

A RATHER SAD STORY: 50 YEARS OF AERIAL SURVEY IN DENMARK

Michael Vinter

The Danish National Network for Aerial Archaeology
Moesgaard Museum in Aarhus

The years 2004 and 2005 marked, in different ways, the fiftieth anniversary of aerial survey in Denmark. It was entirely appropriate, therefore, for me to present at the Klai-peda seminar in November 2005, a status report on the results achieved so far, although it would have been better to ask: why has so little research been done?

Most of the information in this article can also be found in Lis Helles Olesen's article 'Aerial Archaeology in Denmark', published in *AARGnews* 28 (2004), but the present paper is illustrated with a substantial number of aerial photographs.

The early years

In the spring of 1954 the first complete vertical coverage of Denmark was carried out by aircraft from the Royal Air Force, or possibly the US Air Force. This coverage is a keystone in aerial archaeological survey in Denmark, and copies are now to be found in most Danish museums. Despite the fact that the coverage has proved useful for archaeological purposes it has seldom been put to use.

In 1955 the first Danish archaeologist became airborne. After having read Crawford's 1938 book on the subject Hans Stiesdal, of the National Museum in Copenhagen, convinced influential people to provide him with money and a licence to fly. In order to start off in the right way he made a trip to England to receive academic guidance from the renowned Professor St. Joseph at Cambridge University.



Figure 1. Harald Bluetooth reveals secrets to Hans Stiesdal, pioneer of aerial photography in Denmark.

Of course Stiesdal was easy prey for cartoonists. People found it hard to understand an archaeologist trying to find buried archaeological remains from the air. It seemed in common sense nonsense. The cartoon in Figure 1 shows the famous Viking king, Harald Bluetooth, revealing the exact location of his dairy to Hans Stiesdal.

Stiesdal concentrated his seventeen years of work on documenting castles, manor houses, churches and protected prehistoric monuments. Looking back, he was sorry that not more photographs were taken of cropmark sites, but his job was only part-time and he was expected to cover the whole of the country (Stiesdal, 1990, p.135). One site he did record was quite important, namely the 1st-century BC Iron Age village of Hodde in Southwest Jutland. Recorded in 1959, it was one of only a handful of known Iron Age villages at the time, and by far the largest with 22 farms at its peak (Figure 2).

Flights by Professor J. K. S. St Joseph

What Stiesdal might have achieved was demonstrated when the University of Aarhus invited Professor St Joseph to carry put aerial surveys in Denmark in the late 1960s. During five summers of

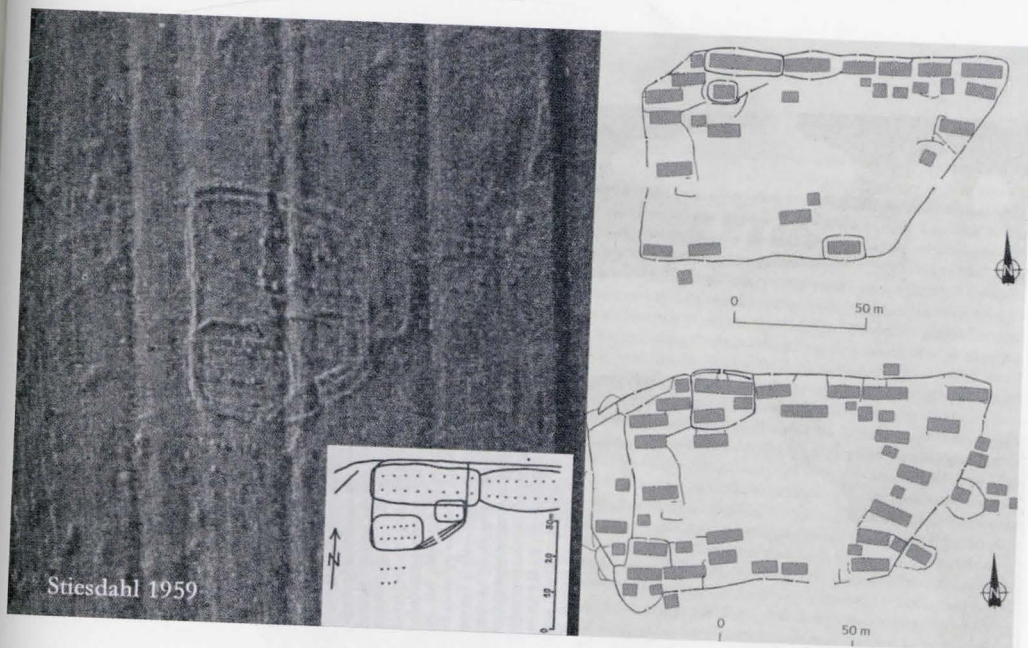
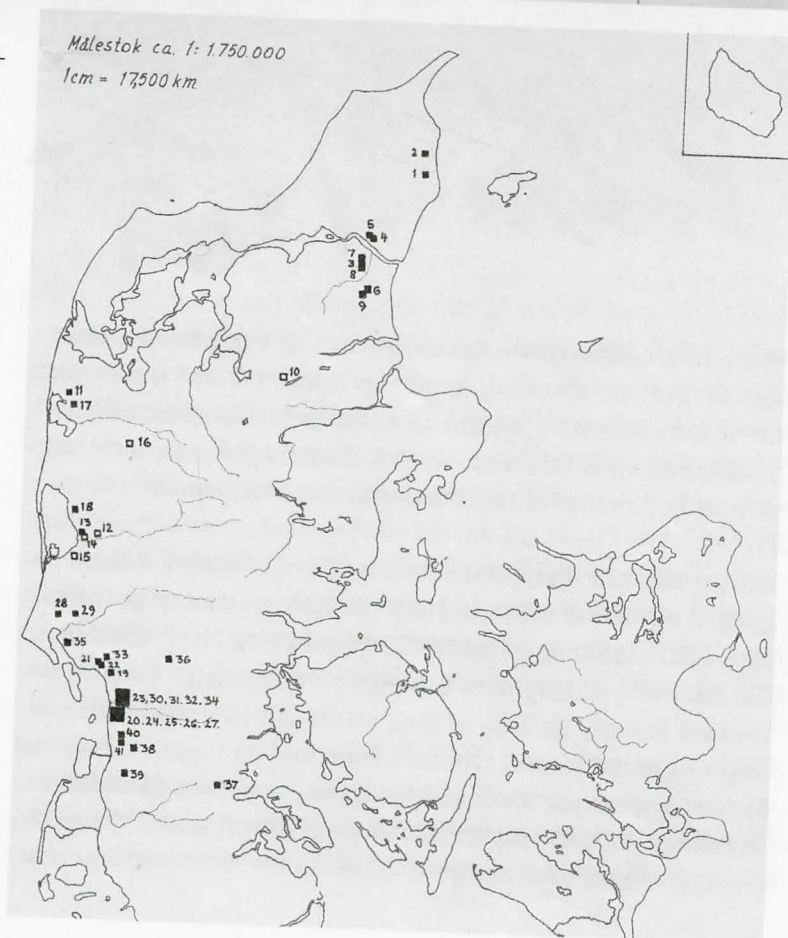


Figure 2. Iron Age village at Hodde, South-west Jutland.

Figure 3. Location of sites with post-built houses.



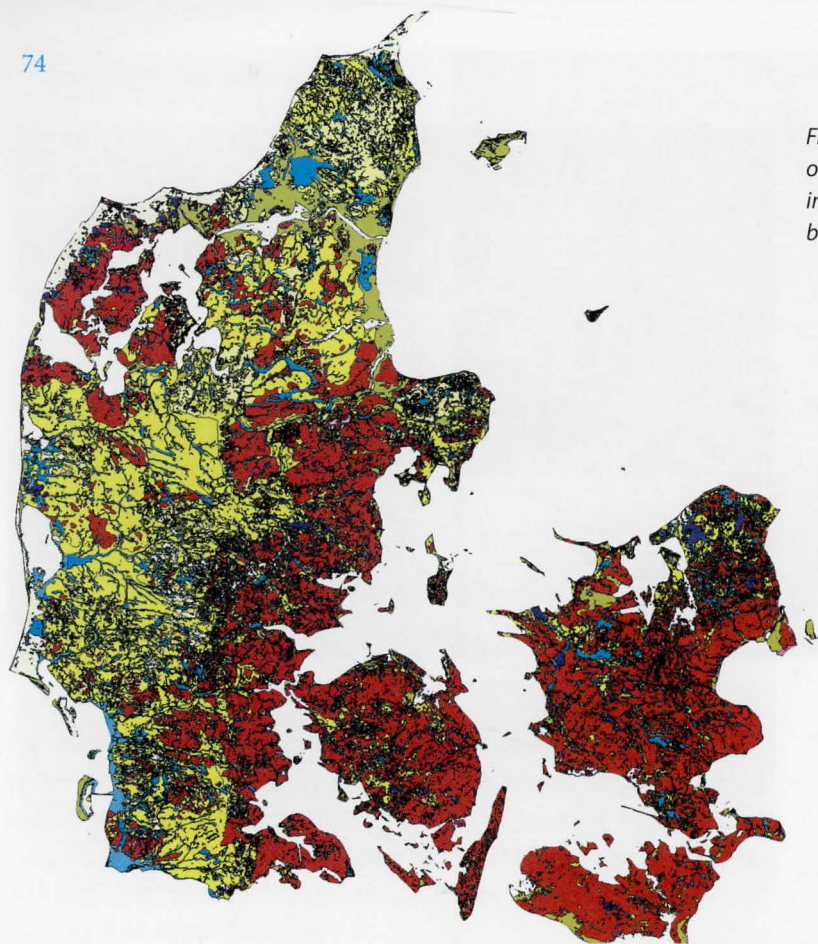
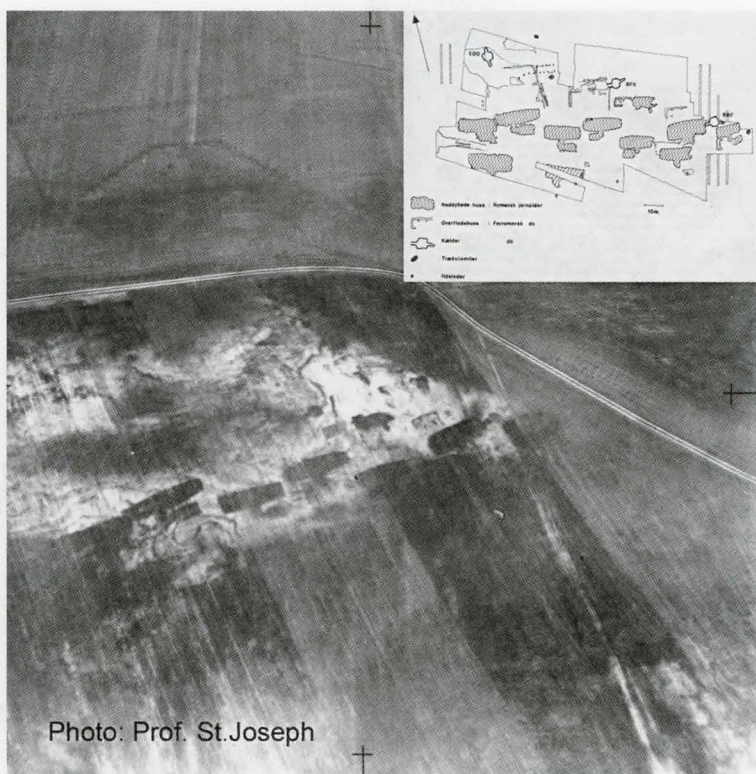


Figure 4. Subsoil map of Denmark: sandy soils in yellow, clay soils in brown.

flying he recorded over a hundred previously unknown archaeological sites. The distribution map in Figure 3 shows the location of the forty sites with positive identifications of post-built houses. Their location, in West and North Jutland, is of course not a coincidence but a result of the differing subsoils in Denmark.

During the last glaciation major parts of Western Jutland remained entirely free of ice. Here the melting ice-cap to the east deposited sand and gravel, making these areas very suitable for the discovery of cropmark sites. Also the Northern parts of Jutland are suitable because of their sandy soils, some of which belong to a raised seabed. On the subsoil map in Figure 4 these can be seen as areas predominantly yellow in colour. The brown areas in Eastern Jutland and on the Isles are clay deposits. So far no cropmarks have been recorded there.

Figure 5. Iron Age village at Overbygaard.



Several of the sites photographed by St Joseph have since been excavated and are today classic sites in Danish archaeology. Two examples are presented here. Figure 5 shows clearly all the houses in the Iron Age village of Overbygaard. In this part of the country the houses are dug beneath ground level to protect them against the wind in an open landscape. Several of them had stone-built cellars at the entrance. Figure 6 shows a less straightforward case. At Spjald, in West Jutland, a Bronze Age settlement with post-built longhouses and small storage houses can be seen as crop-marks. Partly overlapping the houses, and grouped around two Neolithic barrows, there can also be seen ring ditches from an Iron Age cemetery.

What happened after St Joseph?

Before 1970 the majority of archaeological research in Denmark was undertaken by the National Museum in Copenhagen and by



Photo: Prof. St. Joseph

Figure 6. Neolithic, Bronze Age and Iron Age features at Spjald, West Jutland.

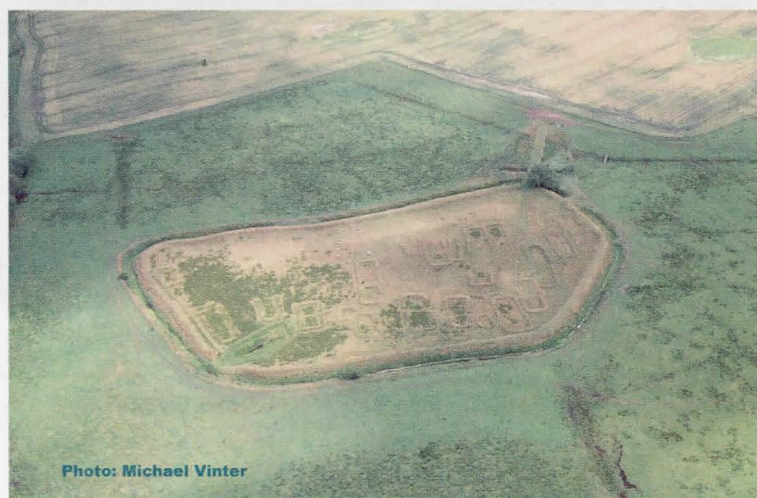
local museums, though at that time only a handful of the local museums employed an archaeologist. This changed dramatically during the 1970s. The final result was a decentralised structure of more than forty museums, each with one or more archaeologists on its payroll. At the same time the National Museum became less and less involved in archaeological excavation.

Unfortunately, few of the museums made use of aerial survey, and even fewer in a systematic way. One of the few discoveries in the

Figure 7. Iron Age village at Lyngmose.



Figure 8. Iron Age village at Borremose.



seventies was a fortified Iron Age village of Lyngsmose, which has recently been excavated some twenty years after its discovery. It is one of only three known fortified villages from Danish prehistory. At two of these, Lyngsmose and Borremose (Figures 7 and 8) there were found hundreds of pointed wooden stakes, set into the bottom of the 1.5m-deep surrounding ditch (Eriksen, Olesen 2002, pp. 79-81). Both villages may be dated to the late Pre-Roman period (300 BC- 1 AD).



Two museums that have been doing systematic aerial survey are those at Holstebro and Ringkøbing, in Northwest and West Jutland. Especially during the dry summer of 1992, but also 1993, many new sites were photographed, including the Neolithic causewayed camp shown in Figure 9. Other sites ranged from Neolithic houses with sunken floors (top left in Figure 10) to Iron Age houses (the two pictures on the right of the Figure) and Viking Age pit-houses, at bottom left.

Figure 9. Neolithic causewayed camp identified from the air in 1992.

It is worth noting that the light soil in the picture with the Neolithic houses is the result of deep ploughing, carried out prior to the planting of trees. The subsoil in this technique is deliberately ploughed up to the surface in order to reduce the growth of weeds. The catastrophic impact on buried structures should be quite obvious from this picture. Many of these sites have been published in the only book (so far) to have been published on aerial archaeology in Denmark, *Fortiden set fra himlen* (Eriksen, Olesen 2000).

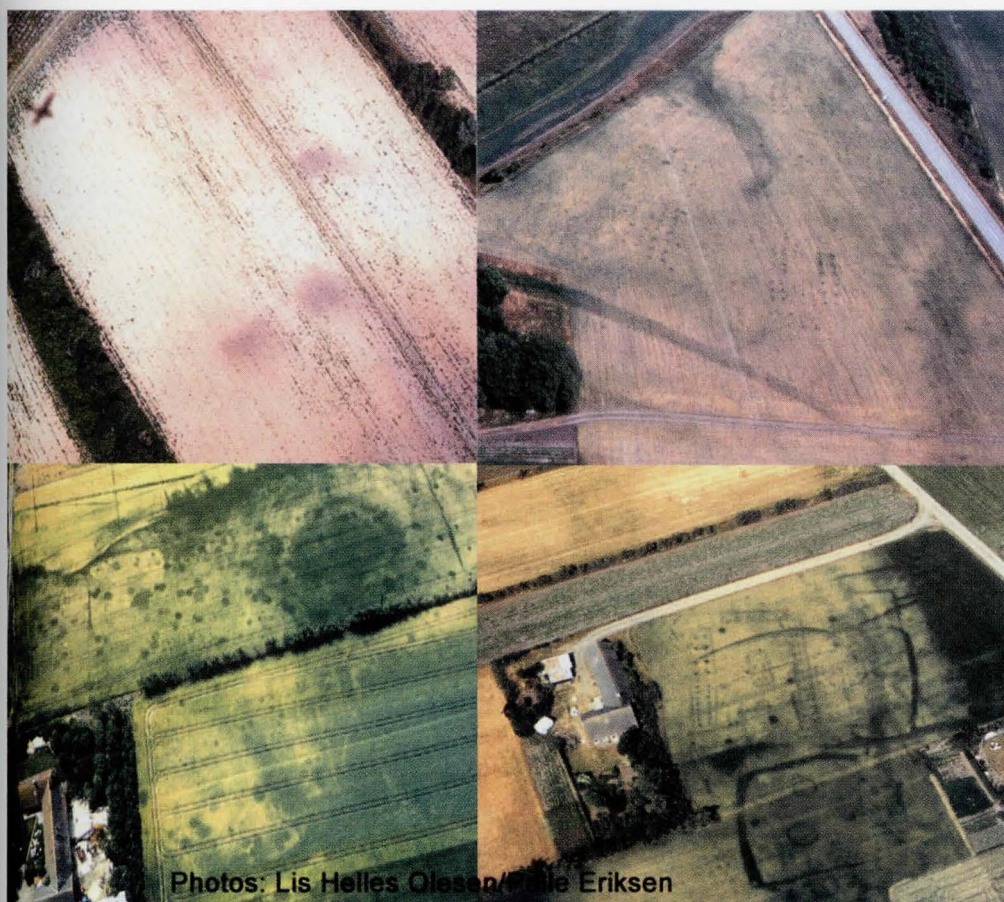
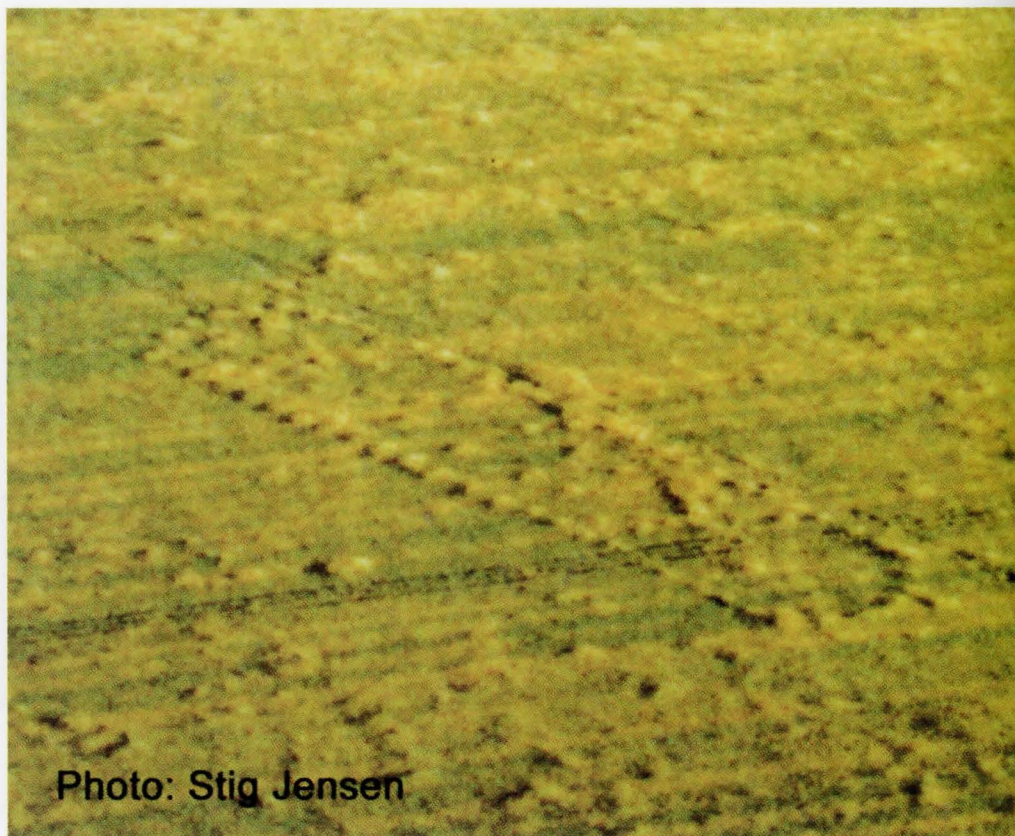


Figure 10. Sunken-floored Neolithic houses (top left); Iron Age houses (right); Viking Age pit-houses (bottom left).

In the southwestern part of Jutland the museum in Ribe has been flying since 1982, with good results. Including St Joseph's results more than fifty sites have been located between 1966 and 1986. Until 1997 houses from the early Bronze Age (1800-1000 BC) had not been seen from the air. Figure 11 shows the only one so far recorded from this viewpoint. It measures 9m wide by 50m long and is one of three giant houses from the early Bronze Age known in Denmark, all dating to around 1400 BC (Jensen, Stig 1987, 1997).

Before turning to the use of vertical air photographs, one last group of structures should be mentioned, namely fortifications



from the 13th and 14th centuries AD. These are also sometimes referred to as mottes. They are ditched enclosures from a time of civil war and are numerous throughout the country. Because of their size they are visible both on low-level oblique photographs and on high-level verticals (Figure 12).

Vertical photographs – what can be seen?

Several series of high-level vertical photographs have been taken over Denmark since 1954, the total number of photographs being counted in hundreds of thousands. They are readily accessible in both local and national archives but have seldom been studied and used by archaeologists. Fortunately, others have made use of them.

Figure 11. Bronze Age house, 9m wide by 50m long.

Figure 12. Mottes can be visible on both oblique and vertical air photographs.



The best examples are studies of field systems from the 1st millennium BC, carried out by two geographers and a retired major from the Danish air force. Using various series of verticals they have added several hundred sites to the previously known record (Jeansson 1963; Newcombe 1971; Sørensen 1982, 1991). So far no serious attempt has been made to relate these to the huge number of known settlements.

The boundaries and size of the field systems do not have the same appearance in all areas. In some their boundaries can be seen as dark soilmarks whereas in others they appear as light soilmarks (Figure 13). The difference in appearance is not fully understood, although the light marks are most likely the product of a podzolisation process, in which humic acids have been washed down, leaving a layer of fine white sand in the middle of the field boundary. This layer becomes visible as light soilmarks when the boundary is levelled by ploughing. Recently, some of these systems have

Figure 13a. Field boundaries from the 1st millennium BC.



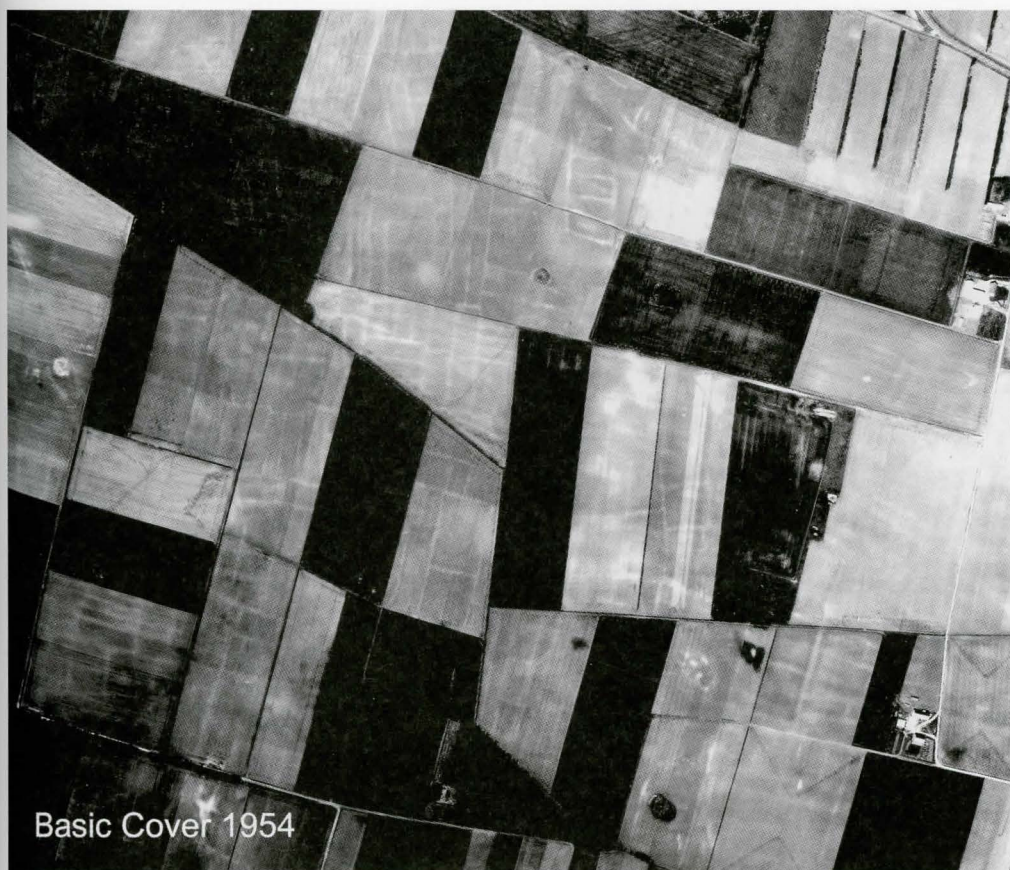


Figure 13b

been identified on new satellite images, illustrating a somewhat surprising durability in the soilmarks.

Other types of structure which can easily be seen on vertical air photographs are burial mounds from a number of prehistoric periods. Since the registration of prehistoric monuments and sites started in 1873, one should think that the majority of the mounds would already have been recorded. But several studies have proved that a closer examination of vertical photographs can add between 30% and 42% more mounds to those previously known (Eriksen, Olesen 2002, p. 34; Johansen, Laursen 2005).



Figure 14, which my own studies brought to light some years ago, shows at least seven mounds. A few years later the area was covered by trees, leaving this photograph as the only documentation of their existence. In the national database a single red dot indicates the record of a possible mound at this location. There ought to be at least seven dots here. However, attempts to get them recorded have so far failed because the curator of the local museum is not convinced by the discoveries.

Aerial studies in Second World War archaeology are to the best of my knowledge non-existent in Denmark. Although historians have mapped a major part of the German defences in Denmark none of them have made use of aerial photographs (Hendriksen, Knud 1983). The coastal batteries close to Hanstholm in North-western Jutland, once a part of the 'Atlantic Wall', are today preserved as a well visited museum. In the photograph from 1954 in Figure 15 one can see the foundations of the batteries, ammu-

Figure 14. Burial mounds, centre, only one of them known before this photograph was taken.



Figure 15. Batteries, railway tracks and trenches from World War II.

dition railway tracks and trenches to the south. These batteries were, together with batteries in Norway, intended to block the entrance to the Baltic Sea. Large numbers of concrete bunkers are scattered along the west coast of Jutland. Because of erosion some of these are today disappearing into the North Sea. The rate of deterioration, especially for the bunkers not mapped in the



Figure 16. World War II anti-tank ditches and trenches.

historical documents, could properly been documented using the available series of vertical photographs.

Another example of Second World War soilmarks can be seen in Figure 16. In the southern part of Jutland these anti-tank ditches and trenches were intended to prevent allied troops coming through Denmark from reaching Germany too easily. While the anti-tank ditches are known, the nearby trenches have not to my knowledge been mapped.

Also during the First World War, the Germans constructed a defence barrier across the southern part of Jutland, which had been in German possession since 1864. The mapping of this was done by a dedicated amateur historian, Mogens Scott Hansen, over a period of more than fifteen years. In his work he has made use of almost all the available vertical photographs of the area (Scott Hansen 1992, p. 112).

Aerial archaeology along the coast

The Danish coastline stretches for over 7000km and the numbers of known cultural heritage sites here exceeds 40000, of which some 20000 are shipwrecks and another 20000 are Stone Age settlements (www.kuas.dk/kulturarv/fortidsminder/fredning/havbun-



Figure 17a. Wrecks off the Danish coast.

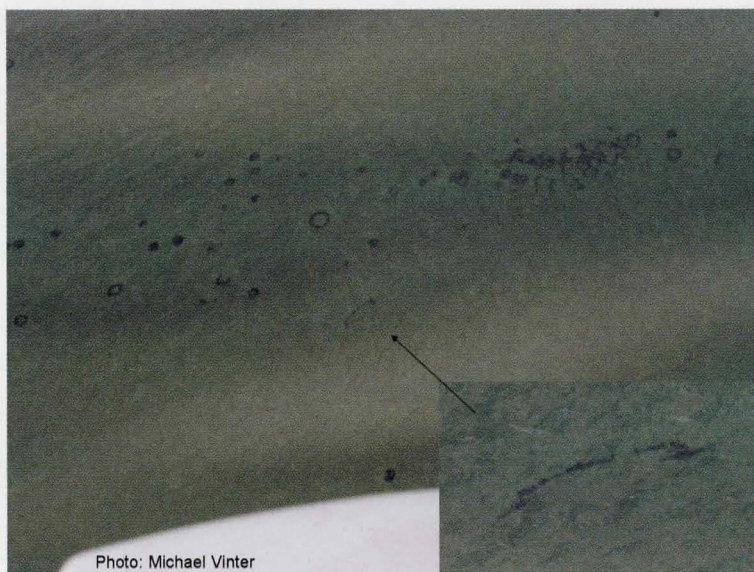


Figure 17b

den.jsp 5/5-2006). The great majority of these have been recorded by divers or through the examination of historical records. Aerial reconnaissance and the use of historical air photographs have so far played only a small part in this work, and when used, the work has been conducted by non-archaeologists. The shallow Danish inner waters are littered with shipwrecks and many can be located on oblique and vertical air photographs. Two examples are shown in Figures 17a, b. The upper photograph shows the English 18th-century vessel *The Marquis of Huntley*, which ended its days in Danish waters after having made several trips to Australia carrying British convicts.

In prehistory, and of course also in historical times, waterways and the sea have been a connecting factor rather than a dividing one. Communication, trade and warfare were often seagoing activities. Starting with the exporting of flint tools throughout Scandinavia in Neolithic times and the importing of bronzes and

Figure 18. Timber barrier built to disrupt sea traffic.



glass in the Bronze and Iron Ages, ideas and artefacts have been exchanged over the sea. Most of the time these activities were carried on peacefully but sometimes they were threatened by hostile raids and attacks by neighbours. The Vikings and their ancestors were not only aggressors but also the victims of raids themselves. In order to protect settlements from these attacks from the sea ships were deliberately sunk and huge wooden pile constructions made at strategic positions. Some of these still survive and can be photographed from the air.

Figure 18 illustrates one of these defensive barriers, predominantly constructed from the 8th century AD onwards but with at least parts of it datable to as early as the 1st century BC (Rieck 1993, p. 212). Incorporating thousands of stakes and beams, it clearly demonstrates a high level of organisation in the society of those days.

Finally, a reminder of what can happen to our airborne heroes. During the late stages of the Second World War allied bombers often crossed Denmark on their way to targets in eastern Germany. Some of them did not get there. Despite the hazy contours in

Figure 19. Shattered wing of a crashed World War II aircraft.

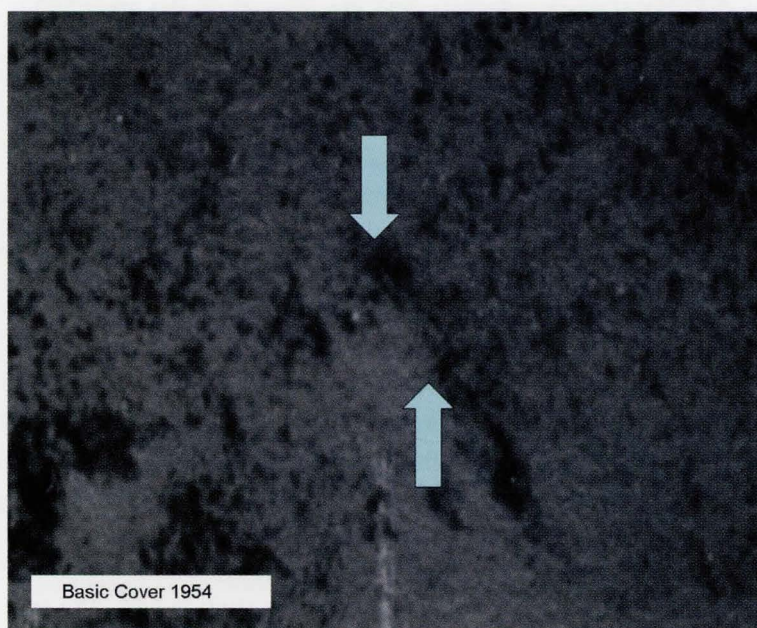


Figure 19 this picture probably records the remains of an English Lancaster bomber, or more precisely one of its wings, measuring 15m long and between 2 and 3m wide. Others parts of the aircraft have been found nearby.

A sad story?

So, why is the history of aerial survey a rather sad story in Denmark? In these few pages I have presented a number of aerial photographs, documenting in great detail a variety of structures from various different periods. But when one takes into account that aerial survey had an early start in Denmark, that there have been no flying restrictions, and that a vast number of vertical photographs have been easily accessible for many years, it is striking to compare the somewhat slim results in Denmark with those achieved in other European countries such as the United Kingdom and Germany.

If Danish archaeologists had shown the same degree of commitment as their European colleagues, the results would have been much better. This is why I suggest it is a rather sad story. To put it bluntly, the history of Danish aerial survey can be summed up in the title of a paper written by Otto Braasch in the early 1990s (Braasch 1995, p.109). He referred to the lack of aerial survey in the old Eastern Bloc after World War II as being '50 Jahre verloren' (50 years lost)!

Since then aerial survey has produced impressive results in many East European countries, although some were sceptical to begin with. I recall a rather pessimistic article from 1994 by a Polish colleague (Rączkowski 1995), but I think that his attitude has changed for the better since then. The same is not the case among my Danish colleagues. Most of them are fully aware of the method, and a number have even ventured into the air, but if they have not had any luck the first time they have concluded that nothing will ever show up.

This and the lack of systematic interest from many museums probably stems from the fact that no formal education in handling and

interpreting aerial photographs has been given, or has even been available, in Danish universities. Neither is there a national archive/database where old and new photographs can be stored.

The experience of Eastern Europe clearly shows that there is still a large potential in aerial survey. Especially in open agricultural landscapes, where no construction work is likely to be done, aerial survey can help to record archaeological sites that are disappearing, centimetre by centimetre, as a result of modern ploughing.

In the coming years a large task lies ahead for Danish aerial archaeologists. There is much persuasive talking and writing to be done, firstly to promote aerial survey as a powerful archaeological method, and secondly to explore the country's largely unknown source material.

Final note

Since I presented this rather pessimistic paper at the seminar in Klaipėda in November 2005 several positive things have happened within Danish aerial archaeology. In December of that year an aerial archaeological network was founded under the name of LAND (LuftfotoArkaeologisk Netvaerk Danmark; <http://luftark.net>). Starting out with only five members, the network has since doubled in number and in the autumn of 2006 hosted a one-day seminar on aerial archaeology at the University of Aarhus, and – at the invitation of LAND – the annual meeting of the international Aerial Archaeology Research Group was held in Copenhagen in September 2007. Already during 2006 several members of LAND had succeeded in raising small amounts of funding for aerial survey from various Danish museums. Fortunately the summer of 2006 was very dry and therefore highly suitable for exploratory air photography, and the results were promising. Hopefully, both drought and funds will be available in the years to come.

References

- Braasch, O. 1995. 50 Jahre verloren, in Kunow 1995, pp. 109-122.
- Crawford, O. G. S. 1938. *Luftbild und Vorgeschichte (Aerial Photographs and Prehistory)*. Berlin.

- Eriksen, P., Olesen, L. H. 2002. *Fortiden set fra himlen (Prehistory seen from the sky)*. Holstebro.
- Hendriksen, K. 1983. *Våben i klitterne. Noter om det tyske invasionsforsvar i Danmark 1940-45*. Det kongelige Garnisonsbibliotek.
- Hvass S., Storgaard B. (eds.) 1993. *Digging into the past...25 years of archaeology in Denmark*. Aarhus University Press.
- Jeansson, N. R. 1963. Fossile Åkrar i Himmerland – En Flygbildinventering. *Svensk geografisk Årsbok.*, 1963.
- Jensen, S. 1987. Gårde fra vikingetiden ved Gl. Hviding og Vilslev. *Mark og Monte* 1986-87.
- Jensen, S. 1997. Bronzealderen set fra luften – et usædvanligt hus fra ældre bronzealder. *By, marsk og geest. Kulturhistorisk Aarbog for Ribe-egnen*. Ribe.
- Johansen, K. L., Laursen, S. T. 2005. Langtidsstrukturer i social praksis – Gravhøjene som tilgang til en interaktionspraksis og til ældre bronzealders fysiske og sociale interaktionsnetværk. Unpublished thesis, University of Aarhus.
- Kunow, J. (ed.) 1995. *Luftbildarchäologie in Ost- und Mitteleuropa (Aerial Archaeology in Eastern and Central Europe)*, Potsdam.
- Rączkowski, W. 1995. Aerial Archaeology and the study of settlement systems. Some examples from Middle Pomerania, in Kunow 1995, pp. 265-270.
- Rieck, F. 1993. Barriers in fjords and inlets, in Hvaas, Storgaard 1993, pp. 211-212
- Olesen, L. H. 2004. Aerial Archaeology in Denmark, *AARGnews* 28, pp. 28-35.
- Scott Hansen, M. 1992. *Sikringsstilling Nord – en tysk befæstningslinie i Sønderjylland*. Miljøministeriet, Skov- og Naturstyrelsen 1992.
- Stiesdal, H. 1990. Arkæologisk fotografering og flyvning. Sølv og salte. Fotografi og Forskning. Tove Hansen (ed.).
- Sørensen, P. H. 1982. The use of air photographs in celtic field studies. *Journal of Danish Archaeology* 1, pp. 77-86. Odense.
- Sørensen, P. H. 1991. *Jyske oldtidsagre. Nordjyllands og Viborg Amter*. Skov- og Naturstyrelsen.