



Aircraft transformed the study of prehistory. Before the First World War the discipline was limited to the few 'islands' of earthworks that had survived on uplands and random, disconnected discoveries from quarrying. In the decade that followed, as techniques of aerial surveillance learned in the conflict were continued and extended, destroyed monuments and whole hidden landscapes emerged. In 1921 RAF photos revealed cropmarks extending the line of the Stonehenge Avenue beyond the earthworks recorded by Stukeley; in 1926 Squadron Leader Insall photographed cropmarks of concentric pits near Stonehenge that were dubbed 'Woodhenge'; and in 1929 the Big Rings henge monument was recognised at Dorchester-upon-Thames, the first aerial photograph site off the chalk.

The great value of the new technique was demonstrated by work at the sand and gravel quarry at Sutton Courtenay in the early 1930s. Amongst the sunken-floored Saxon houses that E.T. Leeds, curator of the Ashmolean Museum, had been excavating as they appeared in the quarry face was a short length of ditch that contained a hearth and a group of 14 flint scrapers. It was clearly of Neolithic date but what was it part of? Fortuitously Major G.W.G. Allen had been photographing cropmarks of very large rectangular enclosures in the area and Leeds realised that one of the cropmark ditch lines ran directly up to his excavated ditch in the quarry. It was part of something much bigger – a cursus. This type of monument had previously been limited to just two sites close to Stonehenge that had escaped plough destruction. From this first cropmark cursus aerial reconnaissance has now added over 100 scattered from Aberdeenshire to Devon (See Neolithic Factsheet 8).

Similar stories can be told of Neolithic causewayed enclosures, long barrows, henges and post circles; Bronze Age round barrows (ring ditches), linear landscape boundaries and field systems; and Iron Age settlements and enclosures – because of their high locations most hillforts survived as earthworks and so haven't had to be rediscovered. Secure

identification, of course, depends upon excavation but, because cultural norms of building and landscape organisation have been recognised, aerial photograph sites can be fairly confidently assigned to a period by their plans. The development of whole landscapes can therefore be recorded but only in areas of permeable soils and arable cultivation.

Cropmark production depends on moisture differences in the soil that affect crop growth. The looser, richer fill of ditches and pits dug into the subsoil allows roots to penetrate further and access moisture and nutrients. Crops over such features grow taller and ripen later, resulting in green marks in otherwise ripened fields for just a few critical days or weeks. They are known as positive cropmarks. The opposite effect occurs over stone features – crops are stunted and mature earlier which results in light marks in otherwise green fields. These are known as negative cropmarks. Soil-moisture deficit is most marked during periods of drought. At such times cropmarks can furnish images as crisp and clear as excavation plans. At other times infra-red photography may help clarify uncertainties. Colour photography generally improves interpretation of aerial photograph marks but was, until recently, too expensive for normal use. In areas with impermeable soils, such as claylands, there is little, if any, moisture differential between dug features and the sub soil, so cropmarks are rare.

Where earthworks have survived until comparatively recently soil marks are valuable. They are created by the plough bringing ditch fill and bank cores to the surface. Results can be dramatic but lack the crisp precision of cropmarks. For the study of prehistory, they are of limited use beyond recently ploughed uplands.

Details of surviving earthworks can be clarified by oblique photographs taken when the sun is low in the sky and casting clear shadows. Subtle features of relief are exposed in this way, as they can be by melting snow cover – the snow lying longest in almost imperceptible hollows. Pioneer aerial photographers made use of shadow

lighting to reveal features of surviving hillforts and field systems.

Although large blank areas remain on the map caused by heavy water-retaining soils, the blanketing grass of 'improved' lowland pasture, dense woodland and bracken covered heathland, a major advance has recently been made in mapping the latter two areas using innovative LiDAR (light detection and ranging) technology. This technique devised in the 1960s for submarine detection and brought to archaeological attention only in 2000 at a NATO conference, involves a pulsed laser beam fired from an aeroplane to measure the distance from the ground surface and other features at rates of 20–100,000 points per second. It builds an accurate, high resolution model of the ground and, most importantly, can be processed to remove superficial tree and vegetation coverage. Hidden landscapes of very slight earthworks can thus be revealed beneath ancient, unploughed woodland (e.g. the High Woods of West Sussex

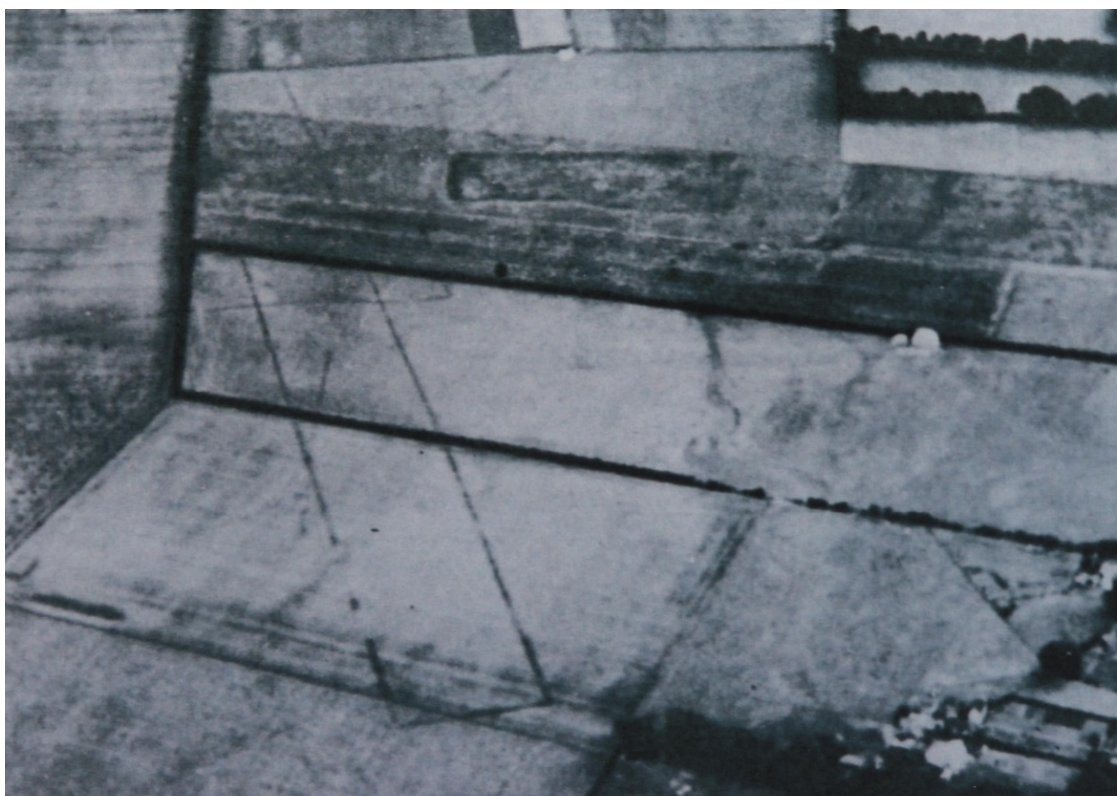
and East Hampshire) and heathland (e.g. the Bradgate deer park, Leicestershire).

Aerial reconnaissance continues to produce new sites and to add further detail to previously known ones. Even more importantly it is the means by which change across whole landscapes and regions can be tracked. Comparison of these results – factoring in data depressing elements such as soils and land-use – furnishes the closest approximation we have to an atlas of prehistory.

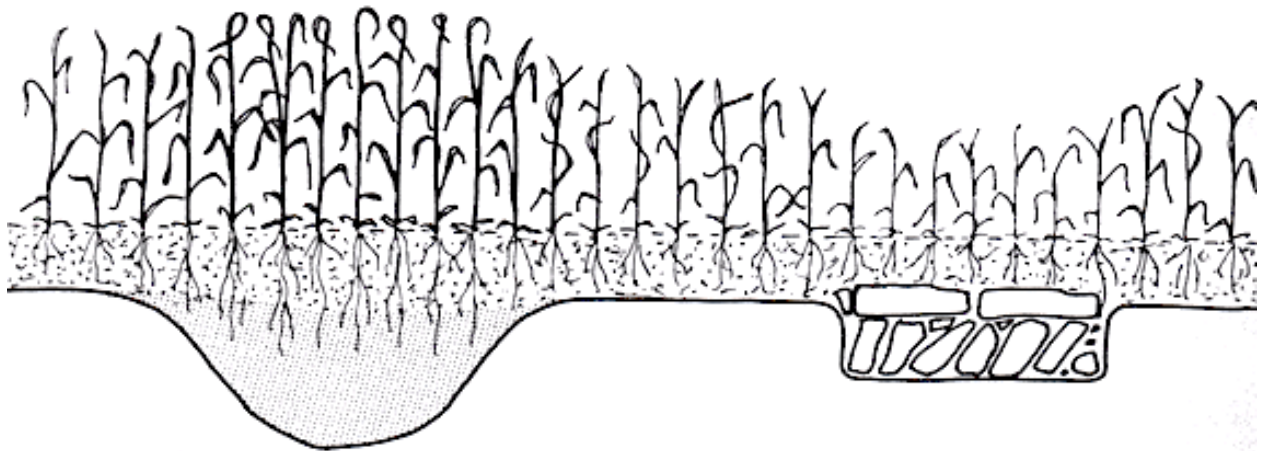
Further Reading

Riley, D.N., 1996. *Aerial Archaeology in Britain*. Princes Risborough: Shire books

Wilson, D.R., 1982. *Air Photo Interpretation for Archaeologists*. London: Batsford
English Heritage National Mapping Programme
Secrets of the High Woods



One of Major Allen's pioneering photographs of cursus sites near Dorchester upon Thames. In this case Benson, 9 July, 1933.



The process of cropmark production (Wilson 1982).

This factsheet was prepared for the Prehistoric Society by Roy Loveday (University of Leicester)