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10. Reading the Tea Leaves, signalling as a means of prophesy on Roman frontiers

by D. J. Woolliscroft

Some years ago, the writer put forward a paper offering a possible explanation of the signalling system of Hadrian's Wall (Woolliscroft 1989: 5f). Before that time, it had always been assumed that signalling on Roman frontiers would have operated in a linear manner, with signals from minor installations, such as Wall turrets and milecastles, being relayed from site to site along each link of the frontier chain until they reached a fort. The reality may have been rather more efficient, however, at least in the Wall's earliest phase when the main garrison forts still lay a little to the south on the Stanegate road. For, with one possible exception, every single one of the 82 Wall installations studied had a clear view to a Stanegate site, making direct communications possible using Roman visual signalling techniques, whilst the Stanegate itself could be linked together via an inter-fort chain. Moreover, this was not simply coincidence, for quite a number of these links had only been made possible by allowing distinct irregularities in the milecastle and turret spacing system, which suggests that signalling had been a definite design priority.

Since that paper was published in 1989, a few doubts have been shed on specific details, notably the exact history of T'45a and MC 39 (Crow 1991: 62f), but the theory does seem largely to have stood the test of time and similar direct signalling systems have now been recorded during surveys on the Cumberland Coast defences, the Gask Ridge in Scotland and the Wetterau Limes in Germany. But, in any discipline with scientific pretensions, there is one sure way of putting a theory to the test and that is to use it to make predictions whose validity can then be tested. For it is simply the case that if any academic theory is correct then other things should follow that can be tested experimentally.

In the case of Roman frontier systems such experiments involve looking for gaps or other oddities in a system and using them to predict the existence and location of missing sites or other factors which can be looked for archaeologically and such prophesies have, so far, turned out to be both possible and surprisingly accurate. In Britain, for example, a fairly rich harvest of new military sites is gradually coming to light, including a second tower on Barcombe Hill near Vindolanda, one and possibly two new fortlets on the Gask Ridge and a possible tower, now under excavation, on the Antonine Wall, all of which would appear to support the conclusions reached on Hadrian's Wall, but as most of this work is now either published or about to be published in this country (Woolliscroft 1988: 23ff, 1994a; 1994b; 1994c; Woolliscroft, Swain and Lockett 1992: 57ff), the remainder of this paper will concentrate on the results from the German Limes (Woolliscroft & Hoffmann 1991: 531ff).

Here, a sample study length was surveyed, consisting of the 65km sector from WP 4/47 in the northern Wetterau, to Groß Krotzenburg on the Main (Fig 10.1), which is the only

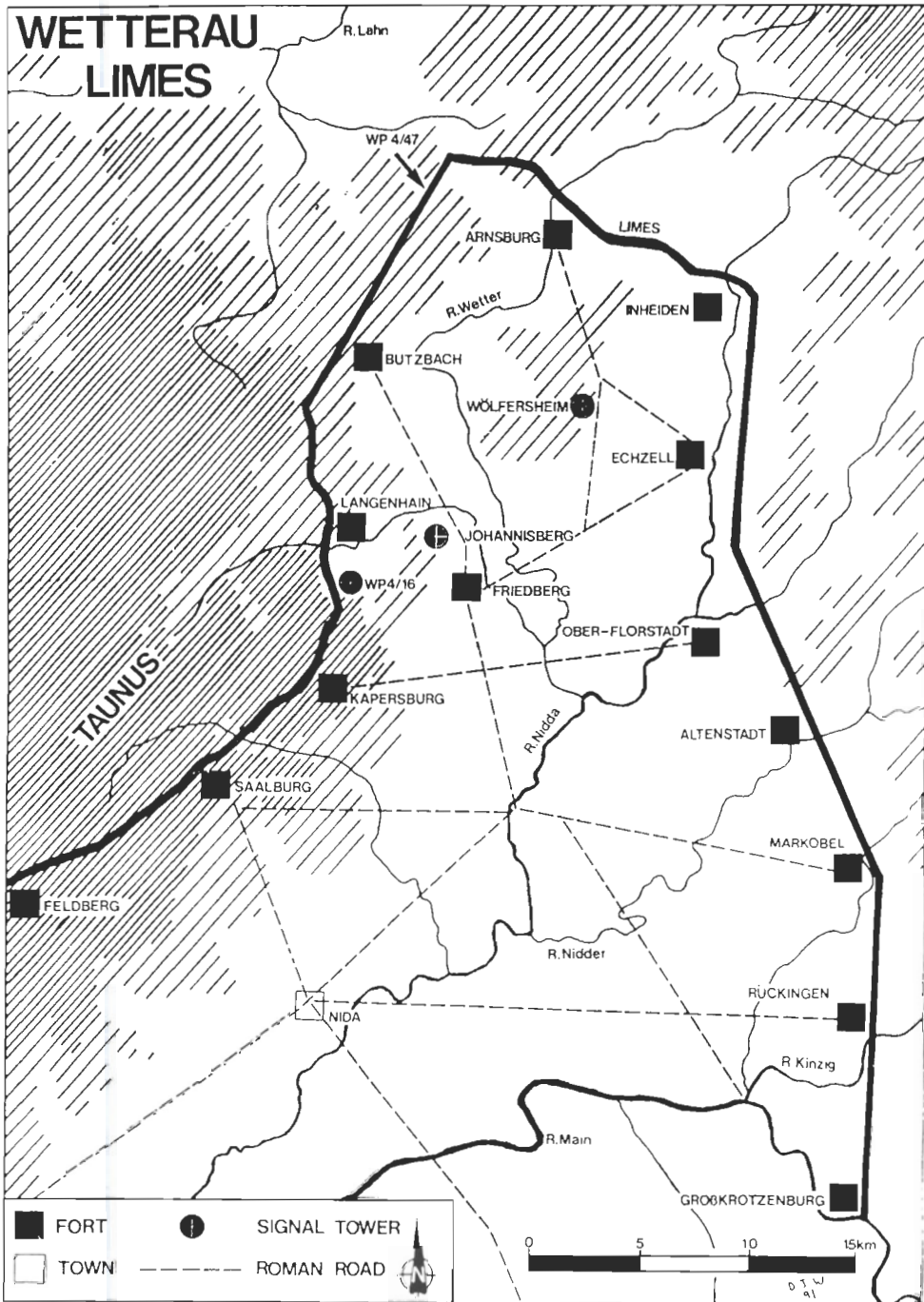


Fig. 10.1. Wetterau Limes

continuous stretch long enough to act as a significant (c. 14%) sample of the whole and largely free of the modern forestry which elsewhere makes studying intervisibilities almost impossible. It takes in 96 separate installations, including 14 fortlets and eight forts.

At first sight this study sector appears homogenous. The terrain is similar throughout. The frontier installations are all sited a little behind the line, with the forts at reasonably regular 6–7 km intervals and the watch towers are sited so as to be intervisible with their neighbours rather than to any regular spacing system. A closer inspection reveals a rather different picture, however, in which the sector breaks quite neatly into two, around WP 4/94b, to produce northern (Arnsburg — Ober Florstadt) and southern (Altenstadt — Groß Krotzenburg) zones, of 36 and 29 km respectively, each of which contains four of the eight forts, but which otherwise show markedly different characteristics. Most noticeably:

1. Although the southern forts lie only metres behind the Limes, those of the northern zone stand much further back. For example, Arnsburg and Echzell, are about 1½ km behind the frontier and Ober Florstadt is 2½ km from the line. Furthermore, in the North the forts are often built on prominent ground whilst, in the south, they tend to be built down in the river valleys.
2. The entire 29 km run of the southern zone is formed by just two almost perfectly straight sections, hinging on the fort of Marköbel. The more northerly of the two then continues slightly into the northern zone, but thereafter the line makes frequent twists and turns right around the northern Wetterau. Of course, the Limes is, here, turning anyway, to form the Wetterau loop, so that changes of direction are inevitable. But this overall 180° turn extends over almost 20 km and is barely discernible on the ground, yet within it the Limes zigzags constantly, often against the general trend of the loop.
3. In the south, the Limes takes no account of the terrain through which it passes. The rolling countryside offers considerable tactical opportunities, which could have been exploited easily by allowing small deviations in the line, yet it remains remorselessly straight. Consequently, it often faces steeply rising ground immediately outside the line and many of the towers have little or no view forward. In the northern sector, on the other hand, the priority seems to have been to gain the maximum possible tactical advantage from the terrain, and the Limes here runs from high point to high point as a much stronger line.

Most thinking about signalling on the German Limes has hitherto been based on the fact that its towers and fortlets are intervisible with their neighbours, and again, the assumption had grown up that signalling was carried out laterally, tower to tower, along the frontier line. But such a system would have been both inefficient and poor military practice. Why?

To be effective, any military communications system must fulfil certain basic criteria. Firstly, of course, it must work and, secondly, it must be as efficient as possible, which means that it must transmit as much information as possible, as quickly and reliably as possible, whilst using as few resources as possible. It must also strive to be as invulnerable as possible to enemy attack, which means that it must contain redundancies and fail-safe mechanisms to allow the system as a whole to survive the destruction of at least some of its component parts.

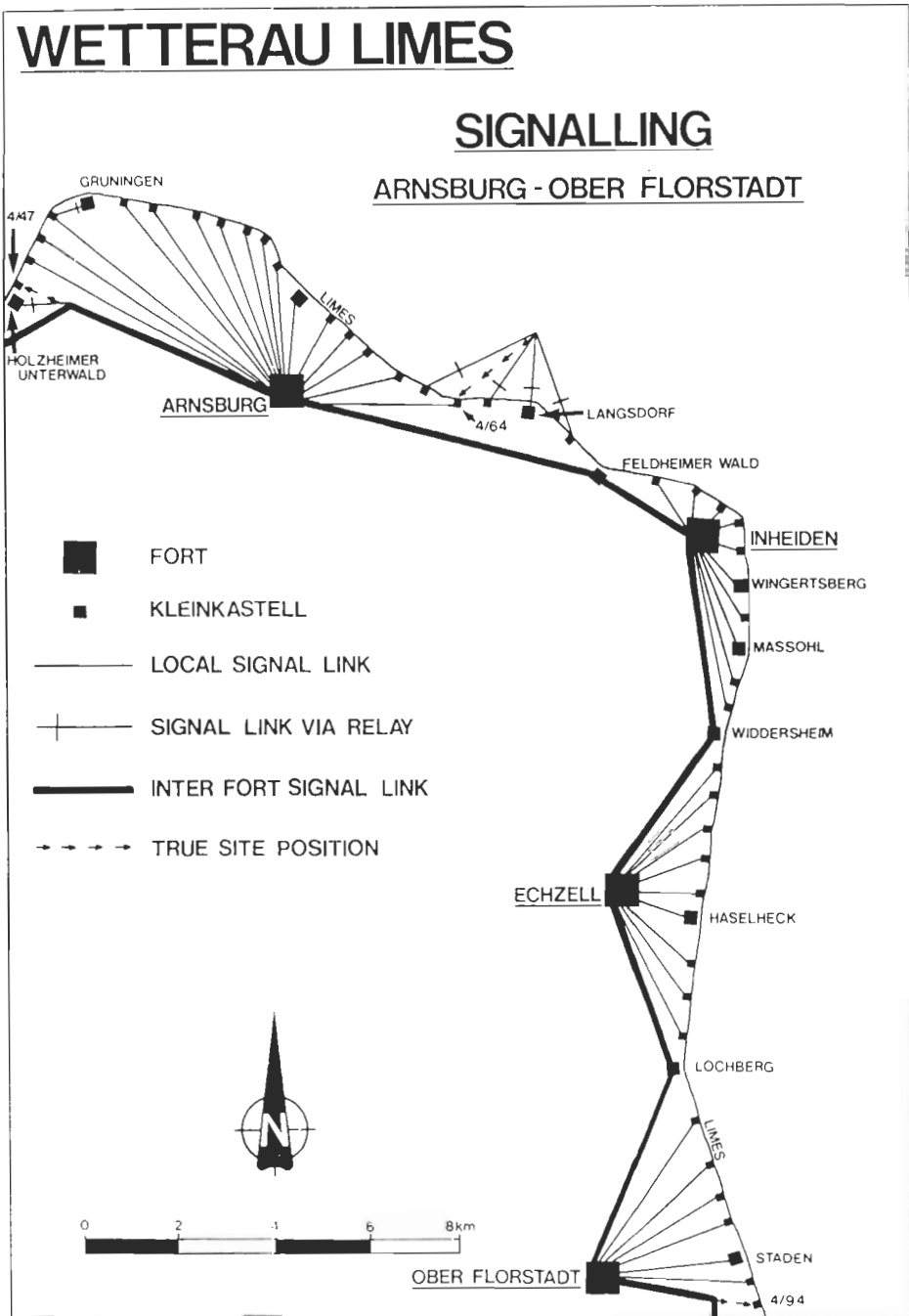


Fig. 10.2. Wetterau Limes. Signalling: Arnsburg-Ober-Florstadt

We can apply these criteria to the two basic choices of Roman signalling system available: the traditionally envisaged lateral system and the direct system found on Hadrian's Wall and elsewhere. Obviously both systems can be made to work, but the direct system is more efficient. It is faster, since most signals do not need relaying and, even if we accept that Roman long range signalling could transmit little more than emergency beacons, it also conveys more information because, as the signals are direct, the recipients can see where they came from and thus where the emergency was. It is also very much less vulnerable to attack.

Because the lateral system passes signals via every tower between their source and destination, an enemy has only to neutralise one tower for the system to fail. But, on a direct system, the destruction of any one minor installation has absolutely no effect on the others. Weaknesses might continue in inter-fort communications, which do usually have to be carried via relays, but even here the direct system is superior because its inter fort communications rely on specific installations, which can be protected. The lateral system can again be disabled by the neutralisation of any site and so one would expect any sensible military organisation to avoid it.

We can now turn to the actual position on the Limes, and again the study sector breaks neatly into the same two zones, with very different signalling arrangements in each. The northern zone (Fig 10.2) is almost identical to the Stanegate phase on Hadrian's Wall, for almost every installation enjoys direct intervisibility with a fort and of the handful that don't, all have a choice of at least two different one stage relays, so that none are dependant on any one other site for their communications (1). The northern zone also possesses an efficient inter-fort system, for although none of the forts are actually intervisible, each can communicate with its neighbour using just one relay and in each case the relay site is a fortlet, a rather more hardened installation than a mere tower.

The southern system, however, veers much more towards a lateral arrangement (Fig 10.3). Here 35% of the installations need relays before their signals can reach a fort and some require double relays via two other sites. Furthermore, plentiful opportunities to improve the position were ignored. For example, had Marköbel been just a few hundred meters further back from the line it would have been able to see five currently blind sites and yet it was built right up against the Limes. Worse still is the inter-fort system. Again none of the forts are intervisible, but here only one of the inter-fort links was accomplished by a single relay and, of the three remaining links, two required double relays, whilst that between Rückingen and Groß Krotzenburg needed no less than four; the neutralisation of any of which would have cut the strategic chain.

We are, therefore, confronted with a problem. Throughout its length, the study sector is made up of the same basic building blocks and runs through similar terrain. Yet, it breaks down into two distinct zones which, although contemporary, have different layouts and operating systems, one of which appears clumsy and vulnerable. Such a situation requires explanation.

For example, if the southern system had operated over the whole sector, we could have argued that, as this is a very early system, Roman frontier design was still in a primitive state which had advanced by the time of Hadrian's Wall and most of the other British systems. But it does not. Nor can we argue that we are seeing a process of learning, with the builders starting from Groß Krotzenburg using one design, then realising that what they were building was flawed and improving that design, for we can find the same two patterns repeated elsewhere on the German frontier, not just on the Domitianic Rhine-Main and Odenwald lines and not just in Germania Superior, but even on the much later, Antonine, Outer and Raetian Limes.

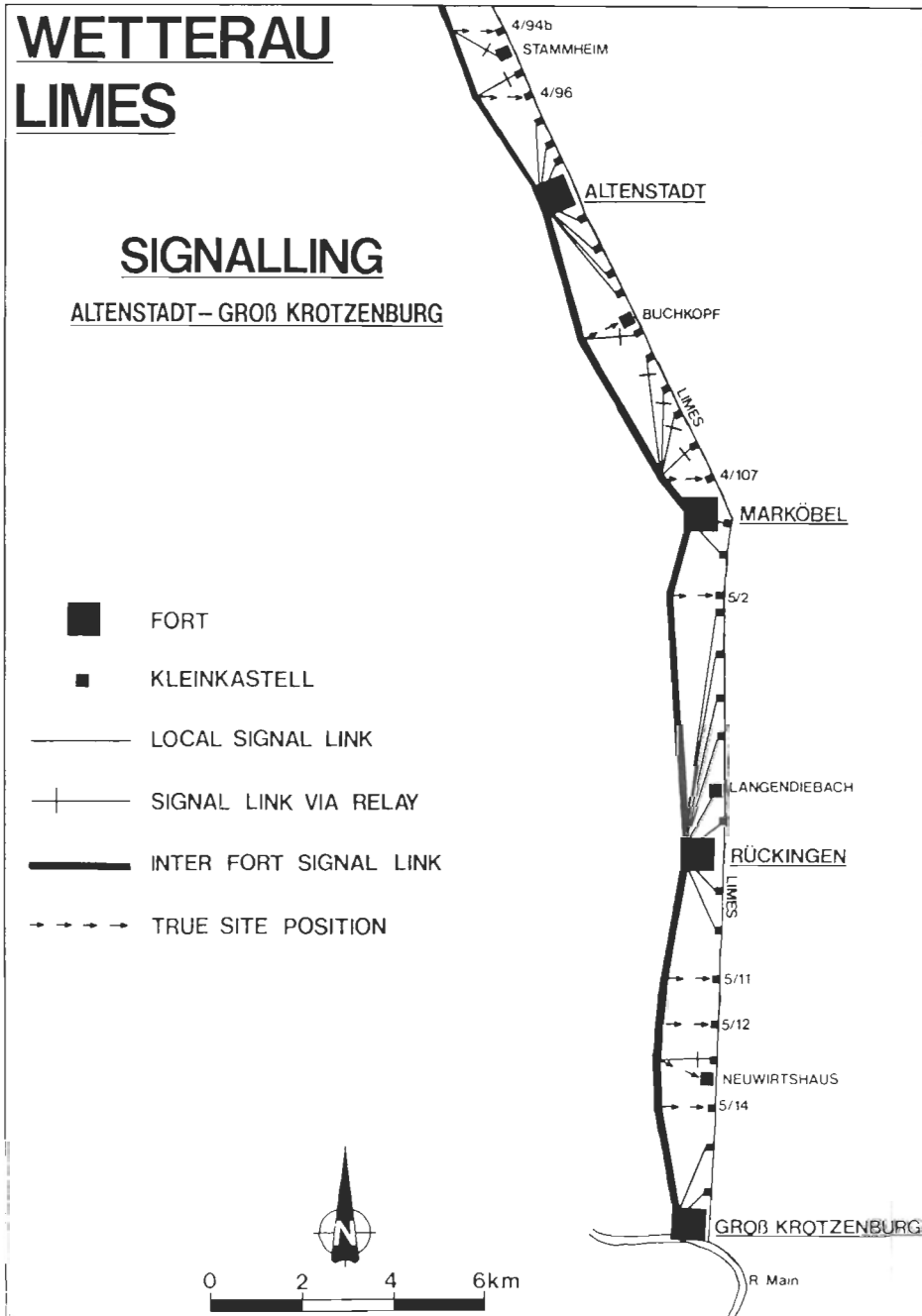


Fig. 10.3. Wetterau Limes. Signalling: Altenstadt-Groß Krotzenburg

Another approach might be to suggest that the two zones were built by different legions. But again, the two patterns survive into the Antonine parts of the line and although it is true that there were still legions in the area that had been there in Domitianic times, it seems unlikely that a unit would have been allowed to perpetuate obviously inefficient methods for so long. Presumably, then, whatever forces caused the emergence of two different frontier designs on the Flavian, Wetterau Limes were still operating in the Antonine period, nearly a human life time later.

One example of such a constant might be the strategic position and it is certainly true that it has always been easier to approach the Wetterau from the north than from the east. To cite this as a reason for the differences within the study sector, however, might be to misunderstand the role of Limes systems, which are probably more bureaucratic than strategic in nature, and there is no evidence, for example, from Hadrian's Wall, that other Roman frontiers relaxed the quality of their signalling systems in strategically less sensitive areas. Besides, there are still some routes into the eastern Wetterau, notably the Main valley itself and the smaller Kinzig valley, which now carries autobahn 66 and a modern railway right past the fort of Rüdkingen. Neither of these produces local strengthening of the system and nor do there appear to have been any specific local threats to the northern zone, for although there are some large hill forts in the vicinity, they do not now appear to have been occupied in the Roman period (Herrmann, 1985; 1986; Mildenerger 1977/8: 157ff).

There is, however, another possibility. So far we have simply dismissed the southern system as inferior, and by the criteria by which we have been judging it, so it was. Yet the Romans built it, and continued to build sectors like it. If we assume that they were not fools and would not deliberately perpetuate an inferior system, we must conclude that, by whatever criteria they were employing, the system was not inferior, or at least, since both systems continued to be used, that under certain circumstances it was not inferior. Theoretically, the direct system is so superior that it is hard to think of circumstances in which a lateral system would be built in preference to it, but need the fact that something was built necessarily imply that it was preferred? A more likely scenario is that under certain conditions the lateral system was all that was possible and once this point is reached an explanation suggests itself immediately, especially in a German context.

The direct system does, in fact, have one potential weakness, in that its successful operation requires a condition which the lateral system does not. As such a system functions by passing visual signals back from, as well as along, the frontier, it can only operate in open country. Yet southern Germany is, and always has been, a land of forests. The Romans may, therefore, have been faced with a choice between clearing trees, a massive undertaking even if only the lines of sight were cleared, and modifying the system. They would appear to have opted for the latter, because the great advantage of a lateral system is that, given one proviso, it can operate in forest.

Unlike the direct system, the lateral system operates in one dimension only, because all signalling takes place along the line of the frontier. It has always been assumed that a corridor around the Limes would have been kept clear of trees, to deny cover to an enemy and enhance the views of the watch towers. This means that, so long as the frontier and its installations were confined to a narrow and absolutely straight line, the presence of forest is irrelevant because the towers could see down this linear clearing and pass their signals freely along it. This is exactly the configuration of the southern part of the study sector and it is noteworthy that the one real bend in the zone hinges on the fort of Marköbel, which would explain why it was built so close

to the Limes, where it would have had a view along both legs of the line, and not in the position further back mentioned earlier. The obvious conclusion then is that the southern part of the study sector was forested in Roman times whilst the northern part was not.

This obviously has potential ramifications well beyond the subject of frontier studies, because if we were to succeed in using signalling to determine the Limes' environmental context in this area, we could do the same for any part of the line. But, for the moment, such potential must be approached with caution since not enough environmental archaeology has been done in the area to either confirm or confound the theory, although a major survey of the environment of the ancient Wetterau is now under way. But we have seen that the two basic layout types recur throughout the line and limited environmental work elsewhere has produced the expected results (Firbas 1930: 75ff, Knapp 1973: 115ff, Knörzer 1973: 71ff, Rösch 1988: 114ff, Streckhan 1958: 61ff).

There now remains one more problem with which signalling may be able to help: the history of the Limes' forts. These are still controversial, but it does seem certain that the full unit forts were not part of the original plan. They are almost all later, some of them considerably later. As a result, it has sometimes been assumed that the Limes initially stood alone, simply as a chain of watch towers, with no real backing by forces in its immediate vicinity. This would, however, have been such appalling military practice as to be incredible.

It is assumed that Limes systems provided an observation screen and monitored and controlled movements across the frontier, but there is obviously little point in observers unless they can tell someone what they see. Likewise, a system lacking the man power of a fort chain may well be able to monitor frontier movements, but there is a limit to what it can do to control them. This means that from the outset the frontier needed forts, for which the minor installations were merely eyes and ears. A system without forts would simply have provided hostages to fortune, for to leave small groups of men, unsupported, in isolated positions, in potentially hostile country is positively to invite their destruction.

In fact, there has long been a certain, limited, amount of evidence that the original plan did, indeed, involve forts, albeit smaller in scale than the later full size auxiliary bases, because excavations at a number of the principle Limes forts such as Saalburg and Altenstadt have revealed rather smaller, turf and timber forts underlying them, which seem to date from the earliest days of the system. But until recently few of these structures had come to light. However, during the signal survey it became very apparent that, in the northern sector, the Limes often followed the exact horizon of the forts and, moreover, this appeared to have been deliberate policy as the line had been weakened in a number of places and various tactical oddities had been caused as a result. It seems most unlikely that such exactness could have been achieved unless the forts had already been there in some form, or at least planned, when the line itself was laid out, and the only conceivable reason for allowing such weakening would be to ensure signalling links with the forts.

At the time the Limes survey was being written up, air photographs became available that confirmed the existence of earlier forts at Ober-Florstadt and Inheiden (2), whilst excavations suggested that Echzell (Baatz 1965: 139ff) may also have had such an ancestor (3) and so my 1991 published report (Woolliscroft & Hoffmann, 1991: 543) took the risk of saying that Arnsburg, the remaining fort in the northern zone, must also have had such a precursor, either underlying the known fort or very near by. Fortunately, just a few months ago an air photograph of the site was published (Hessisches Ministerium Für Wissenschaft und Kunst, 1993, 5+Abb5), which appears to show a double ditch, obviously underlying stone work from

the known fort and although this has not yet been tested by excavation, it could be that the last of these prophesied early sites has now been found.

Notes

1. The signalling maps have been slightly schematised in the interests of clarity by artificially displacing some of the lines of sight from their true termini. This merely prevents lines from crossing or running on top of one another.
2. My thanks to Dr P. Ille for allowing me access to and discussing with me air photographs from the Landesamt für Denkmalpflege Hessen archive.

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