multispectral can be obtained through the use of multispectral sensors flown on aircraft. The ground resolution of the imagery is obviously dependent on the height at which the aircraft is flown and can be of the order of 1m. Using such imagery, Shennan and Donoghue (1992) could identify archaeological features on Morton Fen that were not apparent on conventional air photographs. Whilst the high resolution of this product makes it of greater potential use to the archaeologist than satellite imagery, the requirement to fly dedicated airborne campaigns to collect the data limits its routine use. In contrast, multispectral satellite imagery for the whole of the UK is readily available for purchase.
Figure 2. Thematic maps of land cover in the vicinity of Stonehenge derived from LANDSAT TM imagery. The locations of extant archaeological features are shown as is the reconstructed ground truth of May 1985 (see Figure 1 for key to cover classes). Based on imagery supplied by NRSC.
c. Arable cover

d. Reconstructed May 1985 ground cover
Returning to the thematic map in Figure 2, within the areas of arable cover it is clear that in some fields the classification process has resulted in the presence of non-uniform ground cover. For example, the field of barley to the immediate west of the Stonehenge monument appears to contain an area of mixed cover in its south east corner (SU 118420) that includes pixels classified as grass, peas and unknown cover. It is interesting to note that this area covers part of the site of the World War One Stonehenge aerodrome that had buildings until the 1920s (RCHM(E) 1979, Plate I; Parker 1982). Is it possible that the area of mixed cover within this barley field may be reflecting inaccurate classification due to poor growth of the crop because of the presence of buried features? Further work is required to investigate this possibility of 'cropmarks' appearing on processed satellite imagery.

As an alternative to looking directly for archaeological features on satellite imagery, the imagery can be used to prospect for areas in which archaeological features can be expected to be found. In this way Cox (1992) used LANDSAT TM imagery with air photographs to locate, map and classify areas of wetland peat deposits in North West England in order to target archaeological and environmental research. In the case of the present study, by extending the thematic map to cover the whole of the 20km by 20km image area, the distribution of grassland, both old and recent, can be identified. Such a map is shown in Figure 3 where the ground cover of all three grass types are distinguished. Areas of old grassland, indicated in black on the figure, can be readily identified and include the MoD Salisbury Plain Training Area to the north and the Porton Ranges to the east. In both cases, archaeological features proliferate. Some cross-classification is observed in this map with some areas of known chalk downland are classified as barley/spring barley. Whilst the overall classification accuracy is assessed to be somewhat less than that for the training set used in Figure 2., improved accuracy of semi-natural cover classification is possible through the use of multi-temporal imagery collected at appropriate times throughout the agricultural year (Fuller & Parsell, 1990).

**Concluding remarks**

I hope that this article has shown that the mapping of ground cover from multispectral satellite imagery can be conducted using relatively modest computing resources. Furthermore, whilst the low resolution of LANDSAT imagery precludes the identification of the vast majority of archaeological features, the technique of thematic mapping from such imagery may be of potential use in prospecting for archaeological sites.

**Acknowledgements**

The author thanks Simon Evans of the National Trust together Messrs R Turner and I Sandell for providing invaluable information used in the reconstruction of land cover at the time of image acquisition.
Figure 3. Thematic maps of grass cover in the vicinity of Amesbury. The location of the Stonehenge study area shown in Figure 2 is outlined. Based on imagery supplied by NRSC.

References


PIG ALIGNMENTS – A NEW CLASS OF MONUMENT?

Anthony Crawshaw

If you have been flying in England for some years, you will probably have noticed the large increase in outdoor pig farms in the last few years. This change has been brought about by public distaste at indoor pig farming practices, combined with a willingness to pay more for 'naturally' reared meat. Whole fields are occupied by pig pens separated by electric fences and the scene is one of total devastation resembling a miniature battlefield. Sometimes the pig fields are visually striking, particularly the ones laid out on a radial pattern.

What you may be wondering, does this have to do with archaeology? Consider the pigs point of view - if you were rootling with your snout in the ground, would you dig a hole into a hard subsoil or into adjacent pits/ditches filled with softer deposits? You can probably see the direction of my musings (rootlings?), which were prompted by viewing a pig field in which one might have been able to form some of the craters into half a ring ditch. However, as it is easy to start seeing interesting patterns in what may be entirely random marks, one has to interpret these 'pig alignments' with caution.

Despite that caveat, I think we should investigate the possibility that the pigs are excavating archaeological features. Despite having one or two candidates who I would nominate to check the ground truth, I suggest that we photograph pig farms with obvious pits, on areas where we know conditions favour the production of crop marks. Such areas would have to have been well photographed already and could have hard subsoils, such as limestone or gravel. Comparison of existing photographs with the pig pits may prove, or otherwise, my hypothesis that pigs will re-excavate earlier features.

A corollary of this is the question whether the pig pits will show as crop marks in future years? Since we are starting to recognise some unenclosed settlements by collections of pits, this has obvious implications for some future aerial archaeology. I would lay a bacon butty to a cucumber sandwich that pig pits will show as crop marks in later years. This is based on our having seen the outlines of a former radial pig field showing as a crop mark this year (the pig farmers seem to change the fields from year to year). What we need to do to check on this possibility is to photograph some well pitted pig fields in all their glory, on areas known to give good crop marks. Subsequent photography might show the pig alignments as crop marks. Naturally, the ideal would be a site where there was good pre-existing cover, for 'before' and 'after' comparisons.

Footnote (?trotternote?) - Outdoor-reared pork may not be all it's suggested to be, as the outdoor piglets are often 'finished' indoors anyway. Also, the pigs used are a breed that puts on more fat, because the indoor pigs that are bred for very lean meat would catch their death of cold outside.
THE CHALLENGE: DEFINING AERIAL ARCHAEOLOGY

Bob Bewley

In his two contributions in the last AARGnews (Number 8) our editor and provoker of thoughts presented the membership with a challenge: define 'aerial archaeology' (with a pint of beer for the challenged). This challenge was borne out of a frustration about terminology, even the use of the term 'cropmark'. Rog pats himself on the back for coining the term 'splodge'. I like the word and use it all the time (especially when the children are around) so much so it inspired a Limerick...

There is an air-photo interpreter called Rodge
Who prefers to use the term splodge
It isn't just the rhyme
He uses it all the time
Because to use MACULA would just be a dodge.

The more I tried to define the subject the less convinced I was that I should be spending my time defining aerial archaeology and naming parts of archaeological fieldwork. What made me overcome the waste-of-time argument was the realisation that unless we do define what it is we do, and how we do it, we will not be part of a proper archaeological discipline. The Institute of Field Archaeologists (IFA) has already defined aerial archaeology for its Areas of Competence, not without some controversy. By defining our subject, or the discipline, we can have greater credibility in making the case for what we do, as well as admitting the limitations of aerial archaeology. Similarly a definition will help us rectify the past mistakes and help to prevent emerging archaeologists from making the same mistakes.

Rog has always preferred the term 'air photo archaeology', a term which has much to recommend it but one which has not caught on. Aerial Archaeology, however, is a term which will stick because it is only two words and it does not define too closely what it means. The story of how the drink 'Seven-Up' got its name is a salutary tale. The same drink (fizzy lemonade) had had six unsuccessful names and the drink did not catch on; at the seventh attempt the name makers went for the obvious, if unlikely name of 'Seven-Up' and it worked.

This may help in explaining why a name 'Aerial Archaeology' will stick but how do we define what it is? Aerial Archaeology is part of what used to be called Field Archaeology, but what is increasingly called Landscape Archaeology. It is part of the process of archaeological survey, with emphasis on 'part'. It is also a process in itself which informs other processes and it leads to a better understanding of archaeological sites in their landscapes. Although the list below will be added to (perhaps by future contributors to AARGnews) I thought it worthwhile to list what I think the process of Aerial Archaeology covers:

1. Planning surveys, defining the aims and areas for reconnaissance and/or mapping. This helps define the survey element of aerial archaeology, which is part of archaeological survey.

2. Organising and undertaking the operational side of reconnaissance, in terms of airfield, pilot, plane, maps, archaeological information etc., as well as knowing and understanding the ground and meteorological conditions for the area to be studied.
3. Organising and undertaking flights so that in-flight recording and the taking of aerial photographs is done efficiently.

4. Arranging and 'siting' the photographs; this means making sure every photograph has a physical location cross-referenced with its film number.

5. Curating negatives, slides and prints.

6. Organising mapping projects and carrying out the analysis, interpretation, mapping and recording of archaeological information from aerial photographs.

7. Reporting on all the above, but especially the preparation of reports after analysis, mapping and recording so that the results can be integrated in broader landscape archaeology or excavation projects; this includes integration with geophysical, geochemical and other remote sensing projects (including all types of field survey and field walking).

Thus if you are involved in one or more of the seven activities above (no connection with Seven-Up) you can be said to be involved in Aerial Archaeology. This does not mean, however, aerial archaeologists exist. Within the broad spectrum of aerial archaeology there are photographers, librarians, and air photo interpreters; if they are also archaeologists, using the benefits of aerial photographs for archaeological surveys then they are archaeologists first and we do not need a label aerial archaeologist. Strictly speaking an aerial archaeologist is an archaeologist who surveys from the air (i.e. is airborne), but having defined what Aerial Archaeology covers it is clear that it is more than flying around taking pictures.

Trying to define aerial archaeology singles it out as a sub-discipline of archaeology (and archaeological survey in particular) and this has its dangers. It can give it exclusivity and yet we must communicate what it is we are discovering to as wide an audience as possible. This is not just because we are interested in understanding the landscape but also because the sites and landscapes are threatened. By defining what we do we dispel the belief that air photo interpreters and aerial photographers are a group of myopic obsessives discussing details of crop marks, SMDs, GPS systems and the minutiae of every photograph.

The fact that it is possible and necessary to have proper training programmes for archaeologists to understand the use of aerial photography for archaeology is proof enough that aerial archaeology exists. Only one university (Sheffield) has taken the subject seriously enough at undergraduate level to have allowed a 20-hour module on aerial archaeology, but I am sure more will do so (Glasgow has an M.Phil in the subject).

If we can show that what we do is a fundamental part of archaeological survey and discovery and that we are only just learning what the photographs can teach us (as Rog's Tiptoe through the Fens showed) we will have a greater credibility in these days of cost-efficiency and performance measures.

Have I earned my pint? Is the next question 'Is aerial archaeology organised in Britain (or Europe) in the best way to achieve the best results for archaeology?' Discuss.
AERIAL ARCHAEOLOGY: THE VIEW FROM A SMALL CONTINENTAL COUNTRY

Martin Gojda

My view of aerial archaeology is substantially conditioned by two principal facts. Firstly, before the 1990’s Bohemian archaeology neither had tradition, nor experience, in any activity connected with what is meant by aerial archaeology – and the same is true with me. Secondly, and conclusively, in my country there are no special bodies with staff whose work is divided between specialists for single activities as it is, for example, in RCHME. This means that starting to develop aerial archaeology in Bohemia brings one to think over a complex of problems concerning the strategy, priorities and organisation of this freshly introduced discipline (questions of similar type like "where to start and how to set the hierarchy of activities?" have been occurring to me repeatedly). Moreover, one must balance carefully between theoretical concepts (which I feel must evenly cover the needs of both the discipline itself and of historical/archaeological studies), and actual financial means (conditioning, consequently, the quality of technical equipment, number of hours spent in the air and possibilities to employ documentary staff). To keep this balance makes me, for instance, not to focus my attention exclusively on a limited geographical territory but to spread the range of flights into much wider area to find different types of sites/features (the more attractive they look the better chance for aerial archaeology to get money).

As my considerations are connected with general concepts of aerial archaeology I will now try to express my definition of this discipline. For me the term aerial archaeology embodies a wide range of activities. It is, in the first instance, a method which brings new data/information which may be applied by historians (both archaeologists and historical geographers, art and natural historians and environmentalists, etc.). By means of reconnaissance (air survey, detection, prospection) it collects new evidence on both single components of historical landscape (archaeological features) and on their wide landscape context and setting. Consequently, from this point of view aerial archaeology can be used in many procedures like topographical evidence, theory, heritage protection and public education. I do not think there is much difference between the so-called post-reconnaissance work and common post-excavation work. They both try to elaborate and analyse its own type of evidence properly to enable its interpretation and inclusion to wider synthesis.

At the same time aerial archaeology is a way of a high quality photographic documentation of all types of historical landscape relics, in particular territories or landscape units and transects visible both as standing monuments (e.g., churches, monasteries) and areas (villages, historic towns, etc.), and as crop-, soil- or shadow-marked sites and features. The results of this aspect of aerial archaeology are archives and libraries of photographs and maps.

Stressing these two aspects entitles us to place aerial archaeology to a much wider context of humanities (history) in contrast to other purely prospection methods like geophysics (for obvious reasons these methods are able to see the underground reality in much smaller spatial units, although some times in a higher – and measurable – quality).

I am of course aware that using the expression archaeology in the name of so widely defined discipline may seem misleading to some historians. But let me then argue that archaeology
(considering the linguistic meaning of the word) is a discipline dealing with ancient remains in general (in other words, with ancient human monuments), not only those buried under the ground but also those which are visible on the surface.

As a graduate archaeologist I would like to stress that I find it inevitable for aerial archaeology departments to be headed by professional archaeologists (historians in general) for, first of all, conceptual reasons. Specifically this is valid for newly created bodies in those parts of Europe where the discipline is being newly introduced. As a person in a situation like this I believe that aerial archaeology has a good chance to become quickly and reasonably integral part of landscape history projects of both central institutes (like my own) and local archaeological museums and offices. For instance, for myself as a member of the Department of Spatial Archaeology, it provides evidence on spatial patterns and diachronic changes of human past activities in selected landscape units or regions. It is the combination of aerial archaeology and ground survey (plough walking) that brings very good results. For the study of settlement activity this is a very good instrument (quick and non-destructive) and, at least in our department, appreciated highly (it has been practised also by the only Czech colleague of mine who works in north Bohemia in an archaeology heritage care office). The relevance of this is to show how aerial archaeology can be meaningfully involved into archaeological and historic landscape projects (once again, archaeology is not just digging and I do not agree with many colleagues whose creed could be expressed as *Excavo ergo sum*).

I probably do not have to stress how attractive and illustrative aerial photographs can be both for professional historians and for wider public. I feel that photographs of a high quality, displaying an interesting site or part of a historic landscape can be a powerful instrument linking these two groups of population and bringing profit to our effort to stimulate people’s interest to think about their history and to protect the heritage.

In this contribution I wanted to elucidate how I am trying to introduce aerial archaeology into the minds of historians and archaeologists and consequently, into historical studies of a country where it has no tradition, rather than to write about general problems of this discipline in actual historical study.
AARG CONVERSATION N° 1
JAMES PICKERING and ROG PALMER: 9 AUGUST 1994

Jim came to Cambridge specifically to record a conversation-cum-interview. He brought with him an armful of books of his photographs and we had been looking through some of these before we started recording. What follows are verbatim extracts of some the more coherent sections of from that tape to which I have done minimal editing.

We began recording while looking through a book labelled ‘Interpreting Problems’ that JP had brought along.

RP – You’ve got a book of air photographs that show unexplained things but which appear to be the results of holes – cut or natural. We can make guesses about what some were, but what is the next step? Either you go out into the field and look, and by looking you might explain some of them, or you might go to local records for, possibly, some information on things like quarrying.

JP – We are dealing with phenomena. So if it’s geological then I believe in asking a geologist. Unfortunately, if it is sufficiently obscure to be interesting then the geologist is most unlikely to know anything about it because its outside his normal scope. With agricultural – well we can chase certain effects. Is this example a causewayed enclosure, or part of one? There is a very similar shape in one of Agache’s books. Just because we don’t know it in Britain it doesn’t mean that it doesn’t exist. What about this one then?

There has to be a cause for it. And the cause is either geological, or archaeological, or agricultural. And so many of the subjects we are dealing with have got more than one purpose or reason. This one: the obvious explanation is that it’s a barrow group (with cricket pitches on it) – but is it? On the ground it’s called Danehills.

RP – But they have all got entrances, which barrows don’t normally have.

JP – Makes them henges then! But the nearest I’ve got to an explanation is that there were some barrows there but that there is an ack-ack post on top of it. This one, in Derbyshire in a clay area, I suspect this too is an ack-ack site. I’m not in any doubt about this one but on purely morphological grounds they are the same. So you can’t interpret a lot of evidence from its morphology – it’s got to be interpreted archaeologically.

RP – But is that saying that classification isn’t archaeology?

JP – Yes!

To a certain extent I try to define things by shape. My rough and ready formula that I’ve used for forty years is that a round shape is neolithic. Where they are circular they are constructed in an open landscape. A D-shape is iron age and it is D-shaped because it is built against an earlier boundary. I’ve got a few [boundaries] with double ditches. I rejected trackways for those forty years ago – they’re not, they’re banks, double ditched banks which are a boundary. Where you’ve got rectangular then they are IA-RB. They are constructed in the corners of existing field systems and if you look at a lot of enclosures you can see the extensions from them. But, of course, the field systems are gone although they can be inferred – but that puts an entirely different interpretation on the landscape than just putting an enclosure on it.

RP – All the areas I’ve worked in, mainly Wessex and the Fens, have got – lets call it ‘continuous archaeology’ – I’ve never dealt with some of these areas like Rowan’s Marches where you have isolated sites and nothing in between them. And I find it quite a difficult concept. I’ve not needed to think in terms of those landscapes as mine have been all there – well, more or less anyway.

JP – The Midlands is mainly isolated enclosures and that had to be linked in some way. What is missing is the field systems that go with them. I’ve got lots of examples where there is enough extension from a
corner to show that they are constructed in what already existed. But this is increasing the landuse to an enormous extent.

RP – Yes, I agree. And I realised very soon after I started working for RCHME that you might as well say that there is something in every field. Population figures have probably been well under-estimated.

JP – Actually, it was Arnold Baker and myself at a meeting chaired by Peter Fowler just after he took over [RCHME]. We proposed that there were four million archaeological sites in Britain because there were four million fields. Fowler said, “This is rubbish,” (or words to that effect) “we can’t discuss things on that basis”. (RP – It doesn’t sound many really.) But I argued that every field has got a different history and therefore every field is an archaeological site. Some fifteen years later when Fowler was CBA president, the main point in his presidential address was that every field had to be treated as a separate site! (RP – Takes a while for some people to absorb things!) And Philip Rahtz praised him for it – for a new idea.

RP – You know better than most of us that archaeologists will believe some people if they say that. They won’t necessarily believe you or I.

JP – They never do believe me! But that’s never worried me. What does worry me is if they disagree with me without a viable or plausible alternative. That I regard as nonsense.

RP – OK. But these are the people now who have been doing it for ten years or so. All right, they might only do ten hours or so a year....

JP – Which is a waste of time. Relatively speaking. It was all right when nothing was known – and remember that going back ten or twenty years there were fewer restrictions on flying. I’m the only one left now. There’s not another amateur left.

There was a bloke named Cruikshank, he’d done a lot of work and had flown with me. I put him in touch with RCHME and they turned him down flat [for a reconnaissance grant]. This was nonsense, he was a competent pilot who now has his own commercial air firm and sells his APs to Lincolnshire Heritage. All you can say is that this was crass stupidity. There was a bloke who was prepared to do it at his own expense.

There was one bloke from EH who was put in charge of the grant [we know his name but had better not print it – tact (or libel) again!]. He was not only uninterested but he was determined that it was going to be useless, the whole thing. He never made a decision on anything and I’m sure he was put there because the establishment realised that he was bloody useless!

RP – But EH have always been anti air photography. You remember when Bob Bewley worked for them and volunteered to take over the management of the aerial
money and apparently Wainwright was only too pleased to unload it on him.

JP – On the other hand it’s still only a pettifogging sum compared with the £10000 that was offered 20 years ago.

RP – It was down to about £20000 this year because RCHME had suddenly realised that it had cost them a fortune to move and everybody had to cut back by some 20%.

JP – This is totally against the principles of Arnold and Derrick and myself – that you must do it every year and not let anything slip because the year in which you let an area slip will be the year in which it produces the best evidence.

RP – Yes, but you wouldn’t know that, would you!

JP – It’s like doing an excavation. Do you say that we won’t bother with that bit because it’s raining. It is totally against research principles to do that.

RP – You’ve said that there has never been much of a policy about reconnaissance.

JP – Other than being as awkward about it as possible.

RP – No. I’ve asked for bits of money and they’ve helped.

JP – Ah, but you’re a professional.

RP – No. I’m not a professional aerial photographer – especially by your standards.

JP – Yes, but what is an amateur? Archaeology is a do-it-yourself indulgence – it’s not a science and it’s not an art. Aerial archaeology was nothing at all to do with archaeologists – it was invented by aviators. Crawford was an observer in the 14-18 war. He was an experienced aviator and because of his flying experience was able to say that aerial photography would be useful to archaeology. And he was asked to comment on those early photos because of his flying experience – the obvious thing for the RAF to do at the time was to go to somebody who had also been in the air. Allen devised the systems of reconnaissance that we follow. But since then it’s all been turned upside down. It’s now believed that archaeologists invented flying!

RP – You’ve thrown this argument at me before and I’m never sure where it’s getting. My own beginnings go back to being taken on by John Hampton with absolutely no qualifications whatsoever in either flying or archaeology. But I showed an interest and could actually recognise ‘my’ part of the site on some air photos of Owslebury (where I had been digging at weekends) which, perhaps, showed an ability to read a photo. In the five years I was with the APU most of my time was spent putting photos into red boxes – including yours and Arnold’s. It was, I think, a good background for when I did eventually get airborne. I knew, first of all, what I was looking for and, secondly, the types of photos that I wanted – what to leave in, what to leave out, what angles were best for what I wanted them for, and so on. So without having any actual airborne experience at all I think I started flying with a lot of experience.

JP – But aviation is an entirely different thing. If you are trained as a pilot you see things in an entirely different way from a passenger. My hundreds of hours giving cadets air experience have given me a rough idea of how much somebody without experience in the air can absorb. Also, when I started there was no radio and you had to learn navigation and to read the landscape. That is an essential part of it. People who learned by using map, watch and compass know more about the landscape than any archaeologist will, can, ever know. You see it in different scales – vertically down in a limited way, you can see its context and then you can see its wider application. In Africa, for example, you can see the reasons why settlements and villages are there. When you read landscapes, as long as you know where you are, you can’t get lost. In a recent three day’s of flying I looked at a map once, when we confused the motorways between Sheffield, Worksop and Doncaster in bad weather. It has to be accepted that people who have not had the benefit of that training have to work at a lower level of competence. The problem is to provide them with the best level of competence to get over that disability.

RP – Let’s start afresh then with no flying archaeologists. Who, and how, would you train? I think you need to train archaeologists
to do the aerial photography because they, regardless of what you think, have got a certain amount of archaeological background information on types of site. Whether this means they are only going to see those types of site is another question. Or would you leave the archaeologists out altogether?

JP – I think one of the problems of using an archaeologist is that they already have too many prejudices. They have been indoctrinated, have learned, archaeology as things like stratified layers, and I think this is a disadvantage. It takes five years to train a pilot up to a competence up to which he can operate in this country. Up to 700 hours I would think. Then he would have a commercial licence and could operate. Archaeology is easy compared to that. He could learn enough archaeology in six months in the winter’s evening classes. To go into it, initially, any deeper then you’ll be looking for things that you know. You’ve got to treat it as research right from the ground upwards and you don’t study archaeology only, you’ve got to study geology, botany, farming practices, hydrology, meteorology – to include all those in it, and of those archaeology is the simplest of the lot to learn.

RP – But if you are to encourage pilots to do that the next phase is in getting them interested in doing the survey work isn’t it?

JP – Are you training them to do air photography or air archaeology?

RP – It would have to be air photography wouldn’t it?

JP – So you are carrying out the instructions of the ground-based archaeologist who really has no interest in aerial archaeology.

RP – But look at AARG. There are less than 150 members and most of those don’t fly. Aren’t most of the people who fly for archaeology, in this country, archaeologists who think that through doing air photography they can add a new dimension to the record. They have chosen that as something to be interested in like others choose animal bones, etc. The survey side has always attracted smaller numbers. I noticed that when I was doing field survey. No one is interested in doing it – and the aerial stuff is similar. There are a lot of people who are just not interested in doing it – even if you say that flying is fun. So the people who you have got doing it from the body of archaeologists are the ones who are interested enough to learn about the problems.

JP – But it isn’t enough just to be interested in learning about the problems. I think you have to be a fanatic. If you are doing something that goes outside convention – and taken literally archaeology is the examination of man’s past through his artefacts – and air archaeology is nothing to do with that really to the man who looks at it that way. It’s too remote. A telescope and a microscope provide entirely different evidence from exactly the same subject. In archaeology aerial archaeology is a telescope and excavation is a microscope. People can understand the concept if it’s applied to organic matter but people don't understand it if it’s applied to archaeology.

RP – I think that most of the people involved in it find it difficult to understand. And there aren’t all that many people involved are there? Out of the 150 in AARG there can be, possibly, 25 who fly. Part of the problem, in this country, is that a lot of those 25 do the photography as part of a job. There are very few who can, or do, do full time aerial work: you, I suppose; Roger Featherstone does more aerial hours than Chris Musson or Marilyn Brown and that’s about it now that CUCAP have packed up. On the interpretation side there’s Chris and myself, plus the RCHME interpreters, maybe as many as ten people, and a few ‘outside’ doing NMP work. And that’s it – everybody else is doing it as part of other work so there aren’t all that many people to throw ideas to and the APU are blinkered by the approach that they’ve been told they’ve got to take.

JP – This is what I say, that you’re indoctrinated if you’ve learned archaeology before you take up flying.

RP – It’s not so much the archaeology as the Commission approach.

JP – Who’s the leading aerial archaeologist in the world?

RP – I still don’t know what an aerial archaeologist is, but your answer is going to be Otto, isn’t it.
JP – That’s right. His results are phenomenal. His training is as a pilot – he knew nothing about archaeology when he started and claims not to know much now – but he does. His total flying time is more than 14000 hours and he’ll do more than 700 this year. In Belgium too, Charles Leva, is a pilot. It started from aviation, and I’m sure this is the right way round. Archaeology from the air is completely different from archaeology on the ground – it was wrong ever to mix them. Every archaeologist thinks that he starts fully competent but it’s never been developed except by a very very few of us. We have not been content to take air photographs – what we have been trying to do is develop an air archaeology.

RP – And you started from the flying side didn’t you?

JP – Yes, I’d been to a dig run by my uncle, looked at it and thought, “This is peasant work!” In 1937, when I started flying, my uncle asked me if I’d take a photo of the site he was excavating at High Cross, but I didn’t do anything more until the beginning of the war. I got interested in archaeology when I was in the middle east. When I got back I felt that I’d had a lot of experience at tax payers’ expense, although it was wartime, and I didn’t like throwing that away. So I then started looking – I did what St Joseph did first, entirely the wrong thing but what every archaeologist does, and that was flying along Roman roads looking for sites. Of course, I found nothing – nobody ever does. Then I thought I’d have to learn something about it and started reading about geology. In about 1948 or 1949 I started recording systematically. It’s been a study all the way along – I had to find out myself about crop marks and I think that the big advance that I made on it was when I started flying with Arnold Baker and Derrick Riley. We flew over one another’s territory – sometimes in the same aircraft, sometimes in different aircraft at the same time – and compared results. We treated it as a scientific investigation. None of this nonsense about, ‘if they’ll give me a grant I’ll go and take some photographs of their digs’. We had to pay for our experience.

RP – It’s difficult to think back to the times of ignorance, lets call it, when it was necessary to find out what times of year were best.

JP – One of the great advantages I had was flying cadets. This often meant flying all day, maybe 10 trips, along the same route – and I’ve watched crop marks develop, I’ve seen the effect of rain on them, I’ve seen them harvested. Later I used to go on the fortnight camps with them and so I was able to do the same studies of geologies and crops in Devon, in Yorkshire – at half a dozen airfields. The final time was when I spent three months, a week at a time, at 12 different RAF stations in different parts of the country. So I got a very broad acquaintance with the effect of climate, temperature and height on the growth of crop marks, of the effect of rainfall on the lee of hills. All these things you can study as long as you are in the air, but you can’t go into the air to study them. So I’ve always regarded air photography as a waste of time – merely taking air photographs – archaeologists think they are doing you a favour if they ask you to take a photo of a known site – you’ll get a photograph of something – but I can’t see the point of it.

RP – One of the good aspects, possibly, at the moment is that the people who take the air photographs of their own patch tend to be the ones who use them. If you’ve got your ideal world of pilots going round taking photographs you’ve then got the problem of feeding them back into the archaeological world. Are archaeologists this strange type if person that likes to collect its own data? I’m an interpreter rather than a photographer and am used to working with anybody else’s data, in fact it doesn’t bother me, but I think there are a lot of people who think along the lines of, “I took this photo, it shows a nice site, and it’s been ‘mine’ all the way through.”.

JP – Known as the ‘I saw it first’ syndrome.

RP – But with your ideal set-up you are ending up with a lot of photographs, but what happens to them, what’s the next stage?

JP – All mine go to RCHME, although I’ve still got 20000 transparencies they don’t want to take. But because of the time it takes them to handle them I’ve been loaning them to Museums to copy, at a considerably lower
price than RCHME would charge them for copies before they’ve gone to RCHME. But even these have been slowed up – museums run out of money too – and there has been a certain amount of unacknowledged use of them too. And one bloke claimed that he found a site on my slide because he was sure that I hadn’t seen all of it. Another thing is that people still think – many archaeologists and a very high percentage of the amateur archaeologists – still think that sites are found from vertical air photography and looked for on the photographs.

RP – This is getting back to one of the topics I wanted us to discuss. Have we, the aerial world, been giving the wrong message to students, professionals and the amateur world, if that concept is still believed? There was a time, after the war when the National Survey was done, when the vertical photographs were put to good use. The Fenland in Roman Times is an example. I’ve recently been working on those photographs and Hallam did an amazingly good job with those for the time and with those tiny sites. It’s worked very well for ridge and furrow too, and I’ve seen examples in Wessex where the field systems have been showing very well, but I wouldn’t use verticals for finding the usual crop marked sites – no chance, waste of time – if you’ve got obliques.

JP – Sometimes though, verticals are the only way. I was flying in the Peterborough area years ago on one of those days when you could see miles of sites. I rang Graham Webster [then chairman of the CBA Aerial Archaeology Committee] and told him. He asked what could be done about it. The only way of dealing with information on that scale is in-line vertical survey and, I told him, it wants doing three times a year for twenty years. Well, that’s the ideal – and why not? The RAF were asked to do the work but could not take on anything that might conflict with commercial interests. So nothing was done – although I still think my formula was the right one. High Cross, the site I photographed for my uncle, is one of the sites I use as a control area for checking the stages and developments of crop growth. That has probably had more aerial cover than any other place in the country and it didn’t produce one single crop mark until 1990. On corner appeared then and it was visible for less than a week. So we just don’t know what we are missing in any one year – we haven’t a clue.

We then looked at a couple of examples, taken on successive days, of site near Sleaford, Lincs. One day it was very clear, the next day it was showing poorly.

RP – But I’ve always thought this ‘cropmarkology’, one of the things that Derrick was interested in, was such a futile side-track. Do we really want to know? From an archaeological point of view I know that there are a lot of variables that affect where the crop marks are going to show and how well they show each year. What I’m more interested in is what they’re showing – although I know that understanding of the sample is to some extent necessary when you are trying to understand the landscape it’s recorded but, quite honestly, I don’t give a damn how they show.

JP – Well I do. I think this is part of the interest. You get some information from whether a crop mark develops and when it develops. You get some information if you do it over a large number of years and are able to draw some inferences, if not conclusions, on the depth that it is below the surface.

Pause

RP – I’m listening, but waiting not to agree.

JP – The amount of soil over a site determines whether it will produce a crop mark or not.

RP – It’s one of the variables.

JP – It isn’t only the depth of soil that inhibits the creation of a crop mark. The Roman site of Manduesedum, near Atherstone on the Watling Street is on the flood plain of the river Sence. There have been vast excavations there over the years and there are massive ditches, wells, and industry – yet it never produces crop marks of any kind. Originally it didn’t because ploughing [horse drawn] at a uniform depth produced an iron pan – and we don’t know how many iron pans there are in the country. Even now, after excavation, there are no crop marks there. At Billingborough is an enclosure excavated by Peter Chowne. I photographed it again this
year and there’s not the slightest bit of evidence for where that excavation was. You can see the crop mark of the enclosure but there’s no sign of his trenches.

RP – Would you expect to see his trenches though? What you can often see if an enclosure has been excavated is that it shows up a little bit clearer, sharper – it depends how it’s been backfilled really, but I wouldn’t expect to see which bit he’d dug and which bit he hadn’t. Would you?

JP – It depends on the soils – sometimes the old excavations you can see as clear as anything. One that I photographed was Stan Stanford’s excavations of the Roman fort on the river Combe and you can see his boxes quite plainly – and the excavation was done, what, about 30 years ago. So unless we understand why things like this happen then we don’t understand why the site has survived in the first place.

RP – I’ll go back to the bit I was waiting to disagree about. One of the sites we did an assessment for, at Fengate, was a small field on the gravel fen edge adjacent to the stuff that Francis Pryor had excavated. There were only about two or three CUCAP photos, just one date, showing ditches of fields plus a couple of circles. The field was part-covered by alluvium and we were getting some marks that we could follow a little way into that. But what was interesting about the site – and what neither we nor the excavator could fully understand – was that most of the ditches that we had mapped were tiny little things. There was another big one, perhaps a couple of metres across and a good one and a half metres deep and it didn’t show at all. Just the opposite of what you’d expect.

JP – This is what is happening on the clay soils. You get ring ditches that are literally ephemeral. If a ditch is dug into clay, like a modern pipeline, it is backfilled immediately and the topsoil goes back on top. They show for a few years and then they go. But where you have a ring ditch that was dug and left open you get a turf line forming. If that is levelled now there is a fibre lining which just retains sufficient moisture in a dry year to produce a crop mark and it was through that formula that I found it was profitable to look on the clays. But you have to understand these things – it isn’t sufficient, in my opinion, to photograph one, put a trench across it and find a bit of pottery and a bit of flint and say, “oh yes, it’s bronze age”.

RP – Doesn’t this come back to what we are trying to do with all the photos?

JP – We’re trying to build up a picture of the past from a new type of evidence.

RP – I see air photography as one tool in archaeological survey.

JP – It’s the primary tool. But we think of it too parochially – we’re now part of Europe.

RP – This is what worries me about Potsdam – that what we need to do is to get them to get organised in a way that we’ve never done over here and, I think, are unlikely to do because the people who are now running things have put the blinkers on and they’re not going to change or admit that what we’ve done in the past is not necessarily the right way to do it. So regarding Potsdam, what I think is more important than teaching them to take photos or draw maps is to make sure that the work that they do is an integral part of an archaeological project – or of archaeology – rather than this is air photography and this is archaeology.

JP – Yes, but I still think that the pioneering has got to be done first. There’s Poland, the Baltic States, the Ukraine, all the Russian States, India, China. These are all areas in which it could be useful. In this country we ought to be developing the educational establishment that will assist these other people to start their own programmes – but who thinks of it?

RP – Since I became chairman of the CBA AAC the education aspect is something which I’ve been trying to push through and – I don’t think this is going to do any good at all – we recently produced an outline course, with reasons for suggesting it, of what we thought ought to be being taught at university for the archaeological uses of aerial photography. I tried, two or three years ago, to sell the same idea to Cambridge as a logical follow-on to David Wilson’s course. David teaches what photographs show, I wanted to show the uses. But there is a reluctance at university level, and that is where I think we need to start.
JP – How many universities now provide any interpretation lectures?

RP – One. Sheffield.

JP – Interpretation for a geologist is longer than a whole archaeology course. It’s footling. All concept has been lost – this was started in Britain, it was developed in Britain, we were years ahead of anybody else – and what has happened? Now that the iron curtain has come down there’s a whole world of unexploited territory and who dreams of doing anything about it? There is great interest now in China – but they haven’t come to Britain to start it, they’ve gone to Otto.

RP – I think in this country that air photography for too long has been in the hands of the air photographers and that there hasn’t been a great deal of what I think of as archaeological input. St J was fairly guilty of this. The obituary that David Wilson wrote for the CBA newsletter included a bit that St J gave the impression that St J invented aerial photography and nobody else could do it. Which was true, but I think that for a long time, at university levels, and at public lectures and anything that has gone out on TV – which is not much – has always been along the lines of ‘flying and air photography can discover archaeological sites’: the end. I don’t think there have been many demonstrations of what it can be done afterwards. That’s the level I’m at, of actually using the stuff. But until we’ve got the demonstrations – what Rowan did in the Marches, my Danebury volume, I’ve not seen what Bob did in Cumbria but I think air photography was only a small part of it, the Bodmin thing which has just come out – until we’ve got a few examples like that we haven’t got anything to teach, we haven’t got any examples. Any teaching that I do includes a couple of air photos to show the source data, and then it’s on to the maps and ‘this is what I’ve got from the photos’, and my archaeological understanding of them. So air photographs feature very little in any lectures of mine about air photography, or uses of.

JP – But archaeology in schools is still at the level of ‘the native Britons were pained in woad’. They’ve made not attempt to change the Victorian view of the past.

RP – Schools are more difficult. There’s a friend of mine who sets and marks A level archaeology and they are completely restricted by the budget for school books. In many places they are 20 years behind – if you’re lucky. Universities are different – you expect them to be on the threshold.

JP – There is one particular professor – leave him anonymous – who I sent a few copies of photos that I took in Germany with Otto. He wrote back and thanked me and added, “It seems that the text books are wrong, crop marks are not confined to England.”. From a professor! And he was excavating on the continent at the time, so where do you start with that innocence. OK, he’s out of touch, but I despaired long ago of archaeologists I’m afraid. I don’t take them all that seriously now. There was one bloke who’d opened up an area and I went there 30 years ago and I sent him two films of results along that particular area. I know that they went into a drawer and, thirty years later, they’re still there.

RP – Yes, it’s sad – but to some extent isn’t this what you want to happen. That he realises that he’s not qualified to understand them.

JP – It isn’t that. I know that he isn’t qualified but, on the other hand, you don’t turn down opportunities. You’ve borrowed a digital camera. It would be silly to turn that down, these people who don’t use material that’s available to them. It’s as silly as if you’d said, “Digital camera. Not likely, not touching that!”. No, you’ve got to investigate things.

RP – Yes, even though we know it’s not going to give results as good as film. And the dabbling we’ve done with satellite imagery – we know it’s not going to show anything, but let’s just see what it does show.

JP – Yes, this is the research, but archaeology is not doing research now. It is routine excavations. Pedestrian. For the record – and nobody will ever read it.

RP – Not all of them. There are a number of unit managers who have got their own research interests and, one day, all these bitty excavations will be pulled together into some sort of synthesis.
JP – It’ll confirm what’s already known!
RP – No, it’ll change it to the current theory. Which is called progress, isn’t it.

We came back from the pub wondering whether most archaeologists realise the extent of aerial discoveries.

RP – You realise the archaeological landscape is there because you’ve taken the photos. I realise it’s there because I’ve looked at the photos, but most archaeologist would look at a single photo and I don’t think most of them have actually had the chance to see what we know – to see the extent of what’s going on.

JP – And yet the whole purpose of the RCHME library was that all the photographs should be got together so that they were all available to any archaeologist.
RP – But you still need them to go and look at them.
JP – That’s right. You can’t look at them for them.
RP – No. They wouldn’t believe you – do they.
JP – If the archive isn’t being used for the purpose for which it was intended than it should either close down or re-state its aims.
RP – I think that, much as I disapprove of it, this National Mapping Programme might be a step towards showing people what’s going on, if people are prepared to believe maps.
JP – Yes....yes....we shall find out.
RP – It’s not a side that you’ve dabbled with all that much is it? You take the photographs and in your head you’ve got a mental map of how it all fits together. Which I can’t do – I tend to look at all the photos, then forget them. But I begin work at the map stage. That’s what I look at and that is my past landscape – whereas your past landscape is the photos.
JP – I can look at most photographs I’ve taken in the last 50 years and, until recently, I could remember almost every one that I’ve taken and the circumstances that I’d taken them in. I never take a note in the air – ever, of any kind – because I have been able to remember the flight path of any flight that I’ve been on. My slides have a number and a date on them and I can remember – roughly, not to the nearest parish – where every one of those has been taken. I don’t need to know the parish, all I’m concerned about is the area and the geology. [Indicating a print] I couldn’t care less whether this was north or south of Lake Balaton, I couldn’t care less within 50 miles where it is. It’s unimportant, it’s only important parochially, to the people in that area.
RP – I’d go a bit further than that I think. What happens when you find the next one that looks exactly the same and you want to know how the two lie, distance-wise? They could be in the next field – which would be boring – they could be 200 miles apart – which would be interesting.
JP – That’s what I’m finding. I’m finding things that are a thousand miles apart, and also a few hundred miles apart, or even less. I’ve recorded a cursus in the Avon valley and one in the Moselle – I think this is important and interesting. But it’s near enough – it’s the Avon and the Moselle as far as I’m concerned.

End of tape.
AARG 1993 – OBLIQUE AERIAL PHOTOGRAPHY: FILTERS AND THINGS IN FRONT OF THE LENS

Anthony Crawshaw

This is another section from my talk at AARG ’93, so if you found the first section tedious, skip this one also. If this part-work continues, we shall shortly be offering luxury AARGnews binders in sumptuous Rexine, personalized with your initials in gold on the front cover..... Can you wait, or do you cancel your subscription now?

Filters. Always use one, for lens protection and to reduce the ultra-violet (UV) rays effect on the film. As you climb higher in the atmosphere, the proportion of UV increases, with two effects. The first is that the UV rays register as blue on the film, leading to an increasing blue cast on the photograph. The second is that the UV rays may upset the exposure meter on the camera, giving faulty results.

That said, not all filters are equal, even when nominally the same. Glass filters are usually preferred to plastic ones, but see below for more on this. For colour film, a "UV(0)" filter is generally recommended. Some users, including me, have been using a "1A" or "1B" filter, which have a faint pink cast and thus might be expected to ‘warm up’ the sometimes 'cold' colours of an aerial shot. I had assumed that all the coloured filters were as effective as the "UV(0)" filter at cutting out UV rays, with the addition of the colouring agent. I have also seen that stated in print. However, I have recently run tests on a laboratory spectrophotometer which showed that this assumption is incorrect and that "1A" and "1B" filters do not absorb the UV rays as well as a "UV(0)" filter. My dustbin is now full of "1A" and "1B" filters. Also, not all filters of nominally the same sort are the same. If you want to check your filter without the complication of a lab. test, place the filter flat on a sheet of white paper and look at it in daylight. The UV(0) filter has a very slight yellow cast, whilst the "1A" or "1B" ones look faintly magenta.

The other filter that is used for colour photography is the polarizing one. This will reduce atmospheric haze, but it's effectiveness varies with the direction the camera is pointing, with respect to the sun. Haze reduction is at it's greatest at right angles to the sunlight and it's least directly into or away from the sun. There are three disadvantages of polarizing filters; one is the two-stop reduction in the light passing through them, the second is that rotation of the filter on the lens may be needed when taking the photograph, requiring both hands on the camera. The third disadvantage is that occasionally cropmarks polarize the light reflected from them. The case I have in mind is green-on-green cropmarks in wheat, where the crop difference on and off the mark are due to the flat single leaf turning over. I suspect that reflection from this leaf is responsible for the mark - be that as it may, the marks are noticeably directional and the light from them is polarized. Still, if you are wearing polarizing sunglasses, you may not see the marks anyway, so why worry? Out of sight, out of mind.....

For black and white photography a yellow filter is usually used, in order to cut out the blue haze. This has the disadvantage that it cuts out some of the light reaching the film, so don't automatically use such a filter. In particular, it may not be needed on exceptionally clear days and it may not be very effective when the haze is merely a gradual reduction in contrast, rather than having a bluish cast. If the sun's light has a yellowish cast to it, as is often the case in industrial areas, then a yellow filter is likely to be helpful. The reason is that the blue rays in the
sun's light have been scattered, leaving the yellow tint. These scattered blue rays are the source of the haze, in this case.

For false-colour infrared film, Kodak recommend a Wratten 12 filter, which is a yellow-orange colour. The Wratten filters are thin film, to be sandwiched between two pieces of glass, which is a nuisance. The glass 099 filter made by B+W claims to be an exact match to the Wratten 12. Despite the expense, it is probably worth using, if only to be sure that any failures with the false-colour film are not the fault of the filter. Filters for black and white infra-red films will be dealt with in the long-awaited section of this work that covers films, as I am trying a new film at present.

Whilst on the topic of items attached to the front of the camera, lens hoods can serve several purposes. If the sun is shining directly onto the lens it is possible to get 'flare' in the image, even though the sun is not visible directly in the viewfinder. A lens hood can help reduce this problem. You may also be able to position the aircraft so that the wing shades the camera, if you are using a high-wing aircraft: difficult, but not impossible, with a low-wing aircraft.

Another use of a lens hood is protection of the lens/filter from knocks or fingerprints. It is all too easy in the confines of a 150 to finger the lens when groping for the camera behind the seat. Rigid lens hoods are best when operating with an aircraft with an openable window, since the collapsible rubber ones may do just that in the airflow. If you have to photograph through the aircraft's window, a rubber lens hood can be useful in reducing reflections. Place the lens close to, but not touching, the window, with the lens hood slightly compressed by the window. The rubber will not transmit the vibrations and will cut out some of the reflections from bright objects in the cabin. Needless to say, try and clean the window, inside and out, before take off.

One objection that I have heard to lens hoods is that they can reduce the light reaching the edges of the film. This is true if the lens hood is too narrow for the lens. There is a simple way to test if this is the case, as follows: place the lens hood on the camera, removing the lens cap (!) and open, or better still remove, the back of the camera. Throw away the film that was in the camera when you opened the back, as it will be knackered (not quite true - if you shut the back again rapidly, and the light is not too strong, there is a good chance that some frames will be saved). Set the shutter to the 'B' setting, point the camera towards you and press the release, with the aperture fully open. If you hold the camera up to the light, you will see a small rectangle of light through the lens. Looking straight into the lens this rectangle, which is the frame that defines the image area on the film, appears centrally in the lens. Gradually twist the camera away from you and the rectangle will move sideways in the lens, until it eventually disappears into the side of the lens. If, before this happens, your view of the rectangle is obstructed by the lens hood, then the hood is obstructing some of the light. If the hood does not appear to get in the way, all is well. This takes much longer to describe than do.

Received wisdom is that plastic filters, e.g. the Cokin range, are not as good optically as glass ones. Aircraft windows are said to be much worse. To test this under realistic conditions I set up my camera on a tripod about 100 yards from a large brick building. The bricks were black, with light mortar, providing a regular target extending from the centre of the frame to the edge, where the resolution is expected to be poorer. Using a cable release I then photographed the building at different apertures, with various items in front of the lens. These were (i) a glass filter, (ii) a Cokin filter and (iii) a piece of authentic, if battered, side window from a 150. This was kindly supplied by our engineers - how they came by it I didn't like to ask.

I held the perspex about 1" in front of the lens and took three pictures. For the first the plastic
was at right angles to the line of sight and for the second and third it was placed at an angle of about 30 degrees to that line. For the third, I allowed the sun to fall on the perspex, whilst the second was shaded. I then examined the resulting negatives with a microscope to check for deterioration in resolution.

If you have struggled through this so far, you’ll be all agog for the earth-shattering results. Sorry, but the earth remains undisturbed - there was no apparent difference in resolution when the perspex was in front of the lens. The only noticeable change was the appearance of reflections when the perspex was at an angle to the line of sight. This test with the perspex was carried out with the lens aperture wide open. When the lens was stopped down about half way or more there was a very slight loss in resolution when the Cokin filter was in place, by comparison with the glass filter or the unfiltered lens (the aircraft perspex was not tested with the lens stopped down). Since the aerial photographer generally operates at wide apertures, to keep the shutter speed high, I conclude that there is no great optical argument against the plastic filters. Their one drawback, in my experience, is that they tend to attract dust. If you try and wipe them with a brush, that gives them a static charge, which promptly attracts more dust, leading to their being hurled out of the window in a fit of rage.

As regards photographing through the aircraft’s window, I still avoid this wherever possible. If your aircraft’s perspex is curved, I suspect that more problems will arise than with the relatively flat window of the Cessna. On the rare occasion when I have had to photograph through the perspex, I have noticed that portions of the print sometimes seem out of focus, which I suspect is due to the perspex.

for those of you who own next year’s diary already....

A A R G  1 9 9 5

Wednesday to Friday

September 20 to 22

Riseholme Hall, Lincoln
‘Topsoil ghosts’
In a recent day seminar given by and for those associated with Cambridge area developer-funded work I was interested to learn that use of has recorded a small number of ‘ghost’ sites. In the past some aerial photographs – usually of soil-marked features – have recorded features which could not be found on the ground, causing a degree of confusion (I know there are several but an early reference was by T.P. Taylor, 1979: ‘Soil mark studies near Winchester, Hants’, *J Archaeol Sci* 6). These, it has been assumed, were sites that had been ploughed away leaving only trace differences in the topsoil. The magnetic susceptibility cases were mentioned during the seminar by Simon Colcutt (Oxford Archaeological Associated Ltd) who has since told me that magnetometry has also recorded what he calls ‘topsoil ghosts’. Differences can be seen on the ground (*the topsoil is not machined off*) in artefact densities and in the topsoil, in which he claims to be able to identify the causes of the magnetic responses. What we both are hoping to be able to find is a site with recent aerial photographs and a magnetic presence but which no longer survives below the topsoil. Now that would give the cropmarkologists something to think about!

Remotely Piloted Vehicles
I was recently sent information about a conference on Remotely Piloted Vehicles (RPVs), to be held at Bristol – but don’t get excited, it will be over before this issue of *AARGnews* is printed. My point in noting it is to draw attention to the conference, one of a series run since 1979, which includes a workshop on ‘civilian RPVs’ and was seeking specifically to make contacts in the world of archaeology. Might they be of any use? Presumably you could load an RPV with a camera and a GPS and make vertical surveys, or maybe programme one to visit and record scheduled monuments or any other site that we know is there. But until we can get them to look for what the aerial observer needs to see then I cannot see much advantage to using one. Like the RAF and its IR linescan imagery, RPVs might be a source of speculative photography if we can find anyone with the experience and patience to scan the results for archaeological signals. If any of you would like further information, or proceedings of past conferences (highly technical to judge by the 1994 programme) the address is: Organising Secretary, RPV Conference, Dept of Aerospace Engineering, University, Bristol BS8 1TR.

Geological hillforts again (see AARGnews 4, 20-21)
Martin Gojda recently sent me photographs of two sites he had recorded in Czechoslovakia. One, under crop, showed a series of concentric ‘ditches’ (counting them is not easy but there would be at least eight circuits surrounding a smaller central set of, possibly, two – the whole being slightly reminiscent of Windmill Hill, Wiltshire). The site is on a hill top of fine sandstones with clayey lime. It seems, to both of us, to be another natural feature and has a friend, of different character and recorded as soil marks, a few kilometres away. The photograph of the latter is one of those rare shots that appears to show landform as well as the features targeted. This year APS photographed a few more examples of these sites on the chalk in north Hertfordshire, close to those that were the subject of the news 4 note.

More on MAD 2 (see AARGnews 7, 20-21)
Chris Cox overflew and photographed the MAD 2 field on July 27 this year. This field, you may remember, is the one that Anthony Crawshaw noted as being monitored by EH. The flight was not made for archaeological reconnaissance and, on the basis of local knowledge, was about two weeks after the optimum date. By July 27, in Cambridgeshire and Hertfordshire, the barley
had ‘gone’ over the responsive soils although there were quite a few sites showing on clay. Nothing was observed from the air at MAD 2, or on the photographs.

**Infra Red Linescan imagery**

Like the rest of the archaeological world, *AARGnews* has been fairly silent on developments of this technology. Early forms had extremely coarse resolution but recently a combination of high resolution commercial systems and the release of selected RAF images has highlighted IRLS as capable of producing potentially useful images of archaeological and relevant natural features.

Derek Edwards brought it to our attention and spent years persuading the Royal Commissions that they should consider adding this freely given material from the RAF to their collections. I think I am right in saying that each Commission library now includes IRLS images. Rightly these are stored by NGR as just one further addition to the relevant photographic cover.

IRLS is not the answer to all our reconnaissance problems (it was misguidedly heralded as ‘one pass reveals all’) and its ability to record sub-surface features is subject to its own compendium of variables as is conventional archaeological aerial photography. The Commissions have been making some comparative tests – which should make interesting reading (hint!) – but the safest way of using IRLS images would seem to be to study them, as is traditional, along with all others of the same target. A recent example of personal involvement was when I was asked to look at the photographic record for a proposed gravel extraction site at St Ives, Cambridgeshire. Either EH or the gravel company had been persuaded to fly specially commissioned IRLS which didn’t show a thing. Excavation revealed a huge palaeo-channel at least 20m wide and full of lovely black gunge so (I was asked), did it show on APs. Initially the answer was yes – on some 1977 CUCAP verticals as a dark band of soil – but work at NLAP produced even better evidence when, in March 1947 (the time of the Fen flooding), it had been photographed as a water-filled channel. Useful things these collections of APs!

**Three dimensional on-screen displays** (see *PC Magazine*, August 1994)

*PC Magazine* notes two slightly different approaches to this development although both work by polarising light. One, being developed somewhere within the University of Cambridge, slices light from the screen into vertical stripes so that each eye receives a stripe holding a different image which can be viewed without the need for special glasses. The second, from US company, Tektronix, uses circularly polarised light and needs special glasses for viewing.

It was not too easy to clarify the message in published note and to decide whether these were real 3D displays (ie based on two images) or pseudo-3D. It seems more possible that the Tektronix system is a proper left- and right- image display but am unsure about the Cambridge one [note to Colin Shell: how about chasing that one?]. If resolution is acceptable and the displays can be fitted with a zoom control then I begin to accept that photo interpretation on screen may become a workable possibility. Interact this with John Haigh’s rectification software (*AARGnews* 7, 27-31) and we could be getting somewhere....
MANAGING THE ARCHAEOLOGICAL RESOURCE ‘BEYOND THE DITCH’
A CURATOR’S VIEW ON AERIAL PHOTOGRAPHY

Bob Sydes

Introduction

As the professionalism of archaeology becomes ever more noticeable and archaeologists themselves become more ‘businesslike’, more adept at defining their role in society and more capable of setting clear and achievable aims and objectives, so the need to produce quality information and interpretation has become paramount. I well remember my introductory years to archaeology when the key to success seemed to involve learning to do everything, becoming a jack-of-all-trades, and invariably ending up, as the saying continues a ‘master of none’. Twenty years ago that seemed to be acceptable, but is it now? Are we perhaps beginning to realise, as cost-effectiveness becomes crucial, that certain aspects of archaeology are best left to specialists. Fortunately, people did specialise as the larger units employed full time ‘finds teams’, and, in some cases they still exist; but for how long?

Very few archaeological organisations can afford to support full time specialists today despite, in many areas, a healthy supply of contracts. Specialists tend, therefore, to be self-employed and feel, naturally enough, very vulnerable. As a curator, managing a resource and monitoring archaeological research I am concerned that we fully support specialists and respect the quality of their work.

This article, stemming from a short paper I presented to the Institute of Field Archaeologists conference this year, provides a curatorial perspective on the use of aerial photography as an aid in the management of the archaeological resource, and a plea to support specialists. The paper was written in an attempt to take the ‘end user’, the curator and contractor, literally, ‘beyond the ditch’; there being more to aerial photography and the interpretation of photographs than simply plotting lines on maps. Our Sites and Monuments Records are full of variable quality lines-on-maps interpreted as field systems and settlements of numerous periods which in themselves are of limited value beyond indicating the presence of important archaeological remains. Increasingly we are, or should be, more concerned with the archaeological potential of an area or site, to assist in formulating a detailed mitigation strategy in advance of development, or to aid site management. We need to ‘flesh out’ the cropmarks and take photo interpretation far more seriously than I think a lot of us do at present. On that note I will turn to the four issues I dealt with at the IFA conference; the use of specialists, the reassessment and replotting of existing information, a reassessment for new information and finally, how to cope with ‘blank areas’ devoid of cropmarks.

The use of specialists

The design briefs for evaluations and desktops at present produced by Cambridgeshire County Council contain the following standard requirement;

‘The contractor must arrange, through a suitably qualified specialist, the reassessment and re-plotting of available aerial photographic evidence at a scale of 1:2500. This reassessment should also involve the study of cropmarks lying outside the development, where a clear relationship exists’.
The key item in that statement is the term **suitably qualified specialist**. To me, the interpretation of aerial photographs is an extremely skilful task and not one that can be learned overnight, a view, it is to be hoped, that everyone would acknowledge. However, a confusion arises between **plotting** archaeological information from photographs and **interpreting** their value or in other words assessing the potential. In a sense, anyone with a reasonable archaeological background and drafting skills can ‘plot’ cropmarks, especially utilising some of the many PC programmes on the market (a point underlined by Rog Palmer elsewhere in this issue), but understanding exactly what the photograph is telling you is a different matter entirely. I am sure most would agree that geophysics is best left to those who have the skill and knowledge to both operate the equipment, utilise the technique and interpret the results, the same being true for ceramic or faunal analysis. Clearly we need to have reasonable confidence in the results of a reassessment and replot of aerial photographs, and there are many reasons why this confidence is important including the following:

1. If a case needs to be presented to a public enquiry or some other peer scrutiny, a report from a ‘non-specialist’ would not stand up too well against a good consultant or lawyer leaving a case seriously weakened and the profession somewhat discredited.

2. A consultant or curator needs confidence in the results in order to make clear and informed decisions on any mitigation strategies and for those decisions to be understood and accepted by the client.

3. It enables an archaeological contractor's resources to be more focused resulting in more effective field evaluation.

This is all very well, but how do you define who is a **suitably qualified specialist**? In the absence of a suitable vocational qualification, I would suggest that a specialist is an individual with proven track record, who has published widely on the subject, and may be a Member of the Institute of Field Archaeologists with ‘aerial archaeology’ as an Area of Competence.

**The reassessment and replotting of existing information**

In Cambridgeshire, the majority of cropmark information on the SMR is 1:10,000 sketch plots directly on to SMR maps, backed by more detailed plots at 1:2,500 for some sites. Most of this work was undertaken under the auspices of the Manpower Services Commission and the quality is variable. From a development control viewpoint, this information is used solely as a guide to the **potential** presence or absence of archaeological sites within a given area. Experience has shown, through the process of reassessment, that a significant number of recorded sites either move location, have shrunk, expanded, or disappear completely. The advantages of reassessing and replotting, even when apparently good plots already exist, is clear: the information, either forming part of a desktop study or field evaluation, needs to be as comprehensive as possible.
Reassessment for new information

The majority of aerial surveys conducted in past decades have confined themselves largely to showing archaeological information, the ditches of field systems and settlements predominantly, and we should now be asking different questions of the data. What is becoming increasingly important, from both a curator's and a contractor's viewpoint, is the recognition of areas of deeper soil and any other masking influences, e.g. alluvium and colluvium. The mapping of these gives valuable insights into the potential of a site and guides both fieldwork and preservation. A certain amount of predictive modelling becomes possible with the recognition and mapping of buried stream or river channels or areas of deeper soil, and we are in a better position to understand the results and implications of any ground investigations. Equally important is the recognition of land-use and land-use change, as seen in aerial photographs, in particular the excellent collections of verticals held by County Councils.

Investigation of areas devoid of cropmarks

Hitherto, when dealing with a site of archaeological potential sans cropmarks or in an area where cropmarks are sparse, we have been less inclined to reassess the aerial photo evidence, never mind replot; the reasons are obvious. However, we should still seek professional advice; I want to know why there are no archaeologically significant cropmarks. Is it because the soil conditions are unsuitable? Is it because the area has never been flown before? And if not why not? Or are there other reasons? In any case it is always worth consulting the vertical photographs, usually stereoscopic pairs, from which valuable geomorphological and topographical information can be obtained. Any good desktop or evaluation report should therefore include a specialist statement on why there are no cropmarks. If an area has never been flown archaeologically and yet topographical conditions are reasonable, then clearly the potential for archaeology is higher than it might be if the area had been flown.

Conclusion

The view then, albeit a brief one, from a curators world, is that we should be seeking to maximise the amount of relevant archaeological information recovered from a given site before a sod has been turned, and we should never underestimate the value of aerial photography and think that we have exhausted its potential. All decisions we make in our various roles, managing the archaeological resource, should be as informed and professional as we can make them and should at all times be based on data collected by suitable specialists be they excavators, ceramists or aerial photographers.

I would urge all curators, if they don't already do so, to adopt this strategy, particularly when dealing with assessments or evaluations; the advantages are clear and will not only ensure that the product is of the highest professional standard but will encourage the maintenance and growth of a specialism we would be foolish to lose, and there is no substitute for experience and skill in aerial photography as is true with any other specialism in archaeology.
WHO NEEDS A SPECIALIST..?

Rog Palmer

Some twelve months ago John Haigh told me that he had about 30 official customers for AERIAL – but we all know how software tends to spread itself around. Recently I have become aware of the first worrying effects of this unrestricted distribution. It had to happen, and we are now seeing the first amateur attempts at 1:2500-scale output produced to ‘help’ the planning of developer funded projects. There are a number of inexperienced (in the aerial sense) people who see the acquisition of the rectification software as a passport to interpretative ability. Not so – as I have told classes that I (reluctantly – for just this reason) have taken – any computer-literate idiot can operate AERIAL but very few can produce competent photo interpretations and even fewer the archaeological interpretations which follow the rectification processes. “Ha!”, you might think, “Old Palmer is getting worried about the competition.” Which is perhaps partly, but not entirely, true.

What I am more concerned about is the destruction of the image that we have just about managed to establish. I think that the point is now conceded that the interpretation of aerial photos – in archaeology as in any other discipline – is a specialist skill. We have established a set of drawing conventions that can be applied to most situations (Riley, et al 1985), we have had the publication of an IFA Technical Paper outlining some of the procedures necessary to produce high-quality mapping (Palmer and Cox 1993), and most recently the Guidance Note written largely by Adrian Olivier and distributed by the CBA (1994). One message from the last two papers is the advice to use specialists for specialist work.

A number of us involved in the interpretation and mapping side of the game had been worried about the possibility of inexperienced ‘specialists’ edging their way into commercial archaeology. Now it has happened. In 1993 APS undertook an ‘enhancement’ of a previously ‘mapped’ road scheme and I have recently been made aware of two more cases. Both had been commissioned by the same consultants who also had told Chris Cox (at their Christmas do) that didn’t find aerial photographic assessments much help. We thought it a bit strange as we had done a few jobs for the same crowd, visited the sites during field work and been congratulated on the material we had provided (in one case this saved them the embarrassment of putting a JCB through two parallel sewage pipes – a Roman road on the SMR....). I’d like to think that the ‘unhelpful’ comment resulted from their other two commissions. I know one of the people who did one assessment and can say, with all honesty, that he knows as much about air photo interpretation as I know about good grooming and dress sense. How, or why, he could undertake a specialist job is beyond me [well, it isn’t really – I know he thinks he can do everything!]. How, or why, an supposedly professional consultancy would engage ‘anyone’ to do such work is also somewhat strange. And, no, I haven’t seen the product although I have been told that the county have an interest in a reassessment....

To use a Whimsterism, lets just remind ourselves what is, or ought to be, involved in interpretation to produce mapping at 1:2500. There is, I maintain, a difference in the intellectual approach to interpretation at different scales and with different questions in mind. As I see it (and APS have had no complaints about providing this) the purpose of 1:2500-level aerial photographic assessments in the developer-funded world is to provide the maximum amount of archaeological and non-archaeological information. This can assist the location and application of any following field work, offer clues as to the nature of features (whether archaeological or natural) that may be encountered in trenches, discuss (through analysis of past land use) why the blank areas may be blank, and help put the necessarily small holes in some kind of context. While at 1:10000 it may be sufficient to interpret the most visibly apparent archaeological features only.
I have seen the second assessment report. Interestingly it was contracted at half the price I estimated (not to get the job, but on request at a later date) and – perhaps not surprisingly – the product is a bit less than half the job. It is a well presented report, the rectification had been carried out with a super-abundance of technology, but the mapping had been carried out with a 1:10000 mentality and appeared to have been modelled on those books of ‘cropmarks’ produced in the 1970s. Use of the technology had also meant that the mapping was at 1:5000 on the basis, I assume, that as it was entirely computer generated it could not be printed on larger than an A3 sheet! Was this perhaps also part of the reason for only doing part of the job? Let’s have another reminder of the working process. We go from photo interpretation, to rectification, to compilation of a master drawing, to archaeological interpretation by ‘finishing’ the drawing with reference back to the photos. This report most certainly didn’t reach the final stage. All lines were a standard width and there appeared to have been no post-rectification finalisation. Neither was there any information (other than by erroneous inclusion as ‘archaeological’) on natural features – and the area is on a gravel terrace! Without my own reference back to the photos that’s almost all that can be noted on that production other than to add that is an area that I have mapped as part of my Lincolnshire patch and that I have got more information, and a bit more archaeological sense, on my 1:10560 maps than on this 1:5000 product. We have a case where use of technology has been impressive but photo interpretation was juvenile. The final report cannot be said to approach the problems that the assessment was, or should have been, produced to assist.

With unusual tact I haven’t mentioned any names (please send an sae!) but wonder how we can get the archaeological profession to see the need to use specialists for specialist work. Do we need to wait for someone to make a gigantic cockup before we respond with a whispered, “Told you so!” or might it be possible to pressurise from AARG, the CBA and IFA? Maybe, on this occasion, my tactful silence is wrong. Ought we to have an obligation to publicise inept aerial work when it comes to our notice in an attempt to help the field archaeologists obtain (next time) the best product for their own optimum efficiency?

It will come as no surprise to learn that, at the time of writing, neither author of the two assessments responsible for my outburst is a member of AARG or IFA (let alone one specialising in their completely meaningless AOC ‘aerial archaeology’). I am certain this was also the case for the 1993 enhancement. Here, perhaps, is a moral to the story?

References

CBA, 1994. Aerial Archaeology Guidance Note. (Prepared by the Aerial Archaeology Committee)


ROYAL COMMISSION ON THE HISTORICAL MONUMENTS OF ENGLAND
AIR PHOTOGRAPHY UNIT
GRANTS FOR AERIAL RECONNAISSANCE 1994/95

Roger Featherstone

Grants for regional reconnaissance have been allocated by RCHME for the current year (1994/95) in the following way (last year's figures in brackets).

Twenty four (22) applications were received for projects with a total estimated cost of £49,975 (£46,462). These were carefully examined by a committee comprising Bruce Eagles (RCHME), John Hampton, David Wilson (CUCAP) and Roger Featherstone (RCHME). As a result, allocations were made to 19 organisations (19) totalling £18,700 (£23,220) out of a budget of £20,000 (£25,000). This allocation represents, in gross terms, approximately 185 hours of flying. In addition, one regional organisation has been allowed to carry forward last year's programme to this year, thereby increasing the potential flying time to nearly 200 (230) hours.

It is believed that the budget reduction is a temporary measure and will eventually be restored to at least its former levels.

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<tr>
<td>Air Photo Services</td>
<td>8</td>
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<tr>
<td>To survey the area around Bourn, W Cambs, and the Bedfordshire claylands to record both newly showing sites and monitor destruction of the remainder.</td>
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<th>Hours bid</th>
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<tr>
<td>Cheshire CC and Merseyside Museum</td>
<td>10</td>
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<tr>
<td>To survey the lowlands of Cheshire and Merseyside and through integrating the evidence with that from other sources to create a fuller picture of the landscape as the basis for further work.</td>
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<tr>
<td>Cornwall Archaeological Unit</td>
<td>24</td>
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<td>To continue to prospect for additional crop-mark sites, also augment coverage of the whole range of extant sites and landscape features, including specifically this year, more work on industrial landscapes.</td>
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<td>Devon County Council</td>
<td>35</td>
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<td>To continue the primary reconnaissance in Devon but undertaken in an increasingly analytical and problem orientated way.</td>
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<th>Hours bid</th>
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<td>Devon for Somerset County Council</td>
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<td>To continue the primary reconnaissance in western and southern Somerset.</td>
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<td>To continue to survey the area around Stansted Airport in NW Essex, to continue the survey of Essex intertidal zone and reconnaissance in NE Essex directed at areas where there are no existing crop-mark sites and at enhancing existing complexes.</td>
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<th>Hours bid</th>
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<tr>
<td>Hereford and Worcester</td>
<td>9</td>
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<tr>
<td>Focus on two areas, one in central and the other in south Herefordshire, where there has been no systematic survey but a continuing threat from development.</td>
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Lake District National Park 5
Focus on two areas within the LDNP which contain important prehistoric and industrial remains that are inadequately recorded.

Lancaster University Archaeological Unit 12
To continue the current programme of reconnaissance and monitoring of upland and lowland landscapes, recording industrial landscapes and establishing a programme of reconnaissance for the Cumbria SW coastal plain.

Leicester Museum 10
To continue reconnaissance for new sites and enhancing existing ones with particular focus on areas threatened by developments.

Norfolk Archaeology 50
Problem-orientated reconnaissance and recording status of scheduled monuments. Continued work on Historic gardens and other landscape themes if conditions for crop-marks are unfavourable.

Norfolk for Suffolk 30
To continue the primary reconnaissance and begin recording the status of scheduled monuments.

North Yorkshire Moors National Parks 3
Survey of North Yorkshire Moors in direct association with fieldwork.

Northumberland 30
To record earthworks N of the Tyne aimed at improving record of Otterburn ranges and Hadrian's wall corridor (excluding the wall itself) and bringing coverage of major pre-medieval settlements to around 90-100%.

Shropshire County Council 12
To continue reconnaissance in the western half of the county. (Grant carried over from 1993/94).

St Albans District Council 20
Systematic survey of the river gravels around St Albans and in the area of a proposed community forest at Watling Chase.

Teeside Archaeological Society 12
Continued reconnaissance of Cleveland and Lower Tees Valley.

Warwick Museum 8
Special focus on recording and updating photography of earthwork sites.

West Yorkshire Archaeological Service 10
Special focus on areas threatened by development in the eastern part of West Yorkshire and also previously unrecorded earthworks on the Pennine uplands/slopes.

Yorkshire Dales National Parks 10
Focus on neglected or poorly recorded earthworks sites and industrial remains.

In addition to the above grants, applications for a further £7000 have been received as a result of the exceptional development of crop marks in certain areas. Whilst some of the expenditure has been approved, a decision is expected soon on the remainder.
BOOKS OF INTEREST?


Following the notice of this book in news 8 I am pleased to pass on the news that the ‘introductory’ price has been retained for this year.

One third of the volume is a series of essays divided by period and written by regional experts. Otto adds a chapter on aerial archaeology which includes some technical data on the hows and whys of ground effects as well as a few monochrome photos to demonstrate the points covered. The remaining two thirds of the book comprise a face-to-face set of full page (about 10 x 10 inch format) plates and comments. Interestingly this section is also arranged in chronological order rather than as a regional tour or by topic. My one complaint – and this is common to almost all regional studies – is that there is no small-scale location map (other than that of the Celtic world) to show Baden-Württemberg in a European context.

Most AARG members are familiar with Otto’s photographs – we keep asking for slide shows – and the book, from the first plate, reflects the high quality of his work. Many of the plates show a resolution that the rest of us can only hope for – and this is after the screening and printing processes – such that on one plate showing visitors at a Roman excavation I am sure that the original would contain detail in the hair of the visitors. But resolution is not everything and some of the plates can best be described as mood studies and would make wonderful posters. My enthusiasm for the book is due to a mixture of the quality and the subject matter. Many of the illustrations are of types of site that we do not have in Britain – and that makes a change from the same old crop mark again and again – or that we once had (the open field system on p235) and have since destroyed.

The final picture – a farm worker clearing a Roman building from his nicely cultivated field – reminds us of the fragility of our evidence. In the 70s ‘Rescue’ tended to concentrate on the more dramatic destruction of our past while farmers carried on their annual degradation of the majority of the landscape. Plough damage is invariably underestimated because, perhaps, the annual destruction is low, but should we be looking ahead to a time where the photographic record is the only surviving evidence for our rural past. And, having suggested that, will that record be comprehensive enough for future generations of archaeologists?

South-east Perth: an archaeological landscape. By the Royal Commission on the Ancient and Historical Monuments of Scotland. HMSO. 1994. £40.00

This volume, says the Preface, completes the recording of a sizeable area and provides a companion volume to North-east Perth (RCAHMS 1990). Who thinks, says I, that Commission surveys cannot be fast? S-E Perth has been compiled on the basis of one season of fieldwork (1989) plus a few additional visits (1992). It is also heavily based on aerial photographs – those resulting from CUCAP annual campaigns between 1945 and 1980 and from RCAHMS since 1975. Photographs taken up to April 1992 have been used – the latter, hopefully, providing reasons for some of the ‘additional visits’.

The contents divide into three parts: an extremely useful and well written commentary on factors affecting the state (and hence recovery) of the archaeological record; the record itself, divided into thematic sections; and a gazetteer, that follows the same division. S-E Perth is worth reading, if for no other reason, for the section on the nature of the evidence. This begins with a description of the last 250 years of record and land change and contains the comment that the air photographic evidence includes types familiar from upstanding examples plus others ‘which bear little comparison’ to those
surviving locally. There is mixed use of the terms ‘cropmark’ and ‘cropmark sites’ – both might best be replaced by ‘cropmarked’. The section on survival, destruction and discovery is good solid stuff that sets the scene and aids understanding of the archaeological section. Interpretation and classification of cropmarks is covered in a way that suggests that the authors actually understand the things. Four categories of site were sufficient and it is good to read the honest comment that although enclosures could be divided into rectilinear and curvilinear forms the significance of this is ‘quite unknown’.

The text is amply illustrated by photographs, site plans and maps – all well reproduced. The site plans present the one aspect that I am not too happy with. While Roman sites are shown by use of solid or dashed lines (for ditches) other features (?prehistoric) recorded by aerial photos have been stippled. In places the stippling becomes solid black, in others it shows a less dense feature. I have no complaint about the drawings – they are good and reflect the way that features have been recorded – the reader can understand some of the problems of interpretation and, to quote John Hampton, the ‘subtleties of the evidence’ – it is what David Wilson liked (AARGnews 8, 36) about Derrick Riley’s plan of the Mucking cropmarks. But isn’t that the point – these are drawings of cropmarks. They show what is on the photograph (maybe just a photograph) and are not an interpretation of the archaeological features that they indicate. So which ought we be aiming to do?

The maps, sensibly, make use of a consistent base with overlays as appropriate (do we have the first Commission use of computer generated maps here? RCAHMS are well ahead of the other two in that respect) and sites are planned as either upstanding features or from aerial photos – or both. There is an interesting break from the traditional numbering of plates and figures that suggests that the whole volume, text and illustrations, have been set on computer. Illustrations are referred to by the number of their page via page-side references (?sidefixes?) with the text. After overcoming my initial confusion it worked very well and leaves the text uncluttered and easier to read. But I wasn’t too happy with the use of emboldened site names – they are obviously useful when chasing index references but make the text slightly uneasy to read. Despite this (and surprisingly, given that there are at least seven authors and two editors – they must have an intelligent secretary) I found the text quite compulsive reading – the style was not heavily academic and the archaeology was interesting. My notes taken while supposedly reviewing the book turned very quickly into notes on the subject matter.

Is it because the authors of books such as this have worked in the area and know it so well that they invariably do not include a map to show place names? (There is an extract from the OS 1:250000(?) but this has too many names, not just those relevant to the text!) I have made the same comment about other books (see above!) and it could have been added reasonably effortlessly to S-E Perth by sticking a few names on the otherwise near-empty introductory map (p.x). For a model map I can only recommend the specially made (and argued for) fold-out map in the back of the recent EH Fenland Survey (Hall and Coles 1994) – and even that could have done with a few more names.

South-east Perth ought to be on every reading list covering ‘survey’. This is field archaeology at its best and presents a superb example of how aerial and field survey can, and should, be integrated to record and understand the archaeology of an area. This is what our Royal Commissions do – or did – so well. The reader is aware of the traditional inventory roots throughout this volume but it has been skilfully linked into a narrative that offers considerably more than its equivalent forerunner, the ‘Sectional Preface’ (of the English Inventories). RCAHMS have made a step away from the tedious site-by-site listings and have produced a summary of an area that has been written by the people who collected the data and know it best. What could be a better demonstration of the capabilities – through discovery and recording to sound scholarship – of (Crawford definition) field archaeology?
With the publication of the Perth volumes plus recent offerings by the English Commission (Bokerley Dyke, NW Lincolnshire and Bodmin) we are beginning to form the reference collection through which we may be able to teach and demonstrate the fact that, yes, air photography does record sites but just look at what archaeological use can be made of them. Which surely is what we need to do.

**Bodmin Moor: an archaeological survey. Volume 1: the human landscape to c.1800.**
By Nicholas Johnson and Peter Rose. EH Archaeology Rept 24/RCHME Supplementary Series 11. 1994. £45.00

Only recently arrived and barely glanced at, this is the long awaited report resulting from combining the photo interpretation of Ann Carter with survey by the authors (for the Cornwall Archaeological Unit) and RCHME field teams. For £45 you get a box containing the book (some 130 pages), three quite beautiful 1:25000 maps and half a dozen loose figures. Some of the figures show features as mapped from air photographs with (red) additions from fieldwork which is interesting even if most of the additions are more-or-less as and where expected. It’s worth looking at, maybe even buying, for the maps and figures alone and to get annoyed with those people who insist on printing vertical photos of sites in the northern hemisphere with north to the top. Please let’s keep eye and brain happy by printing verticals with the shadows falling towards the viewer. Should we perhaps start a campaign to adopt south points as the norm...?

**Prehistoric and Romano-British Settlement in the Solway Plain, Cumbria.**
By Robert Howard Bewley. Oxbow Monograph 36. 1994. £18.00

This volume has been condensed from Bob’s PhD thesis and – quite bravely – published ten years later. Reading it brought back some of the feeling of adventure, of the experiment, and the breaking of new ground that comprised the bulk of AARG meetings at that time. A time when the ‘R’ in AARG stood for research and not field trips!

However, it should not be thought of just for its nostalgic value. The volume leads the reader through much of the thinking involved in proposing and constructing a system of classification and its application in understanding the archaeology of a small region. It also tackles in detailed and interesting ways how we might relate settlement to land types. One of the main themes is to demonstrate that there was settlement in the area before the Romans – a hitherto overlooked detail – and to examine, and refute if necessary, the usual assumption that ‘all enclosures in the Solway Plain are of Roman date’.

The introductory chapter, as in most PhDs of the time, contains a certain amount of theoretical dabbling but also addresses the problems of how uses of aerial photographs may be most effective in studying past landscapes. There is a lot of sense in that chapter which – work and family permitting – might well be worked into a paper aimed at educating the non-aerial fraternity. After dealing with the necessary environmental background the book gets to grips with the crop-marked data and starts by questioning the reliability of the sample recorded. His classification – the genesis of MORPH – is an attempt, as he puts it, to describe the features identified in a manner which avoids use of subjective (or intuitive) terms such as ‘settlement enclosure’ and tries not to use a shape = date correlation. One of the great questions concerning classification is just how much extraneous information we let ourselves attach to an otherwise pure scheme. Bewley’s way was to divide his enclosures by shape and size and then to discuss dating evidence for them (much of this latter coming from his own field walking and excavation) and apply this to his total sample. An interesting aside in that chapter is his attempt to integrate plans of earthwork enclosures into his classificatory scheme. It didn’t work because, as he notes, the difference in their location suggests them to be different components within a contemporary system – a point also made by RCAHMS in their SE Perth volume. There seems to be a degree of
confusion through the volume that starts in this chapter – sometimes the enclosures are plain and simple enclosures (Chapter 3), sometimes they are defined as ‘settlements, probably farmsteads’ (p65) but later we are told that only a small percentage are ‘farmsteads’ (p80).

The Prehistoric Potential (Chapter 4) ought perhaps to be read after the introduction as it was written to balance the heavy bias of work in the area towards Roman archaeology. It shows, quite clearly, that there were people there before the Romans and lays the foundations for the questions on settlement expansion that come later in the book. It also suggests that much remains to be found.

Chapter 5 builds on Chapter 3 with the aim of understanding the settlement pattern. Here Bewley introduces the concept of ‘field capacity’ [something that could usefully be expanded at a future AARG – unless he has gone off the idea], toys with territorial analysis and finally examines a few sites using territorial exploitation analysis. My reading of this has been necessarily rapid so as to get some comment into this issue and while it may seem unfair to say that all of this demonstrates that sites are found on good soils that is one of the main conclusions of this research. It would be surprising if the bulk of them weren’t. There follows extensive discussion about what the Romans ate and how it got from field to stomach. One thing that does seem to have been proven is that the Solway Plain was not the vast grain producing prairie as has been claimed (usually, it seems, by Barri Jones).

The work in this volume has broken new ground by studying the pre-Roman Solway Plain and synthesising the aerial evidence. Some of the problems of morphological analysis are identified but – as we all find – it is often the only tool we can use once we have mapped the data. The work on soils and location is important and ought perhaps to be resurrected [I’d like to see it tested in an area where we have real fields]. We have here an example, maybe the only example, in which aerial photography has been integrated with field survey and small-scale excavations as a means of answering specific questions. If ‘aerial archaeology’ is to get beyond the photograph we need much more work of this kind.

I cannot leave without one final interlude – and not only because it got me some strange glances in the train when I burst out laughing (one of the hazards of working on the move). I quote: ‘During this survey many crop-mark sites, showing as ditched enclosures, were discovered....’ (p2); and I remain unusually silent!
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