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MILITARY STUDIES ON TECHNOLOGY TO IMPROVE FUTURE LOGISTICS

Abstract: *The article describes the possible applications of technology to improve the efficiency of logistic operations based on the main developments made by the coalitional forces around the globe.*

Keywords: *future logistics, military logistics, unmanned vehicles, military robots*

INTRODUCTION

During today's conflicts, most of the militaries around the world face different problems regarding logistic tasks. In most of the cases, the standardized and accepted methods are not usually enough for solving particular problems that can surface on today's changing war theaters. The leading investing countries with advanced military forces are currently working on and have already developed several systems and technologies. They can be used to make the solving process of any future logistical tasks faster and more efficient with minimizing the possible casualties in the process. The United States is in possession of military force considered to be the largest and most advanced on the planet up to date. It is renowned for investing the most significant amount of capital into technological research in comparison to any other country today. The U.S. alongside other countries like Japan, China, Germany, Finland and Sweden is contributing to this cause to a large extent. The U.S. Army Research, Development and Engineering Command is the primary institution established to deliver the most efficient technological solutions for the army and integrate them.

1. COMMUNICATION, SOFTWARES AND DATABASES

As the use of digital technology becoming more and more popular, the developed systems are becoming advanced as the time passes. The military software designed using the last technological inventions open new frontiers for the planning of tasks related to sustainment and logistics. Major General James L. Hodge mentioned a so-called Army Techniques Publications (ATP) which would be the form of information that will be used on a portal called Army Knowledge Online (AKO) MilWiki (Fig. 1). Upon approval by the supervisors, the information packages will be added to the database. This way it will contain all the latest advancements and field experiences in all possible situations. All future development will be

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accelerated by the easy-to-reach up-to-date data collected in this archive. The aim of this systematical collection of information is to develop the most efficient and relevant logistical doctrine to use in the future.

Fig. 1. The icon of the MilWiki database
Source: www.ssi.army.mil [downloaded on: 15.05.2014].

Upon starting any military operation, the rounding up of all the needed materials can be a time-consuming process, not to mention the execution of the whole logistic support process. Such system is used by NATO since 1997 and being constantly augmented to enhance further its so far outstanding performance in solving this task and more. The so-called LOGFAS (Logistics Functional Services) was developed by International Solutions Group. Using this system, the sustainment leaders can analyze the situation to plan and develop the most suitable solution for the logistic tasks related to the mission. Upon completion, this program can be executed, monitored during the whole process and can be modified upon receiving the reports of the forces that are conducting the operation. It can also be used to provide assistance during the deployment and in-theatre sustainment of the military forces. It is a flexible system as it has many subsystems to use for concrete and complicated logistic tasks. The ADAMS, EVE, CORSOM, ACROSS, SPM, SDM and LOGREP subsystems are all divided into smaller subsystems that are used for a given phase during the sustainment process of a mission (Fig. 2).

Fig. 2. The illustration of the LOGFAS system and subsystem
Source: http://www.isglimited.com/isg_services/logistics [downloaded on: 15.05.2014].

The need to use up-to-date information broadcasting and receiving systems are also becoming acute. However, the need for high-speed and mobile broadband connection is a burning problem to solve. Among other countries, the U.S. military is focusing on developing technologies based on the latest smartphones that in capabilities can easily surpass the previously used FM radios. As the range of network coverage is being expanded, the soldiers on the field can quickly send and exchange information with higher command. The problem that arises with the future use of these smartphone-based communication devices is that the protection of sensitive information can be a challenge for the developers. In theory, all sol-

diers would have access to a brigade level network that would provide the latest intelligence and support requesting possibilities for them. The program of the U.S. military called the Land Warrior have similar goals. This information-oriented approach for the future can be very practical as most of the bad decisions while a military operation is made due to the lack of information on a given scenario. Integrating every soldier and upon the extensive installation of high-tech communication technology – every military vehicle and its position would allow any commander to track a movement of their subordinates or view a location of any allied vehicle or unit.

2. TECHNOLOGY USED ON THE FIELD

Alongside the virtual background to support the logistic and sustainment related tasks, the technology is used to realize them and also permanently is researched. The recent results of such developments are very promising.

The future of all the aspects of warfare lies in the adaptation of Unmanned Vehicles or Remotely Controlled Vehicles. The first advanced drone capable of providing fire support in a conflict as part of an army was the Predator. However, there were several other examples before this drone to control various vehicles remotely. Nowadays in the U.S. the primary institution responsible for the funding of the development of remotely controlled vehicles and robots for the future use of military forces is the Defense Advanced Research Projects Agency (DARPA). This agency is renowned for developing several prototypes that can be used extensively for fighting, logistic and even medical tasks.

2.1. Alphadog/BigDog/LS3

Boston Dynamics developed the rough terrain robot called AlphaDog (previously called BigDog). This quadruped, 0,91 m long, 0,76 m tall robot weighs 110 kgs. It is dynamically stable, which means it can stabilize itself regardless of the terrain it is moving on. The maximum speed is 6.4 km/h while it is carrying 150 kg of equipment and climbing a 35-degree incline. The aim of this project is to provide the soldiers with a robotic mule that can transport a huge portion of their gear. The rough terrain wouldn't cause any problem for this robot, and it would enable the soldiers to move faster and get tired later due to the lighter equipment. It can maintain balance on any icy surface and even if kicked from the side. The latest prototypes are now called Legged Squad Support System (LS3) and are in their final stage of development before entering service (Fig. 3).

2.2. MULE

A more ambitious design for a similar task is so-called Multifunctional Utility/Logistics and Equipment vehicle (MULE). The 2,5 t robot would have been able to move on rough terrain, and would have had three variants: a logistics, a countermine, and a light assault variant. The program was canceled in 2011. Alongside with the Crusher, which is a six-tonne massive robot designed for similar tasks, the MULE can be used for a future design of robots that could be used for the same functions (Fig. 4).

Fig. 3. LS3 prototype
Source: http://www.geekosystem.com/alpha-dog-spoken-command/ [downloaded on: 15.05.2014].

Fig. 4. MULE
Source: http://www.militaryfactory.com/armor/detail.asp?armor_id=314 [downloaded on: 15.05.2014].

2.3. MQ-8 Fire Scout

There are plans for developing the ability to fulfill similar tasks from the air – the MQ-8 Fire Scout is one of such construct. This remotely controlled helicopter can carry up to about 100 kgs of equipment or emergency supplies, but the other versions are used to transport weapons into battle.

2.4. HULC

The support of the soldiers would be solved with the further tuning of the above-mentioned robots. However, what can a single soldier do when is facing long journeys on foot and has to carry enormous amounts of equipment solitary or has to lift massive weights? What if the military does not have the capability and budget to invest into the utilization of a vast number of robots to aid its ground forces? The development of the Human Universal Load Carrier (HULC) has started to solve such a problem. Designed by Ekso Bionics and licensed by Lockheed Martin, this hydraulic system can enable a soldier to lift weights up to nearly 100 kgs and move at a speed of 15 km/h for an extended period of time, depending on the capacity of the power source that supplies the system with energy. There are several versions already designed. The aim is to tune fine the whole HULC to maximize carrying capacity while minimizing the restrictions on movement and the size of the hydraulic

supporting elements and the power source itself. There are also plans to develop integrated and lightweight body armors using nanotechnology (Fig. 5).

Fig. 5. HULC prototypes
Source: http://www.kurzweilai.net/lockheed-martin-test-next-generation-design-of-its-robotic-exoskeleton and http://htka.hu/2010/07/27/szuperero-a-katonaknak/ [downloaded on: 15.05.2014].

2.5. THE FUTURE OF FUELS

While the development of several systems is underway for the future, all armies have to deal with the equipment they currently possess. The logistic and sustainment needs cannot be fulfilled without one visible element – fuel. The expensive character of the fuel and its adverse effect on the nature leads to a question: How can we make it less expensive and more environment-friendly? The JP-8 fuel currently used by the U.S. army is the most inexpensive available and standardized, and nearly all of military vehicles can use it. It is due to its uncomplicated way to provide the fuel for the units. Regardless of this, the plan is to change to an alternative „green energy" type to power the vehicles as soon as it will be possible financially. The recent agreement between the U.S. military and General Motors on the use of hydrogen fuel cells can solve the problem of utilizing cleaner energy to adopt in combant vehicles. The engineers of TARDEC are working on a method to convert JP-8 fuel into hydrogen that then can be converted into electricity. Similar methods and the use of renewable energy sources represent the future of vehicles.

CONCLUSIONS

We cannot forget that most of the today's conflicts have a multinational-alliance character. What is more, all the contributing countries have to be capble to cooperate with all the participating countries in the particular operation they are conducting. The international nature of these missions can carry an opportunity for all members of the given alliance or organization being involved in a variety of conflicts that can be located far from their borders. Regardless this fact, the reason for this involvement is the efficient use of pre-warfighting techniques so the possibility of more bloody conflicts will be reduced as much as possible. Such peace is enduring, and other similar missions require all logistic services to be flexible.

REFERENCES

1. Beidel E., Erwin S. I., Magnuson S., *10 Technologies The U.S. Military Will Need For The Next War*, http://www.nationaldefensemagazine.org/archive/2011/November/Pages/10TechnologiestheUSMilitaryWillNeedFortheNextWar.aspx.
2. *BigDog – The Most Advanced Rough-Terrain Robot on Earth*, http://www.bostondynamics.com/robot_bigdog.html.
3. *Crusher Unmanned Ground Combat Vehicle Unveiled*, http://www.nrec.ri.cmu.edu/ projects/crusher/Crusher_Press_Release_DARPA.pdf.
4. Hodge J. L., *Doctrine 2015: The Future of Sustainment Doctrine*, "Army Sustainment", Vol-44, Issue 2, March/April 2012.
5. *Releases*, http://www.darpa.mil/NewsEvents/Releases.aspx.
6. International Solutions Group: Logistics Functional Services, http://www.isglimited.com/isg_services/logistics, http://www.isglimited.com/yahoo_site_admin/assets/docs/ISG_LOGFAS_Support_Services.21174722.pdf.
7. Oestergaard Balle J. K., *About MQ-8 Fire Scout*, http://www.bga-aeroweb.com/Defense/MQ-8-Fire-Scout.html.
8. *New General Motors Partnership*, "Army Technology", Vol-2, Issue 2, 2014 March.
9. *The 2014 R&D Magazine Global Funding Forecast*, http://www.rdmag.com/articles/2013/12/2014-r-d-magazine-global-funding-forecast, http://www.rdmag.com/sites/rdmag.com/files/gff-2014-5_7%20875x10_0.pdf.
10. *XM1217 MULE-T*, U.S. Army, https://www.fcs.army.mil/systems/mulet/index.html.
11. *XM1218 MULE-CM*, U.S. Army, https://www.fcs.army.mil/systems/mulecm/index.html.

BADANIA WOJSKOWE W DZIEDZINIE TECHNOLOGII ULEPSZAJĄCE PRZYSZŁĄ LOGISTYKĘ

Streszczenie: *Artykuł opisuje możliwe zastosowania najnowszych rozwiązań technologicznych, które usprawniają wydajność logistyki w czasie misji zagranicznych i są prowadzone przez siły koalicyjne w różnych częściach globu.*

Słowa kluczowe: *przyszłość logistyki, logistyka wojskowa, bezzałogowe pojazdy, roboty wojskowe*