Historical Analysis and Territory
A Contribution to the Study of the Defense of the City of Lisbon – The Peninsular Wars

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Abstract

The way in which archaeological information is obtained, from the traditional processes to automatic capture and graphic computation, allows the establishment of spatial relations, the integration of environmental factors from the past, and, thus, the determination of the social characteristics of the historic period under study. By applying new technology methods to the analysis of building works carried out during the Iberian Peninsular Invasions, which constituted three lines of defense of Lisbon against the Napoleonic troops, a virtual three-dimensional model can be constructed based on existing places and on the determination of blind-spots in the fields of vision between the watch-towers. The future of this new methodology for the consideration of historical investigation is closely linked to the development of Artificial Intelligence (AI) models, which allow new answers to new questions.

1 Introduction to the Period of the Study

Until now, the success of the defense of Portugal against the French invasions of Napoleon has been attributed to the alliance achieved, at the time, with the English, who made themselves available for this purpose very promptly, and who, according to them, in merely one year, reorganized the Portuguese army, recruited and trained the local populace, and brought about the construction of a defense system for Lisbon. That defense system was made up of three protective lines that encircled the city (Serrão 1982:59-87).

The defeat of the French troops in Portugal contributed, effectively, to the overthrow of the Napoleonic Empire. The long duration of the European campaigns, especially the failure that occurred in Russia, has been put forward as the reason for the demoralization of the invading troops, but since they were professionals, it is difficult to understand how they could have been defeated by simple peasants, largely agricultural workers armed with improvised weapons (Limpo 1887).

That is, in fact, what occurred due to the surprise factor of a defense system so ably thrown up on the terrain. In addition, the lack of consolidation of political power at that time was reflected in the underestimation of the importance of the event, and, consequently, in the absence of Portuguese representatives in the negotiations of Napoleon's surrender. What can be inferred is that this might well have been due to the skilful contrivance effected by those who most benefited from the whole process by obtaining dividends at an international level.

At the time, this victory was explained as having resulted from the implementation of a system of defense carried out by the English, in which: 1) the building was carried out in a short period of time (1809-1811) and without knowledge of the site; 2) the builders made use of a type of military architecture little exploited in Saxon culture (the Vauban plan); and 3) the construction work was so discreet that neither the local populace nor even French spies caught wind of what was happening. All of factors led to the defeat of a large, experienced, and well-equipped army.

2 General Technical Information

In fact, although it is theoretically possible to bring about the building of 152 forts in only one year, on the basis of five hours of labor per man to complete one meter in length of wall (far short of the numbers shown for those involved in this process, because after a certain point, it becomes impossible to manage construction work because of the presence of too many workers on the same site), there are other factors which had a bearing on the time needed for the building of a structure, such as the availability of materials (limestone) and equipment, as well as accessibility to the sites, which in this case was quite reduced for reasons of military strategy (i.e., dominant but discreet points in the landscape).

Even recognizing the possibility that this could have happened, that is, that the Linhas de Torres[1], as these defenses are known, were built in only one year, it is impossible that the movement in the area, whether related to the transport of materials (huge ashlars on ox-carts), or to the distance traveled (from the quarry to the site), or to the construction itself (panels of concentric walls, of huge length, alternated with ditches (successively repeated until the stabilization of the containment—normally three), would not arouse attention, thus canceling out any element of surprise, fundamental to the victory achieved. These considerations lead us, therefore, to raise the question as to whom the construction of the Linhas de Torres should be attributed.

3 The Vauban Technique

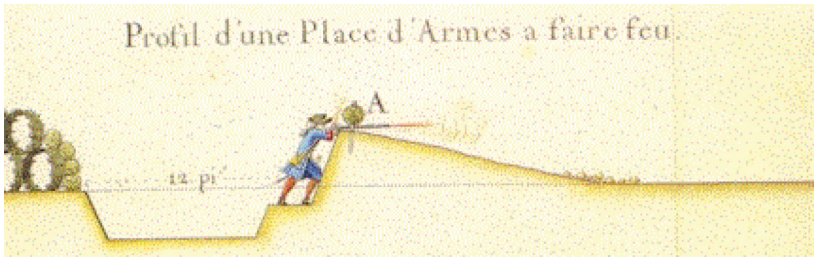

Figure 1. Sketch of the Vauban technique.

Figure 2. Typical plan of the bastions.

The characteristics of the structures, in spite of the advanced state of disintegration of some of the fortifications, leads to the supposition that the plans were those of Vauban—a French military engineer, exercising his profession between 1655 and 1707, who was responsible for the implementation of a new system of defense that remained in use until the beginning of the 20th century (see Figure 1). Notwithstanding the secret nature of the structural plan, this type of construction corresponds to the sophistication of the alterations of traditional fortifications, Greek and Roman, imposed by the advent of metallic munitions at the beginning of the 15th century.

Given the practical impossibility of making solid defense walls in stone sufficiently thick to withstand the impact of a metallic projectile launched from a distance of less than 100 m, their constitution was changed to a composition of alternating layers of stone and earth. This allowed the limitations of the former construction technique to be overcome, increasing the thickness of the parameters, and, in addition, the different densities of the materials were able to absorb the impact of a succession of missiles launched against them.

The inconvenience of such structures is that by themselves, they could not be very high (hence the need to be situated in strategic points of the territory).

To further increase the protective effect against the impact of munitions, the structure was built to a geometric design where the effects of the ricochet were exploited, which allowed, also, focusing the direction of the soldiers' rounds (Figure 2). Vauban's method was, moreover, complemented by a methodology of attack (three systems). Owing to its success it was considered infallible, until a further evolution in martial armament came about.

Acknowledging that the "invention" of Vauban's plan occurred from 1655 (the date of his nomination as engineer to Louis XIV) the construction of this type of building can only be justified if validly useful for defense purposes, or, that is, until the beginning of the 20th century, otherwise they would be considered revivalism or pastiches. For this reason, it seems pertinent to widen the research on the building of the defensive system of the Linhas de Torres to a period previous to its use but in keeping with international events.

4 Portuguese Military Science

In Portugal, little is known of the development of military science, partially due to stipulations associated with its disclosure. Moreover, the majority of the previous documents of the Philippine Dynasty (1580-1640) were "rescued" by Spain, a fact which further increases the difficulty of investigating this period and topic.

It is known that it was King João IV (a contemporary, just, of Louis XIV) who established the bases which, in 1790, gave rise to the Royal Academy of Artillery Fortification and Design (later the Military Academy). The lack of documentation, due probably to the secrecy surrounding knowledge related to the art of war, supported by a sort of closed and corporative education, does not allow this line of reasoning to be pursued. Nevertheless, it is also known that it was during the reign of King Pedro II that Manuel de Azevedo Fortes, one of the 50 academics who created the Academy of the History of Portugal and, later, was promoted to First Engineer of the Kingdom (1719), was invited to carry out the tasks of technical support (1695). Until his return to Portugal, his training took place in the most important centers of Europe, including Paris, where for six years he lectured at the University of the Seine; that is to say, in the same period when Vauban was active, which allows the supposition that they knew each other, especially considering the interest both manifested in the same science.

Thus, it is perfectly possible to suppose that the one person who had the knowledge and who, very probably, analyzed the terrain in order to establish the defense of Lisbon was Manuel de Azevedo Fortes. At the time that he was professionally active, the convent of Mafra was constructed

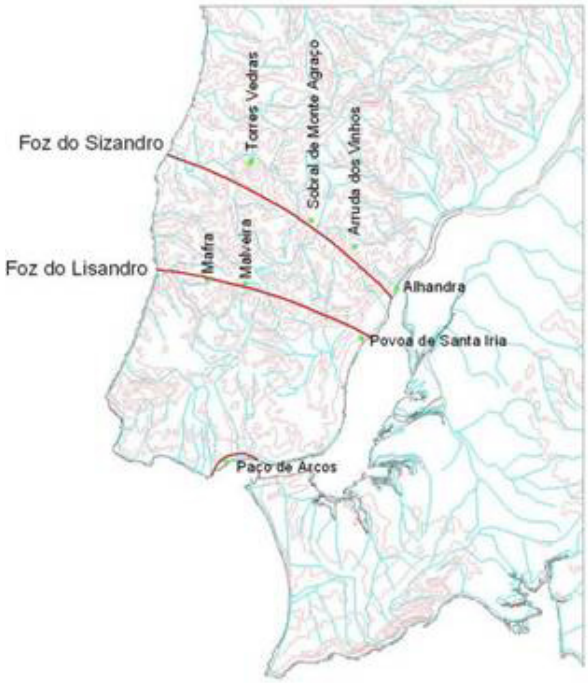

Figure 3. Sketch map of the system of the Linhas de Torres with the location of Mafra (convent) in relation to the centers where the main conflicts were registered.

Figure 4. Panoramic view of the Forte das Carvalhas.

(1717-1744) by order of King João V in gratitude for the birth of his son and heir, the future King José I. The site of the building, the stone used and the movements on the terrain, could well have been a way of justifying other work which needed to be kept secret (see Figure 3).

In the light of this exposé, it seems highly likely that the Linhas de Torres were built at the same time the Mafra Convent (1717-1744), under the direction of Manuel de Azevedo Fortes. The centralizing policy of the (future) Marquis of Pombal (that, despite is political activities, could not have known the First Engineer, because he was only designated Prime Minister in 1750, after Manuel de Azevedo Fortes' death) took it upon himself to keep the secret: the defense of Lisbon was a State affair, and the State was the Marquis.

The discreet way in which the construction was carried out, the secretiveness associated with it and the time which elapsed until its use, allowed nature to bestow on the places a camouflage which made them invisible, in spite of being located in a zone of ridge crests (Figure 4).

With the Napoleonic invasions, the time had come to activate the defense system. Again, there is a hiatus in the sequence of military sciences (curiously, the same occurs in France relating to the "lineage" of Vauban: Haxo, Séré de Riviéres, and Maginot). Captain José Maria das Neves Costa[2] is known to have guided the English in reconnoitering the field. In this way, the difficulty of not knowing the terrain could be overcome, but a judicious choice such as that which was made takes years to prove efficacious. The most straightforward explanation is that the supervision of Neves Costa brought into being the existing structures, and the intervention of the English consisted of adapting them to the martial equipment which was then in use; that is, to redevelop the military building work planned in 1700 to meet the necessities of defense of 1800.

5 Making the Model

The idea that guided the development of this work was the determination of the origin of the structures that made up the main blockade to the Napoleonic Invasion. However, in spite of being able to establish the probable time-frame through the simple comparison of international events, it is very possible that some of these structures had been implemented on pre-existing ones, particularly those from the time of the Romans and the Iron Age. For this reason, the research plan would have to contemplate earlier phases of construction.

5.1 Data Collection

The first phase in the project, obviously, will be an overview of the information relating to the forts, especially of those elements which might lead to their localization and the constitution of their structures. Given the instability experienced at the time, it would be advisable to distinguish between what would have been informal defense structures thrown up by the populace, such as the conversion of windmills—again, dominating points in the countryside—which could be used for lookout systems and/or sentry boxes functioning autonomously, and structures dedicated to and planned with the intention of being a constituent part of an integrated defense system. Thus, the register of properties considered as military by the Army would seem to be a good starting place for the study.

On the other hand, we can gain some advantage from the proceedings of the English who recorded everything (Horward 1965, 1973), justifying the high number of members of their army with an exhaustive rearguard action and also because of their being recent events, which leads us to surmise the existence of relatively well-preserved documentation. All the forts are numbered and their constitution, in terms of personnel and material, can be discovered (Henriques 2005; IGEoE 2005), making possible, also, the indications of their hierarchical organization.

From this overview, it can be seen that, for example, the first line, whose existence as defense for Lisbon can only be justified with the support of a second, has a configuration that is different in the west from in the east, taking advantage of a natural structure such as the development of the

river Sizandro (Lino 1959-1960:159-164) (from the mouth as far as the site of occupation in Runa). After that point, it becomes difficult to trace any one single line, because of the profusion of random structures, especial in Sobral de Monte Agraço as far as Alhandra. Parallel to this, it is also towards the east that the best-positioned structures are found in terms of visibility.

The maps[3] of visibility (although such measurements depend on other factors, such as the transparency of the atmosphere, the existence of obstructions, the height of the target, and, in extreme situations, the curve of the earth) show that the structures situated at west are "more blind", depending on it's linearity to communicate, than the structures situated to the east, visually dominating the territory allowing to observe all the southern bank of the estuary of the Tagus. For these measurements it was taking into consideration that good human eyesight, unaided by any supplementary device, has, on average, a range of 20 km.

From this differentiation arise the first speculations as to the period of the original construction of the structures. At the time of the Romans, the city of Lisbon was not very important, in spite of their use of this settlement, because it was situated outside the circuit of the main commercial maritime routes. The mouth of the Tagus was in Alhandra and the whole zone of the estuary was considered as an inland sea. Thus, the occupation of the dominant points on Alhandra's area correspond to the earliest period, probably from the Iron Age, made by autonomous structures that explore the natural slope of the terrain for defensive reasons. For this reason the probability for persistent occupation in this region is considerably high.

In turn, the western zone is more suitable for the defense of the crossing zones, that is, where the river Sizandro can be crossed, and for the command of the ocean, a specialty deeply rooted in English customs, at least since the time of the corsairs.

The second line, making the visual connection between the first and Lisbon, was constructed specifically for the city's defense. The implementation of this line probably came to be supported by a system of lookout posts and watchtowers that formed another line, which passed through Sintra, as a reinforcement of the original plan. This was very probably made by the Marquis of Pombal, since all the places where his intervention has been verified correspond to important zones in the conflict. In order to test this hypothesis, the characteristics of the stones used in the structure have to be analyzed, and detection work must establish whether they originated from the same place as those used in the Convent of Mafra, well known as being from Pero Pinheiro and Cascais. For this purpose, satellite images can be used and different radioactive emissions can be analyzed to see if they match the quarries from where the stones may have originated. In a second approach, tests can be carried out to see if the traces of extraction, even from extinct quarries, can be found near the structures (and if so, which quarries). It is very likely that the two situations occurred simultaneously, since it was necessary to adapt the existing structures to the equipment of warfare used. Meanwhile, it is expected that indications about the phases of construction of the structures as a whole will be obtained. Finally, it will be necessary to add information concerning the arterial roads and the topographical zones more favorable to foot-traffic.

Figure 5. Example of a military road (below) (technology similar to that of Roman roads) and a contemporary cartographic record of the same road (above)(Luna 2000).

Traditionally, networks of roads are organized on a hierarchical basis, from beaten tracks, which are the result of informal use, to secondary roads and main roads, in permanent use and which also can be used for cars and other means of transport (figure 5). In turn, the persistence of use results in difficulty in attributing a date of road use, which can only be overcome if there is some construction system to be found as a basis for its delineation (only expected to

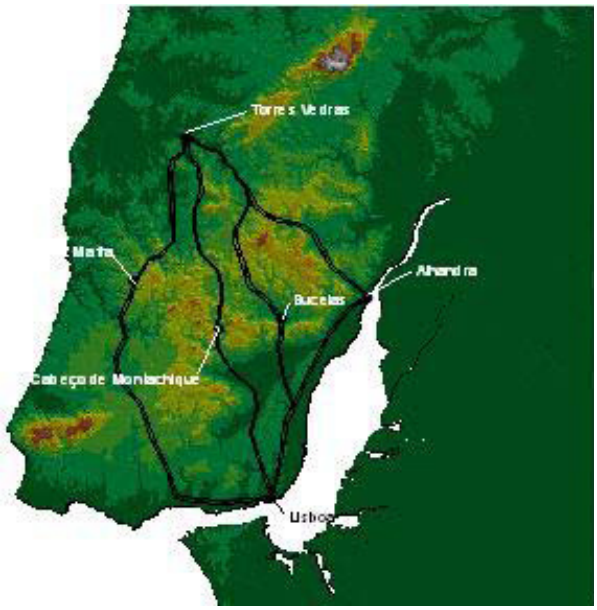

Figure 6. Sketch map of the Royal Roads.

occur in cases of the more important roadways.)

Four royal roads from our study period are known: three which link Torres Vedras and Lisbon, via Mafra, Cabeço de Montachique and Bucelas, respectively, and the fourth which connects Alhandra and Lisbon, following the northern bank of the Tagus estuary (Figure 6). In spite of being excellent roads for military use, their disadvantage was that they passed through three gorges, making them subject to ambush.

However, the type of arms used (iron artillery, 6.9 or 12 in caliber, mounted on old carriages with small wheels, difficult to drive over irregular terrain) meant that on the one hand, access to the forts had to be made easier (also for the maintenance of these redoubts), but which, on the other hand, in terms of defense, had to be made more difficult to use in order to avoid being seized by enemy forces.

5.2 Superimposition of Information

At the start of a study of this nature, no claims should be made about what one is going to find because that may reflect a bias in the interpretation of the results. In the present study, the question being raised is the duration of the construction of the structures and the technical-cultural knowledge of the person to whom their construction is attributed. To some extent, it would be easier to think that the French had fallen into their own trap. For this purpose, what should be linked to the digitalization of information to be considered are the records (if they exist) of the period in which the structures were erected so that a dynamic model can be created.

The structures, apart from being geo-referenced on the terrain, will be continuously complemented by three-dimensional (3D) graphic information in a way such that indications can be obtained about those structures' defensive potential within the environment in which they exist. Their accessibility must be analyzed according to the records of the period, normally carried out by on-site survey, gaps being complemented by the analysis of critical paths. With the creation of this virtual archaeological model, the "armies" can be manipulated on the battlefields, their performance analyzed and their optimal deployments checked.

6 Conclusions

It is a common experience that in times of conflict the succession of events is so rapid that, occasionally, it becomes difficult to arrive at the truth. What is proposed is to draw closer to the quantification of information related to the historic event by means of its digitalization associated to the place in which it occurred. This digitization should be done in order to obtain a rigorous work base suitable for scientific research, and which may also eventually serve as an aid to understanding what really happened in that period of time. Above all, this essay aims at constructing a memorial to those who have contributed to this history of Europe with their efforts.

Endnotes

[1]Lines of Towers, literal translation

[2]During the French occupation, Captain Costa worked as an aide to the French Engineer Colonel Vicent (Rosa 1979), responsible for the drawing up of the plan of defence at Junot's request, along with the Portuguese Engineer Major *Barreiros*.

[3]Drawn up at ground level based on topographical maps on a scale 1:25,000

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