

The Postal Service of the Portuguese Expeditionary Corps (1917–1919): A Time-Step Analysis Using Historical Data Integration in a GIS Environment

Patrícia Franco Frazão, Sandra Domingues, Jorge Rocha
and José Paulo Berger

Abstract This paper aims to discuss the Campaign Postal Service (*Serviço Postal de Campanha*—SPC) of the Portuguese Expeditionary Corps (*Corpo Expedicionário Português*—CEP) which served in Flanders during World War I. The Mission of the SPC was to ensure the exchange of correspondence between Portugal and the Portuguese Expeditionary Corps in France, as well as to regulate internal postal communications between the various units and formations. Much has been written about the participation of the Portuguese Army in this conflict, but the vast majority of studies either omit or refer only very briefly to the SPC. Our objective is to describe the implementation by force of circumstances of a civil structure such as the SPC in a military organization, the contribution of which is considered invaluable in the history of the participation of Portugal in the Great War.

The SPC left for France in 1917 under the guidance of Humberto da Cunha Serrão, an officer in the General Administration of Posts and Telegraphs who had been appointed to command and organize this service. Our aim is to describe the organization of the postal communication network in Flanders using cartographic and textual sources as well as a geographic information system (GIS) to compile new maps which can show not only the organization and operation of the service, but also the adversities it had to overcome in order to carry out its function. We also intend to emphasise the importance of establishing institutional cooperation relations for the study and dissemination of historical cartographic sources.

P. F. Frazão (✉)

Fundação Portuguesa das Comunicações, Lisbon, Portugal
e-mail: patricia.salvado@fpc.pt

S. Domingues

Faculdade de Letras da Universidade de Lisboa, Lisbon, Portugal
e-mail: sandra.domingues@campus.ul.pt

J. Rocha

Centro de Estudos Geográficos, Universidade de Lisboa, Lisbon, Portugal
e-mail: jorge.rocha@campus.ul.pt

J. P. Berger

Direcção de Infraestruturas do Exército, Lisbon, Portugal
e-mail: berger.jpr@mail.exercito.pt

1 Historical Context and the Need to Appoint a Civilian Team to Organize a Military Service

Portugal joined the Great War alongside the Allies. Although officially acknowledging its role as combatant in 1916, the Portuguese troops had left for Africa (where they fought against the Germans) well before they left for Flanders. On 23 February 1916, Britain invited Portugal to take an active part in all Allied military operations, and in August 1916 the Congress decided to send the Portuguese Expeditionary Corps (CEP) to Flanders (Afonso and Gomes, 2010).

An Auxiliary Division was formed with the responsibility of organizing the troops to cope with any emergency in the country's national territory. This division, based in the Tancos Manoeuvres Camp, was the foundation of the preparatory school for future members of the Portuguese Expeditionary Corps (CEP), later called the Training Division. The combat training exercises would only terminate on 10 August 1916 (Themudo and Severiano, 2004).

As the British Government had invited Portugal to participate in its military activities in Europe, political activities went hand-to-hand with the military preparation. A joint military mission of the English and French came to Portugal to discuss the assignment of Portuguese troops to the European theatre of operations with the Portuguese Government and the Joint Chief of Staff. The meetings resulted in the signing of two conventions: the Anglo-Portuguese Military Convention of Cooperation according to which the Portuguese Expeditionary Corps should cooperate with the British army in France where it would receive its final military instructions; and the Franco-Portuguese Convention which would be instrumental in the shipment of the necessary staff to supply heavy artillery batteries to France.

The headquarters of the Portuguese Expeditionary Corps was composed by 17 departments amongst which were the Postal Service Campaign. In 1917, the first troops of the Portuguese Expeditionary Corps embarked for Brest and from there continued to Aire which was the agreed meeting point.

The Portuguese sector, known as the Portuguese Sector of Flanders in the Middle Lys, was part of the British First Army which had a battlefront of 50 km with the Second Army operating to the North, and the Fifth to the South. The Portuguese front which ranged from Scheteland Road, West of La Bassée, to New Bond Street, East of Lavantie, never exceeded 18 km. The rear limit on the northern flank was the Lys canal, and on the southern flank was the La Bassée and Aire canals as far as the railroad bridge in Merville–Berguette.

The contact with the enemy was *via a no man's land*, a continuously guarded strip of land 100–400 m wide which separated the two combatant forces. Apart from being covered with shell holes and craters of all sizes and completely turned over by artillery fire, this was also an area subjected to long winters with frequent fog, rain and snow which kept the soil soggy and the temperature much lower than what the ordinary Portuguese soldier was used to (Marques, 2014).

The realization that military operations leading to victories or defeats could no longer be built solely on the battlefield, but required the effort of the whole Portuguese Society, was one of the most important realities of the Great War. The

importance of receiving news from loved ones regardless of postal censorship was a key factor in sustaining the morale of the troops and reassuring those back home of their well-being.

This need, among many others, was to be provided by the Postal Service Campaign (SPC) which had been created on 14 December 1912, but was not effectively implemented. Despite being a peaceful service, its mission was to support the Army when it was operating within national territory and in the colonies. Given the state of war in 1916, the Military Postal Service had to be reorganized so that it was able to connect Portugal to the Portuguese Expeditionary Corps in Flanders.

To render the SPC more effective, the General Administration of Posts and Telegraphs was asked to provide a technical team to organise and run the service: 48 men were recruited, all volunteers, with the exception of Humberto Serrão who was an officer working in the General Administration of Posts and Telegraphs. All 48 men assumed a Lieutenant or Second Lieutenant ('Alferes') ranking according to their professional category in the General Administration of Posts and Telegraphs (Serrão, 1958). An additional auxiliary team of about 100 men about whom very little is known, was recruited from sergeant and soldiers who were unable to serve on the front.

The procedures the SPC was to follow were in 1916 reviewed at the Tancos Manoeuvres Camp where the team was training. During their military training the team concluded that it was necessary to restructure and adapt the existing 1912 instructions for the Campaign Postal Services as these were outdated and not suited for the specific circumstances of the theatre of operations in Flanders. To effect this, a team was sent to Flanders on 6 January 1917 to inspect the operational area of the Portuguese Army and prepare for the Postal Service.

This mission confirmed that the Postal Service should be organized in a completely different way from what was stipulated in the 1912 instructions and rather defined in line with British Army instructions. The new instructions published at the beginning of 1917 had unfortunately no application in the field due to the constant changes in CEP organization which the Postal Service had to adapt to. The principle reason for this change was a new tactical mode of employing Portuguese frontline forces, according to the British Expeditionary Force (BEF): one Army Corps with two divisions instead of a reinforced one.

The departure of the SPC team to Flanders happened gradually. Under the Convention of January 1917, Britain had lent seven ships to Portugal for the transportation of the expeditionary troops which were joined by two Portuguese ships—the *Gil Eanes* and the *Pedro Nunes*. As Spain remained a neutral country, some of the members of the SPC travelled by train wearing civilian clothing.

In 10 February 1917 the postal service at the E.C.B.P [*Estação Central da Base Postal*/Central Postal Base Station] was formed in a very rudimentary fashion in a shed next to the British postal station of Boulogne-Sur-Mér, using the material brought from Portugal and with the tools provided by the British Postal Service (Serrão and Feijão 1920, p. 11).

Due to the number of soldiers who were arriving from Portugal, the Portuguese postal stations always remained close to the cantonments of CEP units which im-

plied heavy postal traffic. Based on the network sketches designed by the technical team of the SPC, some stations changed their location dozens of times in an area ranging from 11 to 18 km. Most postal stations were located around the Aire region, and relocated as the battle moved between Armentières and Lens and between Merville and Bethune.

Due to the intense movement of CEP military units and the movement of officers and men between the units, there was daily correspondence between post offices. The mailbags were opened in all the SPC units where correspondence and parcels were handled, and then delivered to the postal ordinances of the different units who waited daily at the postal station to which they were designated to transport the mail to their units.

Each unit had one person in charge of the postal service with the responsibility to deliver all correspondence to the addresses indicated, and to redirect correspondence and orders after these had been submitted to local censorship. All CEP correspondence was censored in the sender unit (or formation) by the unit commander or his equivalent. If a letter contained objectionable matter, it was marked 'CENSORED' and, after being opened and receiving a number that identified the unit, delivered to the officer responsible for the unit who closed and stamped the envelope, preferably on the upper left corner. Upon its arrival at the Operating Base, the letter could, if requested by the Committee of Censorship, be reopened and examined by official censors who then returned it, labeled "OPENED FOR CENSORSHIP".

The team's arrival in Flanders was the starting point for our investigation, the methodology of which we will describe in the following sections. Our aim is to understand how a hastily trained civilian service was able to organize and implement a mail distribution system in articulation with the military organization in an adverse geographical space.

Despite all these challenges and the fact that they operated more than 2000 km away from Portugal, the SPC was able to ensure that recipients normally received post within 5 days. They also established a dynamic workflow which, between 1917 and 1919, involved the daily circulation of approximately 113 postal bags resulting in the distribution of a total of 32,862,989 postal items which included ordinary and registered letters and parcels (Serrão, 1942).

2 Disclosing the Activities of the SPC Through the Collection of Humberto da Cunha Serrão

The project discussed here is based on the private collection of documents that were donated to the Portuguese Communications Foundation in 1999 by the family of the engineer Humberto da Cunha Serrão (1885–1959). Humberto da Cunha Serrão joined the General Administration of Posts and Telegraphs in 1902 and reached the position of Services Director in 1932. His entire career is documented in his collection, which includes evidence of his participation in World War I. In December 1916, with only 8 days to prepare, he had to join the Portuguese Postal Service

Campaign of the Portuguese Expeditionary Corps. As 1st officer he was given the post of Captain and, being the most senior officer, he assumed the command of the service.

Humberto da Cunha Serrão's collection is the primary source of information that allows us to reconstruct Postal Service activity during World War I. However, as we shall see in more detail, the time and circumstances in which a large part of this documentation was drafted, introduced a significant number of inaccuracies and inconsistencies that made us look for alternative information sources. We need to consider the loss of documentation that occurred through the exchange of correspondence after the return of the SPC team to Portugal, which includes the disappearance of a report prepared by Humberto da Cunha Serrão whilst still in Flanders.

It is important to stress that the project implied a geographical analysis matrix of the organization and functioning of the Postal Service Campaign. This required an interaction between textual and cartographic sources, which is not always easy to implement as we shall demonstrate below.

2.1 The Collection of the Head of the Postal Service and Other Documents of the Portuguese Communications Foundation

Processing the information contained in the previously described collection implied dealing with different types of documents, such as maps, postal network schemes, letters, reports, and some manuscripts, printed and dated between 1917 and 1942 (Serrão, 1948). This led to a stage of transcription and information mapping which we hoped would help us to fully understand the way the SPC functioned.

Throughout this process, the team was confronted with many obstacles, mainly related with deciphering abbreviations, unclear handwriting, lack of uniformity in the terminology applied, and inconsistencies in the opening and closing dates, location and relocation of the postal stations. The data we worked with were interwoven data collected from Humberto Serrão's diary and data collected from other documents in his collection with data collected from the Military Historical Archive and other references. In completing this phase, we raised a number of questions and problems which we tried to solve accessing other existing collections from the Fundação Portuguesa das Comunicações (FPC), particularly their collection of newspapers and the *Official Bulletin of the General Administration of Posts* in which the orders and instructions given to the SPC were published.

2.2 Searching Other Archives: Completing, Complementing and Clarifying the Collected Information

The starting point for this new stage was not only to obtain sources that would complement what we already had and clarify the data obtained from the analysis of the collection of Humberto Serrão, but also to find information on the military

organization into which the SPC was integrated. It was crucial that we should understand how the Portuguese Army was organised and how it operated.

Due to the nature of the subject under study our research focused on the archives of military or related institutions—the Military Historical Archive (AHM), Directorate of Army Infrastructure (DIE), League of Combatants (LC), Portuguese Commission of Military History (CPHM), and the Portuguese Navy Hydrographical Institute (IH). However, we did not forget other libraries and archives for issues related with the Portuguese participation in World War I. All these institutions promptly agreed to collaborate with us and graciously offered us all the relevant information we could find in their collections.

The information collected from the AHM could be divided into two groups: textual documentation, which completed, supplemented or clarified the information collected from the collection of Humberto da Cunha Serrão, and cartographic information which assisted us, using GIS capabilities, to compile the maps we required to understand the functioning of the postal service which was so important to the morale of the troops.

As we completed the review of our sources, we moved on to the analysis and comparison of the data collected from the AHM with the data extracted and processed from the collection of Humberto Serrão. This intersection of data was performed at two levels: between textual sources, and between textual and cartographic sources. This phase solved some contradictions and filled in some information gaps, but also indicated that not everything was clear, a conclusion not uncommon when one is working with information from different sources and origins which were produced at different times or in the context of a war. Realizing that the few maps we had found could not cover the entire postal network or even reflect the several changes in the locations of the stations due to the constant movement of the military unit they served, we decided to create new maps using GIS capabilities.

3 GIS Analysis of Historical Cartography

GIS applications in the field of the history of cartography are very valuable, for instance to assess the accuracy of early maps, establish a database of places and historical administrative units, and integrate early maps into GIS or digital images. This phase of our work was divided into three distinct parts. The two first ones were associated with two different concepts sometimes regarded as synonymous, i.e. geocoding and georeferencing. The latter part consisted in the geographic analysis itself.

The first part is the process of associating an address or a place name with geographical coordinates on the map. In a spatial database this is done as a point layer with the name of the place as an attribute to the point location (thus the confusion with the term ‘georeferencing’). This is one way of geocoding. The second is the process of associating images, e.g. rasterized maps, with map coordinates. Once the image is associated with the map coordinates, it can be overlaid with other informa-

tion. Geocoding is therefore the process of taking coded location information (such as addresses or grids) and turning them into explicit location information (X and Y coordinates, usually). Georeferencing, on the other hand, is the process of taking a raster image or vector coverage, assigning it a coordinate system and coordinates, and translating, transforming, and warping/rubbersheeting it into a position in relation with some other spatial data, such as survey locations, street intersections, etc. For both processes one could use GIS software such as ArcGIS or QGIS (open source).

3.1 *Geocoding*

Our goal here was to identify the locations of the points and features of an early map on a modern base map, i.e., to find strictly comparable points and features between the early map and the modern base map. This modern base map with the identified points and features was used as the reference map to evaluate the accuracy of the early map.

Identifying the locations of the points and features of an early map on a modern base map can be very difficult for several reasons. First, some of the points or features of an early map may have disappeared over time. On the other hand, even though some of them might still exist today, their names may be different from those indicated on the early map. Further difficulties are caused by place names that are the same as the old ones but currently represent different features. Therefore, one must be very careful when conducting studies using this procedure.

Our geocoding procedure relied on quantum GIS software which uses Google maps interfaces to search for locations. With this approach we managed to geolocate 96% of the places where the SPC was stationed during the Portuguese campaign. The remaining 4% were located using bibliographic research and inspecting the records available online. All the data were projected onto a WGS84 datum in order to be compatible with Google Earth and to guarantee a wider dissemination (see Fig. 1).

Subsequently, we applied the same procedure to the localities related to the battlefront (see Fig. 2).

3.2 *Georeferencing*

Because features on the scanned original early maps are just images, these features need to be digitized as points, lines, or polygons to create vector GIS layers in order to perform spatial analysis. Once vector layers are created from the original early maps, the attribute data, such as the population of the administrative divisions, can be added and linked with these spatial features.

Integrating early maps into GIS or digital images creates valuable resources and techniques to study historical spatial information, as well as information relative to the early maps themselves. Nevertheless, this is a time-consuming, labour intensive and expensive procedure.

The maps produced by the British Expeditionary Force to support operations along the Western Front were of three scales: 1:10,000, 1:20,000, and 1:40,000. For the most part, the three series were identical as the maps which had been first drafted on a scale of 1:20,000 were later either enlarged or reduced.

The three different scales also used the same grid system. The 1:20,000 series was the most popular topographic map used by British and Canadian forces. Due to the particularity of its mission, Portuguese data were also almost exclusively overprinted on the British 1:20,000 map series. Since the British maps used in northern France at that time were produced using Belgium data and were discontinued right after the end of the War—which resulted in further loss of information on their precise location—the only possible solution was to georeference the data. The first step was to digitize the original early paper map using GIS. When we managed to get a 1:40,000 map of France which showed all the locations of the Portuguese troops, we used that as our reference map and matched the other maps of equal or greater scales to it grid.

In order to georeference the 1:40,000 map, the identical points on the two maps had to be selected as common control points for an overlay. Because the scale of an early map might vary in different places and its orientation might also be different from the modern base map, it is critical to carefully choose the common control points that can most accurately be overlaid to produce the maximum attainable degree of coincidence between the two maps. The principle of selecting the first common control point should be based on which point will provide the best possible overall average fit of the two maps.

Geometrically the point in the centre of a map is deemed the best for this purpose. The principle of choosing the second common control point is determined by which point will most accurately show the scale and orientation of the maps when it is connected to the first common control point. The most distant point from the centre is the best for this purpose as it has the smallest percentage of error in the overlay process when connected to the first control point.

Control points must be carefully selected around the edge of a map so that they are distant from each other and have a smaller percentage of error in the data conversion process. In addition to the distance from the centre, a point in an area of denser features and identified points should carry more weight than those in areas of fewer features and identified points. We eventually managed to find and mark 116 control points, almost all of them referring to buildings and crossroads, and widely dispersed over the map.

The last step was to examine the degree of distortion of the early map based on the overlay of the early map onto the modern base map. The absolute distortion can be analysed by the linear distance between the point on the early map and the identical point on the modern base map. The relative distortion of the early map can be examined by measuring the ground distances and angles between two points on



Fig. 3 The location of the Portuguese corps between 11 and 20 of December 1917

the early map and comparing these with the identical distances and angles on the modern base map. Using a second order polynomial transformation, this process resulted in an overall error of 6 m, with a minimum of 3 m and a maximum of 8 m. As a result, we had a map showing the location of the Portuguese Expeditionary Corps which we first transferred to vector format and then transformed to Google Earth (see Fig. 3).

3.3 *GIS Spatial Analysis*

Having the geographical location of both the SPC stations and the Portuguese Corps, we could overlay this information with other GIS related data, such as Digital Terrain Models (DTM). In Fig. 4 we can see that all the battles took place in lowlands which, coupled with the extremely severe weather conditions of that time, helps to explain the difficulty encountered by the opposing parties to gain just a few 100 m.

Despite being a very interesting method of analysis, data overlay can also be reductive as the GIS allowed us to progress even further in our analysis. Hence we moved to a space-time analysis of the Portuguese presence, taking into account not only the places where the troops were stationed, but also the time they spent there (in days). For this we applied a Kernel density estimator.

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