

THE THIRTY YEARS' WAR BATTLEFIELDS' PLANS IN THE CZECH REPUBLIC IN THE THEATRUM EUROPAEUM

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ABSTRACT:

The systematic research into the battlefield plans of the Thirty Years' War (1618 – 1648) in the Czech Republic has been under way in cooperation of the Charles University and the Czech Technical University in Prague. The research deals with the collection of 26 plans from 17 localities which were published between the 1620s and the 1650s, mainly in the first six volumes of the *Theatrum Europaeum* in Frankfurt am Main, in contemporary newsletters or in some other form. The paper presents the study of the engraving depicting the Central Bohemian town Kolín in February 1640 and it can clearly demonstrate the benefits that can be gained from using advanced geospatial technologies to study historical sites and image related analysis. The GIS software provides number of useful tools and functions which can be used for making a digital terrain model, various analyses (the visibility, the scale analysis), georeferencing of the old map files, spatial identification of objects marked on the engraving (the course of a former fortification wall), location of raster maps or the picture of the engraving on a digital terrain model and creation an isometric view with the location of the imperial army in accordance to the engraving and mapping the possible routes of troops across the Elbe River. It is evident that the historical engraving was not designed as a full-fledged cartographic work and does contain a number of inaccuracies, however its analysis using GIS technologies brings valuable findings about the features of the town Kolín and its surroundings in the second half of the 17th century. It is supposed that the common historical and geospatial research will continue focusing on some other localities of the Thirty Years' War Battlefields in the Czech Republic.

Keywords: *Research, battlefield plans, Geospatial technologies, GIS, maps.*

1. INTRODUCTION

Since 2005 systematic research into the battlefield plans of the Thirty Years' War (1618 – 1648) in the Czech Republic has been under way in cooperation with the Charles and the Czech Technical University in Prague. The research project has not yet been completed; however preliminary theses and results can be presented. The study of the engraving depicting the Central Bohemian town Kolín in February 1640 can clearly demonstrate the benefits that can be gained from using advanced geospatial technologies to study historical sites and image related analysis.

2. THE PLANS OF THE THIRTY YEARS' WAR BATTLEFIELDS

The collection of 26 plans from 17 localities was published between the 1620s to 1650s - mainly in the first six volumes in the *Theatrum Europaeum* in Frankfurt am Main (18 plans in total). The other eight plans were published in contemporary newsletters or in some other form. The plans are always composed as high oblique views, not oriented according to points of the compass. Mostly, they are oriented according to the view of one of the rival

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armies. In the cases of town sieges, plans are usually composed as a view from a dominant viewing point (generally upland). The plans are compiled from a greater number of partial observations as arise from the confrontation of the plans with later cartographic sources and field observations. A battlefield was always systematically walked through by the authors, and sketches of the landscape sections were taken from elevated points in the vicinity. Besides a good visible vantage point, the places where important war events took place in the landscape were very important for the choice of viewing. The plans were published in a form of well-balanced regular rectangular compositions; however in reality they often pictured complicated polygonal sections of the landscape which depicted the given terrain very unevenly. Parts of the landscape that were less or not at all interesting during the primary field observation are filled by fictitious scenes in the final compositions. From some published plans it stems clearly that the author of the field sketch and the author of the final published compositions are two different persons, as the authors of the final compositions sometimes did not understand the original field sketch. The example of the battlefield plan from the locality Třebel is presented on the **Fig. 1**.



Fig. 1 The battlefield plan from the Třebel locality.

The plans can be divided into two qualitatively very different groups. The more numerous group (13 localities in 19 planes) is formed by pictures whose basis was most probably either a project of the field fortifications or siege works designed for preparation of the particular battle or for documentation of the battlefield or relics of the fortifications after the war event and which were used primarily as study material for war strategy and tactical studies. Many of the plans are signed by military engineers. A series of battlefield plans from the Swedish army campaign into Bohemia in 1647 can serve as an example of project documentation of the field fortifications created before the battle. The field sketches are made by *G. W. Kleinträtl/Kleinsträll*, a military engineer. A three-part series of the

plans documenting sophisticated tactic manoeuvres at the Jankov battlefield on the 6th March, 1645, made by engineer C. Mardenfeldt, can serve as an example of the documentation created after the battle and designated for future study.

A set of five plans of significant study character was made by C. Cappi, a Habsburg imperial engineer who in the 4th volume of *Theatrum Europaeum* documented particular events of the Swedish army invasion into Bohemia in 1639-40. Precise ground plans of field and city/town fortifications are typical signs of these engineering projects and designs. Having compared them with both the later cartographic sources and fieldwork study of the relics of fortifications, they represent very accurate documentation. Particular ground plans are set into schematic maps of the terrain in which settlement patterns, water-courses and water areas, features of vegetation, morphological conditions and distributions of military brigades are depicted concisely. Surprisingly, little attention is paid by the author to road network. Particular landscape structures are of orientation point character and they are usually reduced to simple icons, comparable with map symbols on contemporary maps.

A smaller group (9 plans of 5 battlefields) consists of compositions, aimed primarily to celebrate the victor of the battle or to inform the general public of the given event. On the whole, the documentation point of view, i.e. realistic depiction of the event and the landscape is suppressed in favour of formal attributes. Some designs are of the character of complicated art compositions, others do not overreach the level of superficial sketches of poor art and documentation. Most of the plans were created at the beginning of the Thirty Years' War and they document the events from 1618-1621, with the exceptions of two engravings depicting Prague besieged by the Swedish army in 1648.

3. USING GEOSPATIAL TECHNOLOGIES FOR THE ANALYSIS OF A HISTORICAL ENGRAVING

3.1. The engraving of Kolín in 1640

The engraving of the Central Bohemian town Kolín is the theme which was studied as a thesis work under the auspices of the Department of Mapping and Cartography at the Faculty of Civil Engineering CTU in Prague (*Soudná, 2009*). Within the Department, the research focused on the analysis of old maps of Bohemia has been carried out last years (*Cajthaml, 2007; Čechurová, Veverka, 2009*). The aim of this research thesis was to find similarities between the depiction of the town in the historical engraving (1640) and the current state of the town. It involved a comparison of the engraving with assumed reality, a determination of observation points for drawing the sketch for the engraving, an approximate demarcation of the depicted area and setting the engraving on a 3D model of relief. Cartographic, iconographic and documentary historical resources have been used, together with today's mapping products and knowledge. The tasks have been conducted with the use of ArcGIS 9.2 software.

The engraving presents the town walled with fortifications, its suburbs and close outskirts, including the Elbe River. The inner town is depicted by as a ground-plan, for other parts an oblique North-Eastern projection prevails. The author depicted relief, rivers and wetlands, vegetation, roads, urban and economic objects. Special attention was paid to fortification subjects and the town surroundings, which is probably connected with the military nature of the theme – the picture also portrays soldiers arriving from the locality of Kutná Hora. The drawing pattern for the copperplate was done by military engineer Carlo Cappi and it was first published in Frankfurt in 1650 by the publisher Merian as a part of *Topographia Bohemiae, Moraviae et Silesiae*.

3.2. Background data and their processing

One of the first steps was the creation of a digital terrain model of the area in the form of a triangulated irregular network using the ArcGIS 3D Analyst. The vector hypsometric data of the Fundamental Base of Geographic Data (ZABAGED) was used as input data, along with several types of maps, both historical and contemporary: the maps of 1st Military mapping from 1781, the imperial mandatory prints of the Stabile cadastre from 1841, 2nd Military mapping from 1851-2, the raster Base map of the Czech Republic 1 : 10 000 and the current orthophoto with a resolution of 0,5 m.

A crucial preparatory part of the workflow was the georeferencing of old maps. Current map data, provided by the Czech Office for Surveying, Mapping and Cadastre, had been already georeferenced in the national coordinate system S-JTSK. Therefore, the coordinates of identical points have been transformed to S-JTSK using affine transformation. The RMS errors of transformations substantially differed, which had been expected due to different map origins. For the imperial mandatory print of the stabile cadastre, the RMS error was 1,6m (using 9 identical points), for 2nd Military mapping 5,9 m (using 17 identical points) and for 1st Military mapping it was 30,8 m (using 15 identical points).

3.3. Identification of important objects

Following the study of the maps and relevant literature, fifteen important objects were identified in the Kolín engraving and on some of the maps, as well. Among them there were towers, churches, gates, mills, etc. **Table 1** shows the overview of these objects and their identification on the engraving and other cartographic sources. At the **Fig. 2**, the identified points are highlighted on the picture of the historical engraving.

Table 1. Identified objects on various resources.

No.	Object	Engraving	1 st Military mapping	Stabile cadastre	2 nd Military mapping	Raster Basic map	Orthophoto
1	Zálabská tower	YES	ambiguous	YES	YES	YES	YES
2	St. Bartholomew Temple	YES	YES	YES	YES	YES	YES
3	St. Vitus church	YES	YES	YES	YES	YES	YES
4	St. John Baptist church	YES	ambiguous	YES	ambiguous	YES	YES
5	Pražská gate	YES	YES	deducible	NO	NO	NO
6	Labská gate	YES	NO	deducible	NO	NO	NO
7	Kutnohorská gate	YES	YES	deducible	NO	NO	NO
8	Kouřimská gate	YES	YES	deducible	NO	NO	NO
9	Podskalský mill	YES	YES	YES	YES	YES	YES
10	Podklášterský mill	YES	YES	YES	YES	YES	YES
11	gibbet	YES	YES	YES	NO	NO	NO
12	bastion	YES	NO	YES	NO	NO	YES
13	fortification tower	YES	NO	YES	NO	YES	YES
14	fortification tower	YES	YES	YES	NO	YES	YES
15	castle	YES	YES	YES	YES	YES	YES

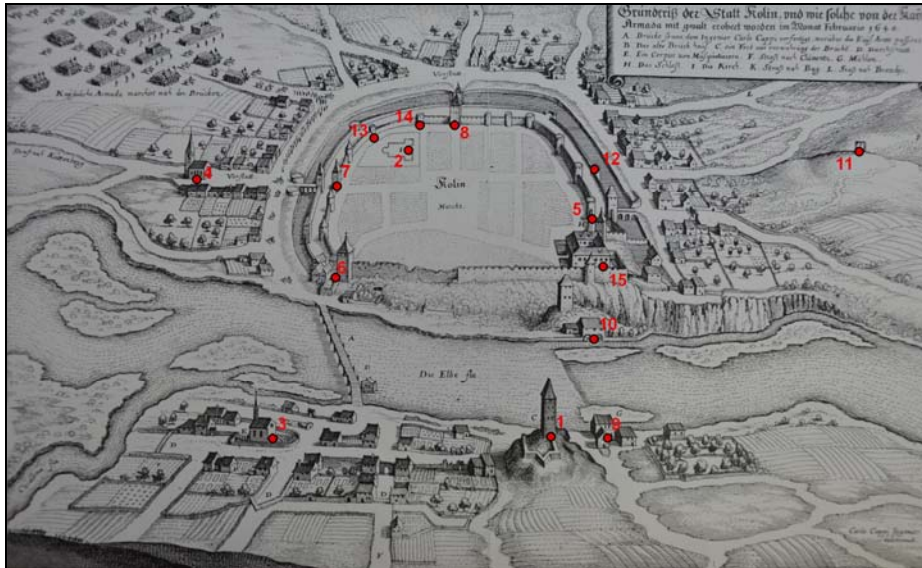


Fig. 2 Engraving of the town Kolín from 1640 – identified objects.

While comparing the engraving with historical depictions several interesting facts have been revealed. On the eastern part of depicted area, the river Cidlina and some swamps are shown. The swamps can also be found on the map of 1st Military mapping, but the river is not marked at this place on any of the historical maps, including Müller's map of Bohemia. Looking at the terrain in this locality, it doesn't seem probable that the river Cidlina ever flowed into the Elbe here. More likely it may be a flooded wetland or a meander, nevertheless the author of the drawing considered it as a river. A number of details are depicted quite accurately - for example, the drawing of the church towers. The street network of the inner town corresponds with the presumed state but only in general: the shape of the main square and the orientation of main transit routes are kept, nevertheless the depiction of the block of houses on the engraving and on the stabile cadastre quite substantially differ.

3.4. Scale analysis

It can be derived from the general location of the objects that the engraving is not in a unified scale. Based on the comparison of distances between selected points, a calculation of corresponding scales has been done and the scales varied from 1:3600 to 1:9100 (Table 2).

Table 2. Scale analysis.

Join of points	2-Jan	3-Jan	4-Jan	11-Jan	13-Feb	4-Mar	13-Mar	13-Apr	15-Jun	11-Aug	15-Aug
Real distance [m]	430	320	810	1,080	50	690	590	510	350	1,080	320
Distance on the engraving [cm]	10.9	8.9	14.4	14.5	1.3	9.4	11	5.6	9	13.7	7.2
Approximate scale	1: 3900	1:3600	1:5600	1:7400	1:4200	1: 7300	1:5400	1:9100	1:3800	1:7800	1:4400

3.5. Observation points

By using the identical points marked on the map of the 1st Military mapping and further comparison of the engraving with other map sources, probable observation points I to IV have been estimated (Fig. 3) which might be used by the author while drawing the draft for the copperplate. Another appropriate point is Zálabská tower (point V) which was definitely used for observation purposes also in the 16th and 17th centuries.



Fig. 3 Estimated observation points (on the map of 1st Military mapping).

In the case of point I, it was a gallows – an important object on a conspicuous place, which is depicted also on the map of the Stabile cadastre. However, on the current terrain model this place is situated in a former quarry. For the purposes of further analyses, a reconstruction of the hill peak in ArcGIS has been done by means of changes in position and height of selected TIN nodes.

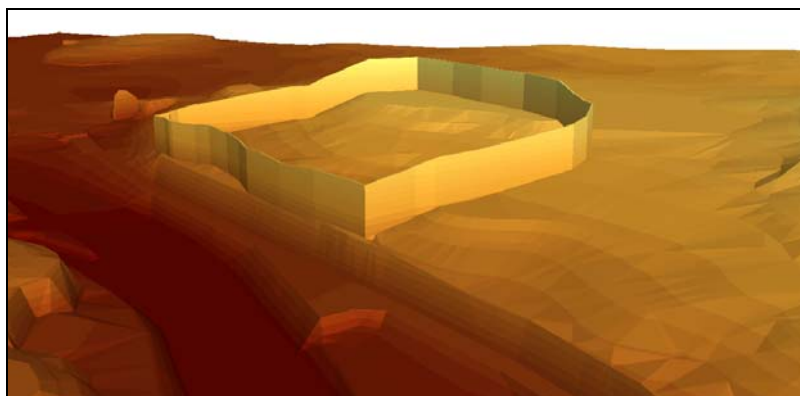


Fig. 4 Modelling of the fortification wall.

An important outlook barrier must have been represented by the inner city fortification wall, whose height of eleven metres is mentioned in the literature. The location of the wall can be traced from the remains of the fortifications depicted on the map of the Stabile cadastre and also from written sources. With use of this information it was possible to make a schematic model of the wall (**Fig. 4**).

3.6. Visibility analysis

The verification of observation points was done using the software tool *Viewshed – Visibility from a point*, which is provided in ArcGIS. This analysis is only regarded as indicative, as the observation points have only been approximately determined and also all the other changes in the terrain, the character of buildings, vegetation cover and the height of the observer etc. are not sufficiently known. Examples of visibility solutions to the five observation points are presented here at the **Fig. 5**.

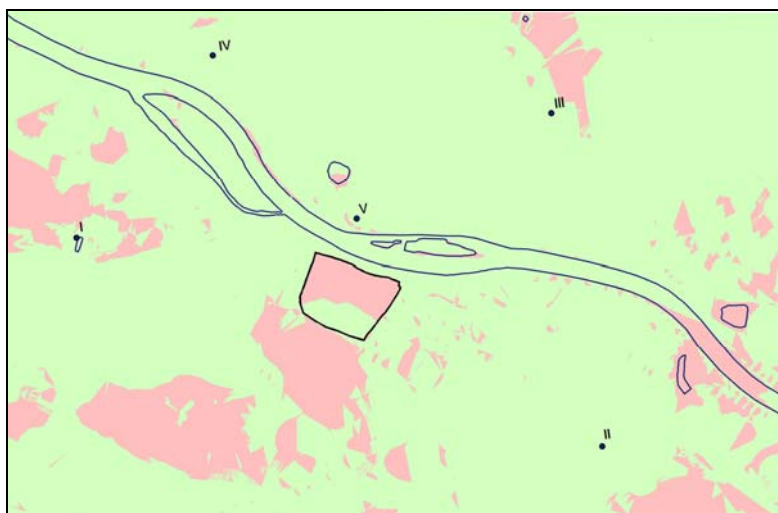


Fig. 5 Visibility analysis (red areas – without direct visibility from the marked points).

It is noticeable that from any of the observation points the author could not see the street network of the fortified inner city and therefore he probably only walked through the centre. This fact can explain considerable inaccuracy in the street network. If we compare the results of the visibility analysis with the visual matching of the engraving and map sources, in many cases we can state their mutual confirmation. Determined observation points supposedly correspond with the vertexes of a polygon representing the area depicted on the engraving. This area can be characterized as an irregular pentagon extended in an east-west direction, with the length of the sides approximately from 800 to 1200 metres.

3.6. Isometric views on the digital terrain model

The current software enables to locate raster files on a 3D model and create an isometric view with stressing the vertical component by the Z unit conversion. Due to the uncertainty of the scale, the picture of the engraving cannot be unambiguously georeferenced – so it was placed on the digital terrain model in three variants, preferring the

city centre, outlying surroundings or a compromise solution. With regard to the image quality and to the flat terrain of the locality, the final isometric views cannot provide a better benefit to the analysis of the investigated engraving. The final example (**Fig. 6**) is the model with the location of the imperial army in accordance to the engraving and mapping the possible routes of troops across the Elbe River.

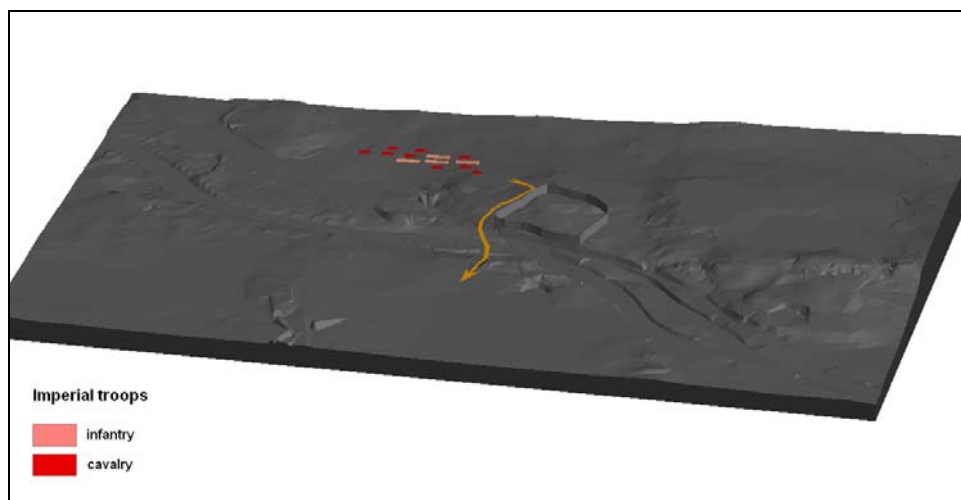


Fig. 6 Digital terrain model with location and possible route of the imperial army.

4. CONCLUSIONS

The results of the research can be seen on two levels. The first is represented by the results related to the engraving itself, depicting the town of Kolín in the year 1640. The second level is a possible benefit of using geospatial technologies for processing spatial data with historical themes. The area depicted on the engraving is in a shape of an irregular pentagon, nevertheless the image of the area is not in a unique scale. The engraving portrays the details that the author probably considered as important quite well – for example the fortification objects. On the contrary, the location of some other objects is obviously incorrect. The benefits of using geospatial technologies for historical spatial data processing are undeniable. The GIS software provides number of useful tools and functions which can be used for making a digital terrain model, various analyses (the visibility, the scale analysis), georeferencing of the old map files, spatial identification of objects marked on the engraving (the course of a former fortification wall), location of raster maps or the picture of the engraving on a digital terrain model and creation an isometric view with the location of the imperial army in accordance to the engraving and mapping the possible routes of troops across the Elbe River.

It is evident that the engraving depicting Kolín in 1640 was not designed as a full-fledged cartographic work and it does contain a number of inaccuracies, however its analysis using GIS technologies brings valuable findings about the features of the town and its surroundings in the second half of the 17th century. It is supposed that the common historical and geospatial research will continue focusing on some other localities of the Thirty Years' War Battlefields in the Czech Republic.

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Cartographic sources

Maps of Military mappings:

© 1st (2nd) Military Survey, Section No. 127 (O-8-V, O-8-VI),

Austrian State Archive/Military Archive, Vienna

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<http://www.geolab.cz>

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Stabile cadastre: Stadt Neu Kollin im Böhmen 1841 – Central Archives of Land Surveying and Cadastre, Prague

ZABAGED[®], orthophoto, raster Basic map – Land Survey Office, Prague

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