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NETWORK-BASED COMMAND-CONTROL SYSTEMS, AS POSSIBLE SOURCES FOR FUTURE MILITARY HISTORY RESEARCH

Abstract

21st century has brought such kind of changes in the way of warfare that the question occurs, whether the military history research, as part of the military sciences, would be able to meet its task in the future, still using only traditional sources. The documents produced at the staff level, used today as basic sources of research, will not necessary be sufficient to serve with an appropriate and detailed picture to the future historians about the new kinds of adapted forces, procedures and technologies. This paper attempts to make an image of one circle of future challenges to military historians, and some possibilities of the answers to them as well, through the presentation of changes in C2 supporting technologic background. During this, we like to present some parallels between the battlefield commanding procedure, and the analytic military history research, revealing also the relation of the two fields.

A 21. század a hadviselésnek olyan változásait eredményezte, amelyek szükségessé teszik a kérdés feltevését, vajon a hadtörténelmi kutatás ezen túl is képes-e hatékonyan működni a hadtudomány részeként, ha továbbra is csak a hagyományos eszköztárára támaszkodik. Az ezek között megtalálható vezetési dokumentumok a jövőben nem lesznek elegendőek, hogy hiteles képet szolgáltassanak a napjaink technológiájával alkalmazott erőkről, eszközökről és eljárásokról. A C2 rendszerekhez kötődő háttér technológia bemutatásán keresztül írásunk a hadtörténészek jövőbeli munkájának néhány nehézségét és azok lehetséges megoldásait kívánja bemutatni. Ennek során a harctéri vezetési folyamat és a hadtörténeti elemzés párhuzamait, a két terület kapcsolódási pontjai is bemutatásra kerülnek.

Keywords: *military history research; battlefield visualisation; C2; C4ISR; TOPCCIS ~ hadtörténeti kutatás, harctér vizualizáció; C2 C4ISR; TOPCCIS*

INTRODUCTION

Nowadays we like to refer to our society as being information-based.[1] The information revolution of the 21st century didn't left the military as a social subsystem, neither the war, as kind of a special social circumstance untouched. Parallel to the brighter social mechanism, it is common to speak about a revolution in warfare as well. To remain able to understand the phenomenon of war, and find the means of fighting – and of course winning – it, military sciences, including military history as well, have to keep pace with the ongoing tendencies in warfare. First of all, this means the defining and understanding of these tendencies and their effects. On the other hand, utilization of the possibilities, delivered by the broadly spread technologies enables the science to labour new approaches of research methodology. This paper is meant to depict some of these possibilities. During this however, the working procedure of these new means is only described in a depth which is necessary to the understanding of the main topic. Since yet – as far as we are informed, and at least in military history – these methods don't exist, particular protocol, or methodology regarding them are neither reviewed.

According the paper's basic concept, the main call of the military history is the collection and interpretation of military experiences of the past, thus making them utilizable in exploration and explanation of the recent and future tendencies. In this regard, military history is only viewed here as scientific research, and a specific aspect of understanding warfare. We are aware, that military history can fulfil other goals as well.

In our view, three main fields can be described as more or less specific kinds of military history. First of all, scientific research for military sciences as defined above. The other two fields could be named such as traditional and descriptive military history. In the first case, we can mention examples like uniform- or unit history, among others. These are first of all meant to help a community identify itself. They can serve with traditions that help to strengthen the cohesion of a minor or major community, and shape its members views of themselves and the world. Descriptive history is more of a scientific nature, by telling the "stories" which fill these traditions. Nevertheless they lack one important scientific feature; they only tell the stories without trying to analyze them. Thus no real explanation is given, which could serve with a historical answer to the present and future military questions. In practice, the three fields act mostly together. Scientific research is of course based on descriptive examples, which can be analyzed, and the outcome can serve the traditions as well. However, we are not meant to mention such specific fields, like unit- or technology-history, which in some cases require other kinds of sources and methodology of research.

Our main goal is to sketch some possibilities that make the future military history research of the military events taking place nowadays and in the near future, possibly more effective. Thus our starting point is the methodology in use today, which is based on the research of the regular official documentation. Thus the paper will not cover research of the more ancient ages, before the birth of the higher staff.

ON THE NATURE OF THE RECENT MILITARY REVOLUTION

Broader social environment of the changes in warfare can be described with the shift from industrial to information-based society. On the level of the main society as well as the military, this means beyond the introduction and use of state-of-the-art information devices, also kind of new approaches in the collection and utilization of information. In fact, the revolution hasn't

[1] This is of course mainly true to the developed societies. At the same time, information technology – and its impacts as well – is present also on the periphery more than ever before, even if these societies don't adapt to it on the level – or even in the manner – as the developed ones.

been caused by the appearance of the new technology itself, but more by the effects of its utilization. [1]

In warfare this means that the ways of collecting, storing, and processing the information are changing thus is changing the way, how each organization is gaining advantage from the increased access to it. During this, new kind of technology doesn't only enable former tasks to be fulfilled more effective, but the repertoire of the warring parties can be broadened also by new functions, being nonexistent yet. [1]

Referring to Martin van Creveld, as the result of the technology development, running military organizations and performing military operations assumes such level of information requirement that makes high level automatisation inevitable. In this way, key of warfare, and motivator of every pursuit will be information itself. [1]

As another aspect of the tendency, we can also tell that on the modern battlefield, the deployment of forces, based on the classic organization hierarchy, which has been evolving since the appearance of the standing armies, will be replaced by the higher autonomy of the operational-tactical level, and by the deployment of ad-hoc modular units, like battle group formations. Through these principles of organization, and by the utilization of C^4ISR systems[2] more comprehensive utilization of the existing forces becomes possible, which at the same time presumes, in order to maintain effectiveness, the highest possible level of digitalization and automatisation of command and control systems. Thus information (more precisely information superiority) becomes the key element of victory or defeat.

As mentioned before, the revolution isn't caused by the technology in itself, but it is accompanied by adequate methodology (automatic command system, delegation of decision authority to lower levels), and also by an organizational shape (tactical-operational level battle groups), serving as a frame to the whole. The whole of these is resulting in the warfare of our days. What does this mean from the aspect of the military history?

As being said earlier, referring to van Creveld, this kind of warfare requires the collection and analysis substantially higher quantity of information in comparison to the past times. We can assume as well, that to reconstruct these events in the future, more information, and the analysis of more sources will be necessary. It is likely, that like on the battlefield, also in the room of the military historian, the maintaining of such huge amount of available information will only be possible on a higher level of digitalization. As the technology helps the commander during his work, it also makes reconstruction easier to the researcher. At the same time, resulting from the nature of the warfare as depicted above, this will not only be possible, it likely becomes even inevitable.

If we assume, that in the warfare of our age, information, and its effective utilization (information superiority) is the key momentum, then research in military sciences, particularly in military history has to be approached from the very same direction, to distil the required experiences.

Regarding the other aspect of organization and methodology, appearance of commanders authority on lower levels, the speed-up of decision-execution-feedback circle, organizational frames being raised on occasion and temporarily, and the more intensive use of available forces are such circumstances, which the traditional documentation, created to follow the work of the classic organizational hierarchy, hardly could manage to follow up entirely and effectively.

This paper would like to discourse basically about the use of already existing technologies, and the possibilities of newer methods, but it is also likely that the introduction of these makes some kind of organizational adaptation in the research system necessary as well.

It is worth mentioning, that the warfare of the 21st century is beginning to show an even more complex shape in other aspects, like asymmetry as well. These could also very likely have an

[2] C^4ISR: Command, Control, Communication, Computer, Intelligence, Surveillance, Reconnaissance. Common name for automatic and digital command- and control systems.

impact on the military history research, and the circle of utilized resources, but present paper isn't meant to discuss these other aspects.

NETWORK-BASED WARFARE

As stated before, information, its gathering and most effective utilization as possible, are the core element of the warfare of our time. This is realized in the practice through information operations, meaning:

„coordinated military activity in the information space, affecting the information, and information systems, wielding appropriate effect on the will and ability of the enemy and others to support the operational goal, while maintaining own information and information systems." [2: p. 258.]

Part of this procedure is the visualization of the battle space as described above, the determination of the main goal for our own troops, and the control and coordination of operational pace. In other words the information support of the commander and his staff.[3] Information superiority, as the result of the procedure makes full spectrum dominancy in the military operations possible. [3] Assumption of reaching and maintaining information superiority, are the speed of command procedure, the quality of available sensors and intelligence systems, the abilities of the executing forces, and the connecting of these tools into a uniform network for the sake of an effective flow of information. [4] In this regard we can speak of network-based warfare of our days. The point of it is that the partakers are able to reach all the information necessary to fulfil their task, with appropriate subject-matter and in usable form. [4] [5]

Key element here is digitalization, the both horizontally and vertically integrated information system is through the available speed of information flow able to support the procedure of command and control, and the unity of fire and manoeuvre effectively. Through the summarization, validation and harmonization of the information arriving from different intelligence sources, common pool of information comes into being. [2] Real time communication secured by the system makes the visualization and effective utilization of the acquired environmental and tactical information not only for the commander, but also for the executing forces possible. The different intelligence sources connected together are able to generate comprehensive database, and through their connecting the insufficiencies of each tool can be tackled. Their connection into a system results moreover in high level readiness, gives more complex and more detailed picture, more thorough reconnaissance, and constant target tracking possible. [3] The processing, storage, transmitting and protection of information comes true on the level of command and control. This level transmits the commander's decision based on the collected information, to the other two levels. Finally as the third actor, the strike forces execute their mission based on the received information. [3] [6] [7] On the effectiveness of the latter, again the intelligence level is delivering information, and the circle begins again. Thus, each level means partaker in the execution of the task, and from the aspect of technology each component of the digitalized command-control system at the same time. During the realization of command and control, commander's activity proceeds parallel in the traditional physical space and on the digital battlefield at the same time.

„Cyberspace is a domain of the warfare equal to the ground-, air-, sea- and cosmic theatres [...] In the battle space [...] network systems are using electromagnetic energy to collect, store and process data and information." [4: p. 3.]

[3] In other aspect, the information operations can be utilized as a non-kinetic weapon (for example to deceive the enemy or jam its communication) as well. This also means that at the same time as in the regular battle space, also in the information theatre of war, offensive and defensive operations are taking place. [4]

Thus, digitalization not only means the technologically meant support of the so called decision circle (described above from the collection of the information to the feedback), but changes it in regarding the protocol of process as well. All members of the above network are helped by digital devices; communication between them is also secured by these. This means at the same time, that all information and transmitting regarding the given combat action appears in digital form as well, parallel or instead of the traditional documents. Occasionally this can open new horizons to the future military history research as well.

If these systems as described are capable to store, organize, and transmit data, than it's quite predictable, that the technologically meant (long term) storage of these is also manageable, as a kind of digitalized operational and tactical documentation. Beyond this, given to the nature of digitalization, the maintenance of data requires the interaction of human operation in a lesser amount. The creation of traditional (paper-medium) documentation happened mostly manually. Thus, great chance of failure has been given within, from mistake and forgetting through purposive distortion. Albeit the objectivity is meant to be represented by these documents, their means of creation could hardly close out the appearance of subjectivity within them. Of course, even digital setting secures no total assurance against such kind of distortion, but even so, this protocol entices with the possibility of some more accurate sources. Even thought that in accordance with the establishing of the system, operators can still be involved in it, who may shape the information being transmitted (and stored), this is however limited by the speed of network procedures as well. This effect is also further strengthened by the fact, that one most important feature of these networks is real time work. From the aspect of military history this means, that the information can be stored in the very second of its creation, in opposite to the traditional battle reports, operational diaries, which are being written afterwards, and in a retrospective manner. On the other hand, given by the nature and designation of the network, all sources of information are available to all of the partakers. This also means that in the future, the reports and diaries of each level would possibly consist of lesser opposing information, in other words, that each actor would visualize the battle space in lesser different ways (even thought, still from different aspects). At all, the data setting based on the capabilities of the network, could make the separate treatment of the sources regarding each level unnecessary, even in the first stage of research.[4]

But not only is it the case that compared to the traditional documents, the information delivered by digital C^2 systems could possibly be more precise source then any former ones. In practice it is more of an exception, but technically meant it is highly possible that a network-based system (not in regard of making the decision, but concerning the traffic of information) could be totally automatic. Given that there is no human operator in such a system at all, all data and information regarding the systems activity (meaning support of the decision, information transmitting) – which occasionally can be of important affect on the ongoing operations – would be existing already only in a digital form and shape. The other difficulty is caused by the speed of network-based systems:

„In the military commanding process the timeframe of a decision shortens from the former minutes nowadays to seconds..." [4: p. 3.]

Practically this also means, that unlike from the former staff-work, after the starting situation, due to the changes in it, one cannot speak of detailed plans in the traditional way anymore, much lesser traditional sources will tell to the posterity, how the commander has visualized the battle space, and what possible decision scenarios he had based his decision on. The higher intensity of commanding process could possibly set mental limits to the recording and reconstruction of the events in traditionally created reports or diaries as well.

[4] According to the general practice, in the first stage of the research, the historian views the different sources and levels each after another, technically – and in time – separated from another. They are compared only in the next stage, and are logically connected to each other further on during the analysis.

One cannot assume – at least in the near future – that traditional "military documentation" would totally disappear from the procedure of interpreting the events of a war (or any kind of armed conflict, by the instance), and thus from the repertoire of the military history. But the attempts to historically describe the cases of network-based warfare may put a stronger light on their inefficiencies already existing – as we will see – in the 1930's. After all, the problem may deliver its own solution however within, since the digital systems, whose transmitting might be impossible to follow for the traditional means of documentation, carry the possibility of storing their own activity within themselves. Technology is already given, appropriate protocol, created and utilized by the end-users – fighting soldiers and historians – may make it possible, that beyond their main task, network-based command- and control systems might work as relevant source for military history research in the future as well.

WHAT EXACTLY IS A MILITARY HISTORIAN RESEARCHING?

The main problem for a military historian – not only nowadays, but more as a rule – is caused by the task of (retrospective) visualization of the battlefield (by which here we mean the imagining of the events and acts). At the same time, in the future – partial – salvation of the difficulty is also delivered by battlefield visualization, and the related technology, this time meant as the visualization of the commander. What does this phrase exactly mean to each actor?

"In the past, battlefield visualization (imagination) was a procedure based largely on the intuitions of the commander, during which he shaped a mental picture, comparing the – often unmatchable, inaccurate, outdated, or deficient – information delivered by his staff, whit his own impressions on the battlefield; based on which he led the fighting. This picture then he shaped by certain means and methods into a form being utilizable to others, by which he could unify and concentrate the activity of each partaker. Lack of uniform interpretation of the commander's idea led many times to unsynchronized use of forces." [8: p. 126.]

The lines of the definition put also a light on the difficulties, which the military historians of the posterity have to face during the reconstruction of one or another event. When he (or she) is looking for the roots of the events, the historian is reclining, beyond the reachable description of the events, also upon the documents made during the decision-making of the commander (assuming, such are existent). Regarding the subject-matter of these – as one can see from the above definition – it comprises of "often unmatchable, inaccurate, outdated, or deficient" information, on the other hand of the commanders "own impressions on the battlefield". Of course, the protocol regarding the work of the staff, and staff culture (since it is existent) is striving to secure that the orders, and the picture on the situation would be delivered to those involved "in a form utilizable to others", but the last sentence of the description reflects on the shortcomings of this procedure as well. If the proper and accurate reading of the commander's idea – not to speak of his intuitions – meets such difficulties in real time to those, who are on the same battlefield at the very same time – even assuming that they are naturally seeing only smaller parts of the big picture, and that also from a different perspective – it is not hard to imagine, what amount of challenge the same task to the historian might be, who is working in a very different dimension of time and space in the posterior ages.

This difficulty is described by the Hungarian military historian, Ödön Bialoskorski at the beginning of the 1930-s, in accordance to the military documentation of the First World War:

"Their designation is after all to make even the first recording of the events easy and simple to the historian when required. (at the same time) [...] due to their deficiencies, most of the operation diaries of the World War can hardly meet its expected task, some of them even not at all." [9: p. 220.]

In Hungary, a new school of military history is finding place that time, which means not solely the description of the events, but a kind of analysis and interpretation as well. The first large volume work, which was dedicated to this striving, has been the monograph entitled "World War 1914-1918":

"Our main effort desires to reach the higher goal, that [...] we might deliver a thorough scientific military work, from which one could get known to the inner relations and connections of the Great War, the operational planning, executing, and the effects of these, and finally the inner value and performance of the Hungarian troops." [10: p. 5.]

In this approach – putting stress on the causal relations, through which one can draw conclusions to the present and the future, instead of merely depiction facts and data, exploration of the "causal relations based on the connections between past, present and future" [11: p. 257.] – we can summarize the main (scientific) tasks of the military historian today as well. It's safe to say, that this exploration work can be most effective, if the historian can manage to understand the logic of the events to the most exact level possible. From the above definition one can see, that the activity of the facing troops, the chain of the events occurring, and the interaction of these are caused – among others – by the decisions of the commander, which are based on the picture of the situation available, and on the analysis of the battlefield visualized by them.[5] By reversing this logic it can be proved, that if the historian would like to understand the flow of the events most efficient, then he (she) has to understand the logic of the commanders decisions as well, to this reason he but has to "see the very same picture", which the commander had seen in the second of his decision. In other words, he has to re-visualize the battlefield and that in the possibly nearest fashion to the original picture. What exactly has he to see, to get closer to his goal?

"The creation of the commanders idea regarding the battlefield, the battlefield visualization is a basic ingredient of the military command: the procedure, during which the commander estimates and analyzes the actual situation (own, enemy, terrain), imagines the final state, meaning the fulfilling of the given task, and then shapes his intention on the series of interaction leading from the actual situation to the final stage. Base of this idea comprises of the information delivered by the staff, and of the knowledge, experience and intuition of the commander." [8: p. 126]

This new definition sets two important phrases: the *actual situation* and the *final stage* as expected. Every decision of a commander can be regarded as an attempt to bridge the logical ravine between these. Regarding the events, the historian is usually in a reverse situation compared to the commander: he knows the final stage (at least the outcomes of the events), while the commander is more informed of the actual situation in the beginning at the time of his acting. The likeliness between them is, that trough the chain of the events, both try to get from the known circumstances to those being unknown to them.

To reach his goal, the historian has first of all the documents made on the battlefields as tools. In the World War I research mentioned above, these were tried to be utilized following the next logic: the grand connections of the analysis were given from the orders and diaries of the higher units, which were filled with subject-matter through the official documentation of the subordinates, and reachable enemy sources. To complete these, in many cases to find the exact cause of certain events, and to clear the occurred situation, writings of personal nature,

[5] This is regarding first of all the intended acts. Of course, other components in the unfolding of the events can also be of such level of importance, like for example outer circumstances. The picture is even made more difficult by the fact that in the second of the decision, the commander can at best only forecast the thinking method, and expected decisions of his opponent. At the same time, the „ideal" decision of the commander takes these factors in consideration by definition, thus in theory these are affecting the shaping of combat activities through his decision indirectly as well. Of same importance are the cases in military history as well, where this only partially comes true, or not at all, but in these cases, the commanding procedure – more precisely its failure, and the circumstances causing it – can be put in focus of the research as well.

such as diaries and memoires served as means. The credibility of the latter has been many times hard to be confirmed, at the same time, through their informal voice they often put focus on such - partially personal – circumstances as well, which wouldn't have come to light through the official documentation, but sometimes could offer as explanation to some otherwise hardly justifiable decisions. [9]

Captain Bialoskorski stresses another aspect of the human factor as well; this time in accordance with the historian. Amongst his principles of research, the ability of empathy, "vivid, but soberly cool imagination" deserves a great role, especially because, as he writes, the sources are not able to transmit the "living side":

"And this stands not only to the sources of the historically far past, but to those of the near past as well [...] To feel these aptly, to evaluate them as needed, and to set them right in his judgement is the task of the historian…" [12: p. 211.]

In this thoughts – beyond the scientist, who is cultivating his call in an understanding (and feeling) fashion – we can observe an attempt to solve the dilemma of the retrospective researcher, as depicted above: how can the intuition of the commander, as well as the impression, which are existing only in his head in the momentum of decision, grasped, when the documents left over to the predecessors are holding them only in an indirect manner at best. The answer seems to be not least hard to catch, as the problem itself: the historian is made able to explore the intuitive dimensions of the commander's decisions, even nowadays mostly by "his knowledge, experience and intuition".

What is the case with the other element of the decision; the information regarding the actual situation, the own and enemy troops and the environment?

"Acting without orientation and consideration is senseless fool-hardiness. The warlord has to review the situation thoroughly before and clear in himself precisely, what exactly he wants to do. These two inevitable tools are regarded in the military dictionary under the entry of intelligence and control, and both are among the basic elements, which are mentioned by the analyzers of strategic issues as C^3I: Command, Control, Communication, and Intelligence. The new definitions however don't change anything to the old realities. Basic element of the commanders acts are knowledge and sight." [13: p. 439.]

John Keegan describes the procedure of the commander's decision-making in 1987, from the aspect of the military historian, in a similar fashion as we could see in the definitions before as well. In his case the aggregation of information regarding the situation (called knowledge) and the personal abilities of the commander (here sight) can also be found. But Keegan introduces a new definition as well: C^3I, meaning the digitalized command and control systems. He but shows – in the wake of the new revolution of warfare – that these don't change much of the basic logic and procedure of the decision-making however. But the technologic background of the activity changes, and as one can see, this time the aggregation of the information regarding the actual situation takes a slightly new shape as well.

With this, battle space visualization wins a – partially – new interpretation as well:

"digitalized stills and moving pictures, maps are delivered to the computer of the commander regarding the digital battlefield, utilizing which, he can manage to get a sight into further and impossible to see territories as well. This way, the manoeuvres of the enemy reserves can be followed, and one is able to observe [...] the changes of the battle space situation. [14: p. 189.]

This last definition doesn't mention anything about the intuition of the commander, however, there's no reason to assume, that it might not play an ongoing definitive role in the time of technology. Recognising our very first definition, recalling especially the part, according which the commander has to compare "often unmatchable, inaccurate, outdated, or deficient" information with his own "impressions" on the battlefield, instead of it here we get the pretend of getting a sight into "impossible to see territories". In this regard it seems to be logical to

assume, that nowadays the focus seems to shift from the intuition (sight) towards the acting from more precise picture of the situation (knowledge). How are the two fields, disputed above working together in the practice?

ON THE HUNGARIAN POSSIBILITIES, AND A DEVELOPMENT FROM HUNGARY

At first it might sound utopia to set the above concept into Hungarian reality, since digital and network-based warfare one may likely to consider as the tool of armies of the large, leading powers. In reality, also in the Hungarian Defence Forces we can find researches targeting these fields of technology. Their achievement hasn't been established yet, to introduce the (HU)TOPCCIS5 system, developed in Hungary, may give us the opportunity however, to analyze the practical connections of those written above.

The development of the Computer-based Tactical-Operational Command and Control Information System was being led by the recognition that for the land forces of tomorrow it will be inevitable to maintain an information system supporting the operational and tactical level planning and commanding procedure. [15] The designation of the system is as follows:

"...on the level of land forces, the planning and leading of operations and combat activity, the commanding of battle utilization of intelligence tools, the transmitting of information (data) from the reconnaissance units to the command post, the collection, analyzing, processing and systematizing of these. The distribution and transmitting of the target data to the forces involved in fire-support missions, through computer-system or tactical radio communication, by formalized messages." [15: p. 43.]

As one can see, the system is capable to maintain all the tasks, which are required to maintain network-based warfare: maintaining of the intelligence data is present, also the support of the command post (the making of decision), and the support of delivering orders to the strike forces as well. Parts of the system are able to cover and support the battle space systems utilized by the fighting, supporting, and service support units at all levels. [15] By colligating all the levels, the unity of leading can be maintained through the system. The functional units and subunits of the C^2 systems are these [15: p. 43.]:

- Own (friendly) table of establishment (depicting personnel, equipment and combat readiness);
- Joint planning-commanding functional sub-system;
- Intelligence data processing and commanding functional sub-system;
- Fire support functional sub-system;
- Manoeuvre planning functional sub-system;
- Sub-system serving the transmitting of orders and information in text form, and that of map-information.

Each text regarding the capabilities of the system is being cited word-for-word [15: p. 44.]:

„Regarding the planning and leading of fire-support, and the recon of targets: through the system it is possible [...] to visualize the maximal range of action of the artillery units on digital map. The system is capable to receive, process and depict the data of unique- or grouped-, static or moving targets on digital map. Processing of the target data happens in 5-7 seconds from the receiving of it. The targets already rated, are being grouped and listed following NATO standards, which are possible to be printed afterwards. [...] With the aid of the system, the planning of the combat action of joint (tactical) forces can be executed professionally, like the visualization on digital map and ortophoto by the standards of NATO APP-6C as well. The C^2 system is capable to transmit, receive, and process text and map information. It is also possible to constantly play back (visualize) the tactical text and map information within given

operational time-intervals. With the help of the system, planning of manoeuvres, the commanding of them and the real-time visualization of the column in motion is also possible. The system is capable to receive and process the GPS-data of the vehicles and columns."

Some remarkable capabilities of the subsystems: in regard of the joint tactical force subsystem, beyond the ability of planning:

"Support of the command of operations and missions, recording of the situation and combat readiness, composing of operational and other level reports. Helping the preparation of decision through shaping of action drafts. [...] (the system is able) to model the possibility of execution of the finished operational and mission plans. [...] flow of the information between tactical and operational level, the processing and picturing on digital maps is secured; [...] saving and storing of whole exercise or parts of it is at hand"

Intelligence functional subsystem "is supporting and securing the utilization and constant maintenance (actualization – Sz. G.) of the "Intelligence Diary". Beyond this it is capable to record the activity of the intelligence forces. The same can be said in regard of the fire-support subsystem as well. [15] The ranking, fact and rate of destruction, regarding the targets is also easy to follow. Trustworthiness and preciseness of the information arriving can be recorded following the NATO standards, each elements of the validation (comparing each sources, arriving of new information, etc.) can also be tracked. [16] [17]

As one can see well from the cited texts, the system is capable to document its own activity, and through this also the process of the network-based command and control precisely and detailed. Thus, it is not only supporting the planning and C^2 of the activity of forces, but – by appropriate protocol of recording – it can serve as a very precious source of information for the following ages as well. As we could see, all the information, regarding the battle space, from the enemy targets to the activity of own forces, its limits in space, and the precise tracking of manoeuvres can be followed on digital maps, as well as the maintaining of these information during combat-leading procedures. This not only means a static picture of each moment, but the changing of the information – caused by movement in physical space, or by refinement through own intelligence sources – is also possible to be followed. Thus, not only a map picture we get, but a source of a kind of "time-laps" fashion, on which one can follow up, how the visualization of the battle space during the planning a commanding can be realized.

Even more informative could be the documents, which are generated during the following of combat readiness of own forces and equipment, the listing and sorting of the targets and during the definition of credibility and preciseness of the arriving information. Through these, the historian might get a picture, how the visualization of the commander had got clearer – or even more obscure, for the instance – during the planning and commanding procedure. (In regard of the retrospect research of the events, both cases are of the same value.)

Interesting features of the system are the "helping of decision by creation of action drafts" and the "modelling of possibility of execution of operational and mission plans". If one recognises those said of the battle space visualization at the beginning, these are the fields that are mostly regarded as to belonging to the circle of the "intuitions and impressions of the commander". Naturally the system would still not be able to record "intuitions from the guts" (at least in the near future), which can aid the commander in tackling the "fog of war" through the choosing of one of the decision scenarios. At the same time, if one is thinking about the fact that Napoleon or the Duke of Wellington were rigorously not willing to put the alternatives in their heads during the decision making (on that please see the work of John Keegen, mentioned earlier), compared to this, the historian of the future might get at least some kind of guideline by the action drafts and efficiency models generated by the system, when he tries to understand the whys of the commander's decision-making. As a continuation, the system supports "the composition of records of the situation and combat readiness, and that of other reports". It is in fact deriving from the fashion of the network-system that among the recorded data one will be

able to find some sources regarding the circumstances of the creation of the classic "military documentation" as well.

And finally, which may be the biggest of all novelty in the military history research, is the possibility to "save and store whole of exercises or parts of them", and "to constantly play back map and text information during set operational timeline". This practically means, that if the technical infrastructure (hardware and software) is available, the historian of the future will be able to replay again and again every momentum of a military event from the planning to the end of the execution, that is, from the (real time) starting situation to the (real time) end state – assuming that the information has been recorded already in an adequate form, and they weren't distorted since then – and that not only regarding exercises, but real combat as well. During this, he can manage to see the events unfolding from the very perspective of the commander being in the original decision situation, and in every momentum of the events he will get the very same quantity and quality of information as the commander had in his real time situation. (meaning that the later events won't affecting his picture of view – his visualization – of the whole procedure) The same alternatives will appear for him on the same points of decision making, which gives him the opportunity to try to figure out, what logic the commander had followed choosing one or another option in the real situation, without being mislead by information known by himself, but not yet from the actual commander in the actual situation..

The goals of the future development of the TOPCCIS system [15] can serve with some opportunities for the military history research as well: one of the directions is regarding the integration of even more information systems, which means even more precise visualization in the future (for the commander and the historian as well). Other aspect is the broadening through new sub-system modules, which means the picturing of other elements present on the battlefield (CIMIC, engineer, etc.), thus making the picture further detailed. Last, but no least, we should take into consideration the fact that nowadays technology is offering different opportunities to think on the effects of info-communication platforms too. [18]

END THOUGHTS

The warfare of the 21st century shows a picture in many aspects different from the past. Beyond the dominance of the asymmetrical feature, and the irregular actors, another tendency can also be observed. Information superiority becomes a main component in the war fighting and in command and control procedure. The info-communication systems, making this possible reach ever higher level of technology. These changes have naturally also their impact in organisation and procedure. All this has to be followed up by the military science and the military history within as well. The changes of battlefield C2 systems will also have an effect on the circle and shape of the sources of military history research. The tactical-operational staff-documentation, regarded as main sources in the past will not be suitable to deliver an efficient picture from the speed-up decision-making, or even from the whole of the battle space to the posterior ages. But not only are the digital, and sometimes automatic systems causing these problems, they can also deliver the salvation to them. The information transmitted, processed and stored adequately by them, might be sufficient supplement to the traditional sources of the military historians.

To maintain the efficient mission execution, the Hungarian Defence Forces have to digitalize their tactical-operational C2 systems in the future. To serve as a potential source for the military history, one digital system (Hungarian or from other sources) has first of all to be introduced. An adequate protocol also has to be worked out, to collect and record data and information for the military history. Naturally it has to be set to the battlefield utilization of the system, in a manner, that the execution of both tasks would not go to each other's harm.

From the aspect of the history research, it is also of an importance, how and in what form to manage to store and re-explore the data. In the future, this question has also to be solved, the circumstances have to be created. And finally it is also not to be disregarded as a feature, if the end user (in both cases the HDF) is showing any interest towards these opportunities at all.

Literature

[1] DAVIS, N.: An information based revolution in military affairs. Strategic Review, 24 1 (1996), 43-53. www.rand.org/content/dam/rand/pubs/monograph_reports/MR880/MR880.ch4.pdf, (downloaded: 13.10.2014.)

[2] HAIG Zs.: Intelligence and electronic warfare on the digital battlefield, Hadmérnök Vol. IV. Issue 3. December, 2003. pp. 258-264. http://www.hadmernok.hu/2009_3_haig.pdf, (downloaded: 13.10.2014.)

[3] HAIG Zs.: Network-centric warfare and sensor fusion, AARMS Vol. 2. Issue 2. 2003, pp. 245-256.

[4] HAIG Zs.; VÁRHEGYI I.: A cybertér és a cyberhadviselés értelmezése, Hadtudomány, Vol. XVIII. e-version (2008) pp. 1-12 www.zmne.hu/kulso/mhtt/hadtudomany/2008_e_2.pdf, (downloaded: 13.10.2014.)

[5] FARKAS T.; TÓTH A.: Electronic warfare in full spectrum operation, In.: New Trends in Signal Processing 2012, pp. 181-188. (ISBN:978-80-8040-447-5)

[6] FARKAS T.: A válságreagáló műveletek vezetését és irányítását támogató híradó- és informatikai rendszer megszervezése a Magyar Honvédség többnemzeti műveleteinek tükrében, doktori (PhD) értekezés, Budapest 2010., p.144.

[7] TÓTH A.: A hálózat nyújtotta képesség megvalósításának lehetőségei a Magyar Honvédség kommunikációs rendszerében, doktori (PhD) értekezés, Budapest 2015., p. 240.

[8] MUNK S.: Katonai informatikai rendszerek interoperabilitásának aktuális hadtudományi kérdései. MTA PhD dissertation, Bp. 2007. http://real-d.mtak.hu/86/1/Munk_Sandor.pdf, (downloaded: 24.10.2014.)

[9] BIALOSKORSKI, Ö.: Adalékok a világháborús okmányanyag tudományos értékeléséhez. Magyar Katonai Szemle, Vol. IV. Issue 4. (1934), Hadtörténet és hadilevéltári okmányok, 219-222.

[10] GERBERT K.: Előszó, in.: A világháború 1914-1918. Különös tekintettel Magyarországra és a magyar csapatok szereplésére. Vol. I. A magyar királyi Hadtörténelmi Levéltár kiadványa, Stádium Sajtóvállalat Rt. Bp. 1928. p. 5.

[11] GÁRDONYI I.: A történelemtanítás jelentősége, in.: Magyar Katonai Szemle (szerk.: vitéz Berkó István) 1934. Vol. III. Issue 12. Kisebb közlemények p. 257.

[12] BIALOSKORSKI Ö.: Hadtörténeti események tudományos feldolgozása. Magyar Katonai Szemle, Vol. IV. Issue 2. (1936), Hadtörténet és hadilevéltári okmányok, 210-229.

[13] KEEGAN, J.: Maszk. A parancsnoklás álarca. A hadvezéri mesterség Nagy Sándortól napjainkig (translated by Balanyi Bibiana és dr. Molnár György) Aquila, without date.

[14] HAIG Zs.; VÁRHEGYI I.: Hadviselés az információs hadszíntéren. Budapest: Zrínyi Kiadó, 2005.

[15] FURJÁN A.: A „HUTOPCCIS" – Számítógépes vezetési rendszer képessége és továbbfejlesztésének lehetőségei, Sereg Szemle 2013/1. pp. 39-54.

[16] FURJÁN A.: Analysis and assesment of targets on a digital map and Computer processing of Intelligence data, AARMS Vol. 13. Issue 1. (2014) pp. 117-130.

[17] FURJÁN A.: Capabilities and application possibilities of the intelligence functional sub-system of „HUTOPCCIS" computer-aided command system operating on a geospatial information system basis, AARMS Vol. 13. Issue 1. (2014) pp. 89-101.

[18] NÉMETH J. L: A (stratégiai) kommunikáció és a háború kapcsolata napjaikban, Hadtudomány, (2013):(1-2) pp. 129-139.