ANCIENT LANDSCAPES IN AERIAL PHOTOGRAPHY: THE LITHUANIAN EXAMPLE OF NOISE LEVELS

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Abstract

Factors which suppress or interfere with the deciphering of aerial photography whilst searchig for traces of ancient habitations are called noises. The main kinds of noises currently identified in Lithuania are land improvement or land reclamation, woods, urbanisation and reservoirs. Altogether, they make a fair level of noise, thus the search for traces of habitations based soley on aerial photography in Lithuania is not possible.

Key words: aerial photography, archaeological feature, noise, land improvement, woods, urbanisation, reservoirs.

Aerial photography is a universally acknowledged and widely utilised method in modern archaeology. It helps us to find and interpret the most varied features, dating from the Stone Age to our times. With archaeology's entrance into the modern era, the investigation of other areas of human activity is also being aided by aerial photography, such as the legacy of 20th-century wars, something that had been totally beyond archaeology's bounds until very recently. However, the growing interest in things that are not old does not belittle the traditional use of aerial photogrpaphy in archaeology first and foremost when researching prehistoric objects.

The utilisation of aerial photography in Lithuania does not have established traditions (Zabiela 1998, pp.145-147). Due to the secretiveness and closed character of Soviet society, aerial photography started to expand only in the 1990s, after the restoration of independence. However, even today, specific environmental features used in recording the archaeological heritage in an aerial photograph remain undefined, making its gains modest, and more evident simply in respect of recording the landscape. Aerial image catalogues of sites of the archaeological heritage have not been published in Lithuania, nor have the influences of environmental-geological conditions on sites been summarised, as they have been in many West European countries, such as England (Aston 2002).

The aim of this article is not to explore the essence of aerial photography, nor to investigate specific questions in prehistoric research. The article's aim is to explain issues of the utilisation of aerial photography in Lithuania concerning one specific aspect: the influence of human activity on the identification of the legacy of earlier times. This legacy affects essentially the earlier archaeological legacy in a negative way, with certain exceptions of course (eg the abovementioned war relics); thus, in current technical vocabulary, we can consider it a peculiar noise, ie a factor that inhibits the acquisition and interpretation of positive information. Concomitant with this is Lithuanian aerial photography's specific character, in which the noise level is high. The unavoidable stipulation must be made that this noise is a relative thing. While it is not wanted when analysing remote times, in the detection of certain 20th-century problems it is a source that helps us to understand these times, and this source's representativeness will only grow larger as time goes on. Thus, it will be a noise until 20th-century archaeology becomes more important.

The material for this article was accumulated slowly from many incidental observations when compiling an atlas of Lithuanian hill-forts (Lietuvos 2005) and an atlas of Lithuanian fortifications from the 13th to the 18th centuries (Lietuvos 2008). The photographs of hill-forts and fortifications taken from the air between 2004 and 2007 cover all of Lithuania, thus the material is sufficiently representative. The photograph collections of other scientists engaged in aerial photography (Zenonas Baubonis, Romas Jarockis, Rimantas Kraujalis), especially those that are easily accessible, were used as supplementary material. Finally, photographs published in various photography books were also looked at in this regard (Polis 1989; Jovaiša 2007), although, because of the specific nature of such publications, they were of only little use in this article.

As has already been mentioned, noise in aerial photographs means phenomena or processes which make difficult or even interfere altogether in the investigation of sites of the archaeological heritage from remote times.

Fig. 1. Nemunaitis hill-fort, overgrown by forest: the view from the northeast (17 April 2007) (photograph by G. Zabiela).

In the case of Lithuania, instances of noise are land improvement, woods, urbanisation and reservoirs.

Land improvement, or land reclamation, is the main type of such noise, and has an irreversible effect on the archaeological legacy of ancient epochs. The scale of it in Soviet times in Lithuania was rather large. If during the times of the first Republic of Lithuania, land reclamation was not widespread (457,700 ha were drained, but only 12,000 with the aide of drainage), during Soviet times it quickly transformed the landscape. One million hectares had been reclaimed by 1970, two million by 1978 (Šadžius 1986, p.77), while 2.4 million hectares were reclaimed altogether. By comparison, we can say that there were 3.6 million hectares of arable land in Lithuania in 1986 (Vaitauskas 1988, p.664), so that land improvement affected 67% of all the arable land. The irreversible effect of land improvement expressed itself on prehistoric cultural resources in that the levelling (flattening) of land was practised in reclamation, at which time the hills of hill-forts or ancient cemeteries were levelled over, fortified hills were razed and levelled, and a large portion of (usually unregistered) archaeological stones were destroyed (blown up, buried, or removed from their earlier locations). In eliminating farmsteads and especially villages (some were former old villages whose farmyards had been around since the time of the mid-16th century reforms), the remains of farmyards were buried over by bulldozers in specially dug pits. Estate buildings suffered especially in this regard; due to their specific evolution (they had lost their economic value after the 1922 land reform), they quickly fell into decline in Soviet times; thus they were easily destroyed, since they were not protected as culturally valuable. The brick manors that were among them met the same fate. Also destroyed were a large number of other single-purpose buildings: mills, taverns, farm buildings and others. Land improvement also destroyed the environment in which earlier generations had lived: it straightened the channels of rivers and streams, destroyed meadows, marshes, small woodlands and old roads, cut off the edges of larger forests, and even lowered lake levels. Finally, reclaimed areas were ploughed over with deep ploughs which dug into deeper layers of earth than when ploughing with normal ploughs. All of this work, associated with turning over the soil, had an irreversible effect on archaeological valuables, and is reflected in one way or another in aerial photographs. While it is true that natural environmental restoration (the formation of meadows and marshes, the growth of forests) has occurred in some of the abandoned reclaimed plots in the last two decades, these factors still do not affect

Fig. 2. The obstructed Karmėlava ancient cemetery: the view from the west (25 April 2007) (photograph by G. Zabiela).

the irreversible effect on cultural resources in a very significant way.

Two main noises dominate in aerial photographs of land-improved areas: land reclamation ditches and humus-rich territories connected with arable fields. The majority of the improvement ditches have a clear branch-like structure (Plate V:1), which cannot be confused with any other features. Problems arise with the other, atypical, sometimes poorly interpreted ditches, whose visible configurations are reminiscent of places with destroyed fortifications (usually filled-in ramparts). Since we know of very few places with military fortifications in Lithuania, it is clear that many of them currently have no more visible traces on the outside, and remain unidentified. Land improvement ditches obviously interfere here. In aerial photographs, the connection of humus-rich places (former meadows, marshes, even former water bodies) with arable fields often creates the impression that they belong to ancient (usually Iron Age) settlements (Plate V:2). An almost inevitable mistake is made when, for various reasons, the latter features take on regular shapes. Of course, an *in situ* survey immediately allows for the discernment of fertile dark soil from a cultural layer; however, ordinary surveys by aerial photographic data are still very much behind in Lithuania.

The relatively large forest coverage (Lithuania is currently one-third covered by woodlands, and the percentage of woodlands is growing) is a serious noise in aerial photographs. Although a portion of the forests are relics of virgin forests, and there has never been any human activity within them, large areas of overgrown woods were inhabited by people at some point, while woods grew there later, sometimes relatively recently, only in the 19th and 20th centuries. East Lithuania's barrow cemeteries are an eloquent example of this, as the absolute majority have survived in forests (those that were in fields were rapidly destroyed). Some hillforts are also in forests. Both types of archaeological sites can be easily deciphered from aerial photographs, but trees usually make these efforts futile (Fig. 1). If it is still possible to distinguish better-defined mounds or fortifications in deciduous forests in the autumn or early spring (and especially in the winter, when there is a thin covering of snow), then single parts of such features can be observed only in the winter in coniferous forests (which make up 57% of Lithuania's forests). The significance of woods as noise is diminished by its limited influence in time. When a forest is cut down, that place is uncovered and the systematic aerial photography of the area can be undertaken for a few years, in the search for traces of ancient habitation, until the brush and trees grow back.

Fig. 3. Circles north of the Nolėnai hill-fort: the view from the southwest (21 April 2004) (photograph by G. Zabiela).

Fig. 4. The feature at Mikyčiai from the southeast (7 March 2007) (photograph by G. Zabiela).

Another high noise is constituted by the various current urban activities of people, by which the most varied of structures are formed that are easily interpreted from the air, or all of the land's possible information is entirely covered up by modern formations. This is a noise with an irreversible effect, since 20th-century formations are starting to dominate in aerial photography, even though archaeologically valuable things in urbanised areas can also survive (at least in part). The effect of this noise is suppressed by the fact that Lithuania is thinly urbanised, and the noise expresses itself mostly near district centres and larger cities (Vilnius, Kaunas and Klaipėda). True, Lithuania has one kind of urban formation that is encountered in non-urban surroundings. This is the allotment garden plots: in Soviet times (in the 1960s to 1980s) plots of mostly six ares of land of usually poor soil were allocated for horticultural and gardening activities. Due to various factors, mostly due to the lack of habitable dwellings, construction was soon begun in these plots, and now some of the gardens, especially those closest to the cities, have become rather densely built-up areas. Parts of known archaeological sites (usually settlements and cemeteries) have also come within the plots of these gardens, and using aerial photography on them is no longer possible. The archaeological information that lurks underground in such features is always smothered by constructions or the texture of the changed surface (Fig. 2).

Water reservoirs also constitute a very strong noise; they, too, practically drown out all the archaeological features that fall within the newly formed reservoirs. Due to the not-so-clear nature of the reservoirs, some results are possible only from their shores, usually parts not deeper than one metre. The true effect of reservoirs in the search for archaeological features via aerial photography is difficult to evaluate, because of two tendencies that mutually influence each other negatively. On one hand, there are not many reservoirs in Lithuania (the largest is the Kaunas Sea [6,350 ha], then the Elektrėnai Sea [1,264 ha] and the Antalieptės Sea [1,119 ha]), thus the effect would appear to be minimal. On the other hand, the most densely populated areas have always been precisely by water (especially the larger rivers), and no archaeological surveys have been conducted of flooded territory after damming waters in recent years (one exception is the Kaunas Sea, which was researched by archaeologists from 1953 to 1958). This type of noise has a certain recurrent effect (small reservoirs are sometimes drawn off), but because of the brevity and the temporary nonexistence of reservoirs, it is very difficult to record their locations by aerial photography.

All the above-mentioned noises interfere directly in one way or another with the investigation of archaeological features by aerial photography. According to the extant data, there are, however, features that cannot be considered noises (at least on the same level as discussed earlier); although, for the time being, we cannot consider them archaeological sites, either. The first of these are crop circles. These are more or less regular, five to 11 metres in diameter, circles of vegetation, observed either near early hill-forts or in places where there could be settlements from the same time (Fig. 5). This phenomenon can be observed only for a short time in early spring, since later, when the vegetation gets taller, the circles can no longer be distinguished. The circles are associated with the remains of early buildings (Zabiela 2005, p.101); although there could be a non-archaeological explanation for them (eg discharges of water-bearing layers, or the concentrated spread of certain plants). Unfortunately, not one such circle has yet been investigated by traditional archaeological means, so there is currently a lack of information concerning their interpretation.

Even less clear are regular-shaped structures that can be observed from the air at certain times, that, when surveyed on the ground, are imposible to identify with any known archaeological feature. Today we know of two such places.

While photographing hill-forts in the Lazdijai district in 2006, Z. Baubonis recorded an oval feature (Plate V:3) in the village of Mikyčiai, which was later (7 March 2007) surveyed by customary methods. It became clear that this was a 36 by 26-metre-large oval of a plot orientated lengthwise northwest-southeast, encircled by a ditch up to 0.3 metres deep and 2.5 metres wide, at the foot of a hill on low level ground. Since old times, the place has been called Mergakelis, rising out of the surrounding wet meadows by barely 0.5 metres (Fig. 4).

Another altogether unclear oval-shaped feature was recorded from the air in a field prepared for sowing when flying over the village of Eglynai in the Klaipėda district on 26 April 2007, photographing defensive fortifications (Plate VI:1). The feature was localised and surveyed the same day. This is an almost totally flat low field, in which it was impossible to discern any outer visible attributes during the survey. Nor were any artefacts found on the ground level. The oval shape is conferred by a slightly lighter soil, which appears to be slightly higher. The place itself is reclaimed, its soil moist.

The latter two cases show that some kind of different, regular-shaped or human-activity-affected, structures exist in Lithuania which cannot currently be explained, and which are not necessarily the legacy of people's activities in ancient times (Plate VI:2). They show that

today the search for traces of ancient habitation solely by aerial photography is not possible.

The examined noises, and phenomena similar to them, in the interpretation of aerial photographs, obviously do not constitute an exhaustive list. Put simply, the known types of noises in Lithuania today undoubtedly diminish the possibility of interpreting the remains of ancient habitation by aerial photography. By what degree and how much these noises affect the end result is still unclear, because no generalisations have been made regarding the possibilities afforded by systematic aerial photography; nor are we familiar with the research of the effects of noise in neighbouring countries.

Still, this initial research allows us to draw some conclusions:

1. Factors which suppress or interfere with the deciphering of aerial photographs whilst searching for traces of ancient habitation are called noises. The general noise level in Lithuania is high.

2. The main kinds of noises currently identified in Lithuania are land improvement or land reclamation, woods, urbanisation and reservoirs. All of their effects in discerning traces of ancient habitation are different, and are due to many factors. Of them, land improvement and urbanisation have an irreversible effect on research into the heritage.

3. Crop circles, which can be distinguished by their vegetation for a short time in the spring, as well as single, regular-shaped structures reminiscent of human activity, which so far have no explanation, are attributed to noises today, due to the lack of more thorough research in these areas.

4. Having evaluated the general level of noise in the interpretation of aerial photography, we can conclude that, regarding the current level of development in aerial photography in Lithuania, the search for signs of ancient habitation solely by aerial photography and without the verification of results via customary archaeological research methods is not possible.

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Received: 20 January 2008; Revised: 2 May 2008

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SENASIS KRAŠTOVAIZDIS AEROFOTOGRAFIJOSE: TRIUKŠMŲ LYGIS LIETUVOS PAVYZDŽIU

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Santrauka

Lietuvoje aerofotografiją naudoti archeologijos objektų paieškai realiai pradėta tik XX a. paskutiniame dešimtmetyje, atkūrus nepriklausomybę. XX a. žmogaus veikla, daranti neigiamą įtaką aerofotografijos naudojimui archeologijoje, vadinama triukšmu. Nemažas triukšmo lygis yra tam tikra Lietuvos aerofotografijos specifika. Pagrindinės tokio triukšmo rūšys yra melioracija (Plate V: 1, Plate V: 2), miškingumas (1 pav.), urbanizacija (2 pav.) ir patvankos. Melioracija yra pagrindinė tokio triukšmo rūšis, turinti negrįžtamą poveikį senųjų epochų archeologijos paveldui. Negrįžtamą poveikį archeologijos paveldui turi ir įvairi dabartinių žmonių urbanistinė veikla. Archeologijos objektų paiešką pagal aerofotografijas sunkina ir neaiškių objektų (žolės ratų, taisyklingos formos struktūrų (3–4 pav.; Plate V:3, Plate VI:1, 2)) buvimas. Pastarųjų kilmė nėra išaiškinta. Šiandieniniame aerofotografijos išsivystymo Lietuvoje lygyje senojo apgyvendinimo pėdsakų paieška vien tik pagal aerofotografijas, jų rezultatų neverifikuojant įprastiniais archeologinių tyrimų metodais, yra negalima.