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THE IMPACT OF TECHNOLOGICAL CHANGES ON THE DEVELOPMENT OF MILITARY LEADERS

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Abstract: The article focuses on possible directions of development of leadership in future military operations. It describes the principles of leading people and the functions of a leader-commander necessary for fulfilling tasks. However, as the rate of automation and robotization in leading military operations increases, the role of a leader-commander changes. Communication and information technologies allow directing military operations in a larger area with a higher degree of independence of the individual elements of the deployed forces as well as the decentralization of command and control. The increasingly more common use of autonomous systems brings a sizable challenge in the shape of commanding robots into the leadership process.

Keywords: Automation; Autonomy; Robotization; Commander; Leader; Leadership.

1 INTRODUCTION

Leading people is currently a process in which an individual decides the direction a group of people should go and by what procedure (method) will it achieve its goal. Leader is someone people follow and want to follow without needing to be forced to do so, or even being subjected to negative conditions and threats as criteria for advancing towards the completion of the task. Leader is a man with a vision, who chooses the direction and knows the way He is the one always in front, so he can lead others, and helps those, who wander or are out of breath, find the way. He is the example worthy of being followed. [1, p.25] The task of leader is leading men and caring for their needs. A man has to grow into the position of a leader, build it within himself. Leadership can be employed everywhere, where there are people who depend on the leader and want to follow him. [1, p.26-27]

Every leader-commander of a military unit has to be an example to his subordinates, help them and show them the way while fulfilling tasks and achieving goals. Only then can he fulfil other requirements stemming from his function as a leader:

- work out and comprehensibly formulate his idea of the goal, manner of focusing and ways of conducting preparations;
- require his subordinates to understand and fulfil tasks;
- ensure the preparation of his subordinates across the whole organizational structure, require, support and direct the development of his subordinates' abilities;
- motivate towards reaching the best results possible;
- play a large part in the preparation process;
- insist on fulfilling the requirements and standards of preparation;
- encourage environment conducive to preparation.

Of great importance is the specialization of the leader-commander as well as his experience with commanding the specific unit. [1, p.129-131]

The article describes the current ways of leading people, the role of the leader-commander and the way to achieve this, in contrast with the increasing level of automation of the command and control of military units. The increasingly frequent integration of autonomous robotic systems into the composition of units and the use of automated command and control information systems will also have an impact on the functions of the leader-commander. The main goal of the article is to identify the differences between the current leadership and the possible leadership of communication-connected soldiers, units and autonomous robotic systems, using automated tools for decision support in the near future. The article describes the current ways of leading people, the role of the leader-commander and the way to achieve this, in contrast with the increasing level of automation of the command and control of military units. The increasingly frequent integration of autonomous robotic systems into the composition of units and the use of automated command and control information systems will also have an impact on the functions of the leader-commander. The main goal of the article is to identify the differences between the leadership of people today and the possible leadership of communication-connected soldiers, units and autonomous robotic systems, using automated tools for decision support in the near future.

During the writing of the article, the documents and text analysis methods were used to obtain the knowledge base of leadership, as well as the participation observation method in the practical implementation of the process of command and control of military units. Based on the information and knowledge obtained in this way, together with the use of experiments in modelling the axis of maneuver of robotic systems and military units, the induction method was applied to describe the possible implementation of military leadership in the near future.

2 FUNCTIONS OF THE LEADER-COMMANDER

According to [1, p.101], the functions of leader-commander can be divided into planning, organising, leading, supervising and delegating.

Planning is a decision-making process of selecting goals and the means of their fulfilment. It is the basis for all the other functions. It includes setting goals and selecting the ways they are to be fulfilled. Any thought out, conscious sequence of future actions is a plan. A military commander can achieve the goals through a decision-making process, which can either take the mental form of an OODA loop, see [2], or a procedural form dependent on the size of the unit in the shape of TLP (Troops Leading Procedures) and MDMP (Military Decision-Making Process), see [3].

Organising is the effective deployment and arrangement of all available resources in a way that allows for achieving the set goals in time through the planned means. It includes the creation of organisational structure which will allow effective cooperation of the work team or unit towards achieving set goals. [1, s.103]

Leading is a conscious process of influencing colleagues and effective use of their skills and abilities, motivating and leading them towards high-quality and active creative fulfilment of tasks which will help reach set goals [4]. The behaviour of the leader and his style of commanding then tends to be percieved as the way in which he acts towards the group of his colleagues. Classic leadership theory or leadership according to the type of behaviour differentiates between three main styles: authoritative, democratic, and liberal. [5]

Supervising is an objective evaluation of the carried out work from the point of view of fulfilment of the set goals. Its point is the identification and removal of imperfections in work processes, in order for the set goals to be achieved as efficiently as possible.

Delegating is the transfer of work duties and responsibilities to colleagues.

3 AUTOMATION OF COMMAND AND DIRECTION

Currently a number of communicationally interconnected information systems for assisting in decision-making and the sensors with GPS support integrated within them are entering the process of commanding and controlling units. In the case of infantry, it is the set of the future soldier, see [6], which will, alongside vehicle platforms, give the commanders information about the current deployment of the unit. It allows sharing of the information acquired by the set, sending text messages and data layers, while also monitoring the physical state of the soldier and technical state of the vehicle including the current ammunition supply. The set of the future soldier (depicted in Fig. 1) in the combination with the information systems gives the commander an overview of the situation on the battlefield, allows him to control his whole unit in coordinated manner over a larger operational area and deploy soldiers effectively where they are needed. The commander's station can be within his unit, inside of a commanding vehicle or helicopter or at the base.

The information within the network of communicationally interconnected stations is shared across the board among all users or based on authorised access, which allows natural coordination of all of the unit's members' activities.

Fig. 1 The future soldier
Source: [7].

There is a trend towards an increasing degree of automation and robotization in the development of modern combat units, see [8-10]. Automatic robotic weapons systems, such as the one shown in Fig. 2, use variety of sensors and have already surpassed humans in, for example the speed of identifying enemy objects and destruction of set targets through fire. Control of their actions can be semi-automatic with only an occasional assistance from the robot group operator, or autonomous with the use of AI algorithms.

Fig. 2 THeMIS Unmanned combat vehicle
Source: [12].

Autonomous robotic systems can then simply receive a task. The task may be to SEEK and DESTROY, GUARD, or OBSERVE with the specification of operational area. Accurate identification of objects of interest can be achieved via ATR (Automatic Target Recognition) system, LIDAR (Light Detection And Ranging) and a database of pre-defined enemy soldiers and military vehicles, see [11].

Mathematical algorithmic models using tactical-geographic data and information can be used to advance automation and autonomy and fulfil tasks in future military operations. One of such models is TDSS (Tactical Decision Support System), which has been in development at the University of Defence of the Armed Forces of the Czech Republic, see [13]. TDSS consists of several mathematical algorithmic models, such as optimization of observation station model, aerial recognisance planning model, ground units manoeuvre control model (MCS CZ Maneuver Control System CZ) and others, see [14-18]. The manoeuvre axes for individual aerial or ground systems up to a swarm of such systems can be calculated in these models based on the impact of the updated situation on the battlefield, see Fig. 3.

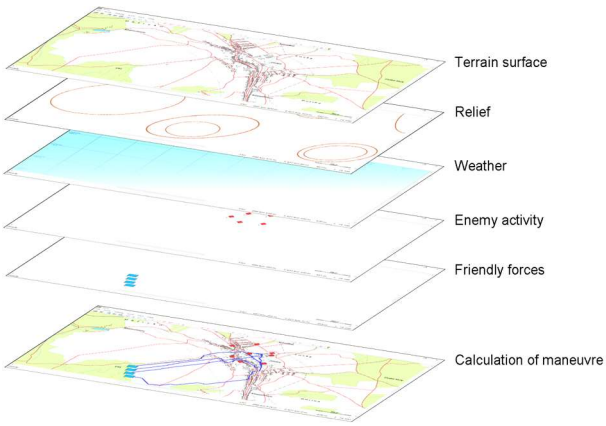

Fig. 3 Layers of MCS CZ
Source: author.

MCS CZ can be used to calculate spatially coordinated axes of ground manoeuvres, which can be used during operations of units of the future soldiers as well as for deployments of swarms of robotic systems [19].

4 FUTURE LEADERSHIP

With the expected development of automation and autonomy of command and control in future military operations, leadership as a process of leading and directing subordinates' efforts will see the disappearance of the people-subordinates. From the point of view of leadership development, we can then speak mainly about the development of "Self-leadership", see [20,21], - knowing one's strengths and weaknesses, motivation, one's own decision-making, goal selection, stress management, rejecting pessimism etc. Inefficient behaviour can be eliminated via a number of strategies, such as self-observation, self-evaluation and self-perception, which encourage leader to achieve higher efficiency. [22,23] The question of cognitive management in contrast with the technological development and NNEC (NATO Network Enabled Capability) conception is further explored in [24].

The basic functions of leader-commander are then also significantly modified. Planning of activity-manoeuvre of subordinates in order to achieve goals remains. But for the sake of speed and higher accuracy it will most likely transform from a personal mental process of the commander into a qualified approval of a variant of the manoeuvre calculated by the information system. Qualified approval, however, requires knowledge of functioning principles and computational functions of information systems as well as advanced experience with carrying out the computed manoeuvres in practice, which will allow the leader-commander to estimate the situation of his units before during and after the manoeuvre. [25]

In the case of remote coordination of units in a larger operational area, organizing will be mainly limited to preparation and supplying with necessary material before the start of the operation.

The leading function will most likely be limited exclusively to the remote authoritative style with the commander giving out the tasks necessary for achieving the required final state based on up-to-date situation on the battlefield, current state of the unit and the required final state. Just like the planning and organising functions, remote leading of subordinate commanders or robotic systems will place significant demands of continuous personal development of the leader-commander in the use of modern technologies, information systems and tactics of leading combat in a way that achieves goals in a military operation. [26]

All authorized unit members will be able to continuously control the implementation of the planned activities in the collective awareness of the battlefield situation environment using the communicationally interconnected information systems, see Fig. 4.

Fig. 4 Future commanders
Source: [27].

Delegating authorities and duties to subordinates using online control will be significantly easier and in the case of decentralized command of operations over a larger area also more suitable.

In the case of autonomous operation of robotic combat units, we can speak of "robotic leadership," which will mostly emphasise the planning of targets and final state in the military operation and subsequent control of its realisation.

5 CONCLUSION

Military operations in the 21st century will be characterised by increasing degree of automation of command and control of units as well as of autonomy of robotic systems. This trend will change what is required of commanders. Despite the remote command and control, this will still have to include those of technological-practical character. Up-to-date awareness of the situation on the battlefield will be provided via communicationally connected information systems for decision-making assistance, the functionality of which also allow for calculating manoeuvres of subordinate units. This will require advanced knowledge of functioning and controlling of these information systems and qualified estimation of the development of the battlefield situation based on practical experience. That is the only way to utilize the advantages of quickly and effectively calculated manoeuvres, which may give us the operational superiority on the battlefield.

A significant part of this "technological leadership" can or even has to be its moral aspect. While controlling "robots" (semi-automatic, automatic), the human-commander of the operation in question has to be aware of the fact that somewhere outside of his present station a "robot" is carrying out activities that may have consequences possibly even fatal ones for a human-enemy.

The comparison of the leadership of people, military units and robotic systems described in the article and their possible realization in the future indicates the direction of development of the functions of future leaders-commanders. In military practice, it will be used by units that will apply the NNEC concept, with a predominant degree of automation of command and control of autonomous robotic systems.

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