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NEW TECHNOLOGIES AND MEANS OF COMBAT SHAPING MODERN MILITARY OPERATIONS

NOWE TECHNOLOGIE I ŚRODKI WALKI KSZTAŁTUJĄCE WSPÓŁCZESNE DZIAŁANIA MILITARNE

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Abstract: *The use of advanced technology land troops and combat undoubtedly will force changes in the terms and manner of execution of modern military operations. The process of implementation of modern automated systems of command, reconnaissance or destruction points to the ever increasing in today's battlefield importance of technical solutions and information technology. These factors, often now raised to the rank of the principles of war art, decide to obtaining an advantage, both informative and quality. Therefore, to achieve and maintain the advantage of modern weapons systems must be characterized by certain properties and combat capability commensurate with the challenges of modern multi-dimensional battlefield.The effect of introducing new combat measures is to seek ways to best use. Among the key directions of development stands out among others the development of the concept of network operations. Generally seeks to combine the various combat platforms, both manned and unmanned as a single system. At the same time large scale systems are deployed soldier's individual equipment. The paper presents the directions of development and degree of implementation of changes in the equipment subunits of land forces and the impact of new technologies on the capabilities and performance of combat tasks. Presenting the issues and concepts of the capacity of the soldier, infantry equipment, limiting the contribution of aspects of human factors in combat through the use of Unmanned Air Systems. The development also raises topics implementation of network data exchange systems and the related expected changes in the rules for the implementation of combat operations.*

Keywords: *means of combat, military operations*

Streszczenie: *W artykule przedstawione zostaną kierunki rozwoju i stopień realizacji zmian w wyposażeniu pododdziałów wojsk lądowych oraz wpływ nowych technologii na możliwości bojowe i sposób realizacji zadań. Zaprezentowane zostaną kwestie możliwości działania i koncepcje indywidualnego wyposażenia żołnierza piechoty, aspekty ograniczenia udziału czynnika ludzkiego w walce poprzez wykorzystanie bezzałogowych platform bojowych oraz bezpilotowych aparatów latających. Opracowanie poruszy również tematykę implementacji sieciocentrycznych systemów wymiany danych i związane z tym przewidywane zmiany w zasadach realizacji działań bojowych.*

Słowa kluczowe: *środki walki, działania militarne*

1. Introduction

Technical and scientific progress, new technologies, political and social changes in the world early twenty-first century functioning revaluate assumptions and rules of conducting military operations and the need to enforce their fundamental overhaul.
Technological development and equipping of troops in the increasingly sophisticated means of destruction and transportation contribute to a change of views on the conduct of modern military operations. The most characteristic features of the modern battlefield include: a large increase maneuverability and fire power of troops, the dynamics of action and rapid change in the situation, increasing the possibility of impact on the full depth of the combat structure, a quick transition from one struggle to another and the strong desire to gain and maintain the initiative. This highlights the dynamic and highly maneuvering nature of modern military operations.
Although due to the currently reigning in the world crisis in most countries is limited to expenditures for the modernization of army, that fact does not mean that they intend to resign from the key programs, developing new technologies and means of struggle.
In theory and practice more and there are new concepts for conducting military operations, are developed technologies and means of fighting, the growing importance of unmanned platforms and precision of destruction. These conditions indicate that based on current knowledge, including the issue of conducting military operations, there are many reasons to make inspiring multifaceted analysis, evaluation and identification of current status and determine the forecast changes.
Alignment with the conduct of military operations to modern battlefield conditions, new challenges and to maintain readiness to respond to new threats can be, inter alia, by implementing innovative techniques and technologies and the continual transformation of the armed forces. Indeed, they should still be characterized by high levels of mobility, technology and military equipment combat and have integrated automated systems of command, reconnaissance and logistical support. Integration and synergy of this type, interoperable systems of different types of troops and the armed forces, allows the efficient use of potential and combat capability.
Among the key directions of development of future systems is observed, inter alia, the implementation of the system equipment infantry soldier, the introduction of large-scale unmanned combat platforms, unmanned air vehicles (UAV) or lighter combat vehicles and robots. The equipment of the armed forces appear active measures to combat in space, which already can not be reduced only to the three basic dimensions, such as length, width and height. There is in fact another dimension in the form of information space, only a limited capability devices in the speed of digital data, voice or image.
Hypothetical predictions of changes indicate the need for modifying existing today, the concept of conducting military operations. In the unanimous opinion of many

military theorists, in the foreseeable future activities will be conducted under conditions defined as network-centric environment. The emergence and development of the concept of acting in an network-centric environment been forced changes taking place mainly in the world of information technology and the growing importance of information as a factor which plays a unique role in contemporary armed conflicts. Development of the concept of network activity causes already at the lowest levels it seeks to combine a variety of platforms, both manned and unmanned as a single system - in one network.
The process of implementation of modern automated systems of command, reconnaissance or destruction points to the ever increasing in today's battlefield importance of technical solutions and information technology. These factors, often now raised to the rank of the principles of martial arts, decide to obtaining an advantage, both informative and quality. Therefore, to achieve and maintain the advantage of principles of conducting military operations should be characterized by certain properties commensurate with the challenges of modern multidimensional combat environment.

2. Determinants of technological change and the implementation of the new means of fight

Dynamically changing external conditions and internal state security system carries a number of challenges, including new risks with asymmetry and unpredictability create a new environment of military action. The conditions most characteristic features of contemporary conflict is the unpredictability of possible measures of size, time and place of its occurrence. Modern military operations are usually asymmetric and often blur the current distinction between internal and external security of the state. Today's armed forces often have to undertake tasks that go beyond their traditional missions[1].
These factors resulted in the greatly expanded the range of activities for which military forces are involved.
Analyzing the principles of conducting modern military operations, indicates that one of the main environments in which they are held in urban areas. The result is that because of limits on the effective use of heavy equipment, the main effort of its own activities rests with the infantry soldiers. There is therefore a need to provide them the best conditions for the tasks, mainly by equipping them with adequate equipment and weapons that will enable achievement of the objective measures with the least losses. Another argument for the implementation of the armed forces of modern technology is the use of civilians by the media to unfettered access to information about their activities, and thus maintaining an acceptable level by policymakers personnel losses. Public opinion forces the

[1] A. Topik, *Terroryzm i broń masowego rażenia w polityce NATO*, Zeszyty Naukowe AON 2003,
nr 1(50)A, page 11.

fact that losses among their own troops, as well as among the enemy civilian population to be minimized. This phenomenon necessitates the need for the soldier to the highest possible degree of protection and security.
Another determinant for enforcement need to modernize equipment a soldier is to advance information technology and telecommunications, which contributed significantly to the emergence of the concept of network operations. An element of this concept was created in the U.S.A the future combat system - *Future Combat System* - whose key element is to be the soldier along with his entire equipment and weapons.
In summary, the above factors resulted in the need for soldiers and information technological advantage by equipping them with the means of providing them the best opportunity for detection, identification and destruction enemy ballistic better protection, better conditions for the implementation of tasks, appropriate mobility, and above all understood as situational awareness, knowledge the action area (environment) and the location, operation, and the enemy's intentions, as well as its own forces. It being assumed that situational awareness is the soldier had seen as part of an information network, with the consequence will be equipped with equipment that allows him to communicate and exchange data with other elements of this network.

3. Concepts of individual equipment land forces soldier

The scope of tasks performed by the soldiers forced the need to adapt their individual weapons and equipment to the nature of the mission performed.
Observing the development of systems concepts and technologies for individual soldier equipment, could be tempted to say that one of the most advanced systems, is American system - *Land Warrior*. The work and development - research started in 1990 when it approved by the United States Armed Forces of the project identified the essential requirements for the future soldier and his equipment, and development trends. The idea of this concept was:

- provide infantry soldiers increased situational awareness;
- providing free communication and exchange of information between them and the elements of superiors;
- increase combat capabilities;
- vitality and soldier survivability.

Requirements for the new system are set out in five key areas:

- **vitality:** providing increased opportunities for observation in day and night conditions, to locate, identify, classify, identify and destroy enemy in every situation;
- **mobility:** reducing weight of equipment while ensuring increased combat capabilities, compatibility in the activities performed by different types of troops (airborne troops, air-assault, mechanized, and special forces);
- **survivability:** providing protection against direct fire, small arms, landmines and incendiary weapons, and also provide protection against the effects of the

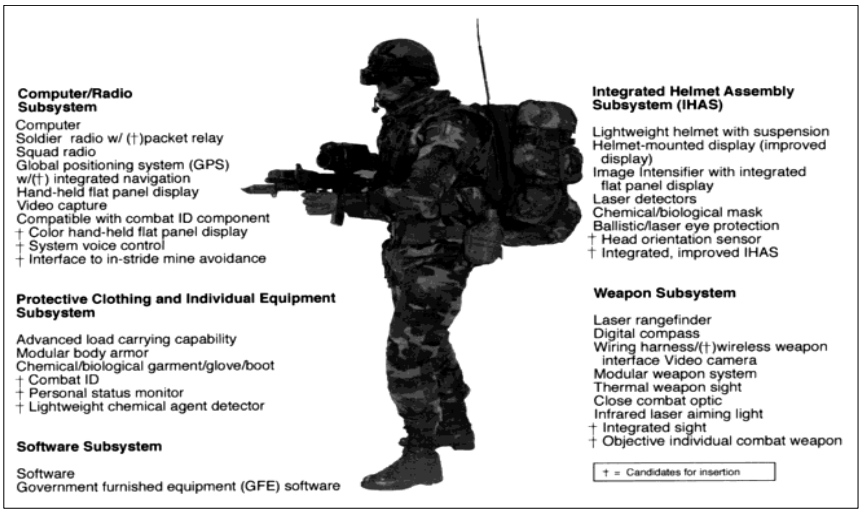
use of nuclear, biological, chemical, high-power microwave and directed energy. In addition, to provide hearing protection, prevention, disruption, or confuse the enemy detection system, warning devices provide a variety of threats present on the battlefield, providing high durability protective equipment, as well as supporting the sense of peripheral vision, hearing and touch;

- **command and control:** providing voice communication, including the exchange of confidential data, images, digital maps, graphics display, transmit and receive the location of the object, providing situational awareness and data concerning the current situation in the combat operations conducted;
- **maintenance of a soldier on the battlefield:** providing logistical support in the supply of energy resources supply (batteries), water, food and ammunition.

The Land Warrior Initial Capability system (LW-IC), consists of the following subsystems:

- **armament subsystem**: it means: 5.56 mm M-4 rifle (a lighter version of the assault rifle M-16), thermal sight (called Thermal Weapons Sight - TWS), a video camera (called Daylight Video Scope - DVS), and a device consisting of a laser rangefinder and a digital compass (Laser Rangefinder English/Digital Compass - LRF/DC) and azimuth determining the distance to the target. In conjunction with its location indicated on the GPS can pinpoint the location of this end, for the submission of the report about the situation for the purpose of fighting or fire support artillery fire during the call on fire.
- **integrated helmet**: consists of a helmet made from ballistic material, providing cover. On a helmet mounted display is connected electronically with other subsystems and with the master system in the network command. The display has a soldier graphic data, digital maps, reconnaissance information, location of other soldiers, as well as images of weapons mounted on the viewfinder and the camera daytime thermal image. This allows to keep fire from behind the corner of a building or obstacle. Foreland to observe through the viewfinder provides faster thermal capture distant, faint, characteristic features of the terrain and enemy positions, including in the event of smoke or other factors impair visibility.
- **subsystem of uniforms and personal protective equipment**: consists of a frame with a modern design, respectively, arching her body to move the backpack of a soldier and individual equipment attached to the frame. Included in the subsystem have improved ballistic shield plates for better protection against small arms. In addition, the equipment includes: protective clothing against biological impacts, gloves, boots and optional detector of weapons of mass destruction.
- **PC module integrated with the radio**: characterized by a manual manipulator connected to the computer module. The manipulator is mounted on the breast of the soldier and acts like a computer mouse, and thanks to him, the soldier can change the displayed images, control buttons on the radio,

change frequencies and send digital data. Some functions can be controlled via two buttons on the language of the gun trigger, allowing the soldier to keep weapons in combat position. Integration of GPS with a computer tenant has eliminated the need for a separate display and switches. CRS subsystem has an open architecture which allows for future conversion of both the software and components for later.



Based on: www.army-technology.com (2011.09.13)
Fig. 1 Land Warrior-Initial Capability system

When the U.S.A. was working on a project of its Land Warrior system with a similar fate also began to develop the French engineers, who launched the project Feline (fr. *Fantassin a Equipement et Liaisons Integrees*).

FELINE system is a modular, with open architecture, which enables the use of specific modules, depending on conditions (in the day, at night, during acceleration or driving in the armored vehicle, flying plane, as well as during operations in urban areas, rural or open). Modular design is to allow the matching of equipment to the nature of the task and to eliminate unnecessary burdens while maintaining the best possible protection. Uniforms are designed so as to not interfere with the natural movements performed during the movement of the soldier. The material is flame retardant uniforms, but also provides good ventilation and comfort measures at different temperatures. Optional equipment also protects the weapons of mass destruction. Large areas of the body are protected by soft ballistic materials, reinforced in places subject to wear, ceramic inserts. Special goggles, retractable inside the helmet, shield you from eyes that could blind him laser beam.

The system offers configurations adapted to their functions, such as platoon leader, squad leader, sniper, machine gun sight or others. The architecture of the system can support different software versions, chosen for specific missions and tasks of

soldiers - such as specialized programs for platoon leaders, snipers, anti-tank weapons handling.

Based on promotional materials of SAGEM

Fig. 2 FELIN system

The system includes five following modules:

a) vitality:
   - day-night sights for enhanced image;
   - control system components via buttons on the handles of weapons;
   - observation and maintenance of fire with the camera (mounted on the weapon) without tilting the body around the corner of a building or other object;

b) mobility:
   - ergonomics of the system;
   - use of GPS tracking (positioning) of all units (soldiers) in the vicinity;
   - enhanced image sighting devices;

c) C4I:

- individual radio station with the possibility to exchange voice and digital transmission;
- osteofon;
- configuration of network radio and digital battlefield;
- situational awareness closer to the real time;

d) protection:
- ballistic;
- NBC;
- against the negative factors of climate;

e) power supply:
- lithium-ion batteries;
- portable and on-board charger;
- sets for system integration with the vehicle.

Units equipped with FELINE have an element of the French system of network-centric information exchange *Bulle Opérationnelle Aéroterrestre* - BOA, whose purpose is to integrate various fighting systems of land and air component. It is assumed that the system will be integrated with land vehicles, now considered a 8x8 VBCI infantry transporter, whose first models produced by Giat Industries in collaboration with Renault are in a testing phase. By the end of 2008 in a system equipped vehicles sixth Light Armored Brigade and the 2nd Armored Brigade. Plans call for installing the system on conveyances VBCI, combat infantry, chariots, and AMX-10P AMX-56 tanks Leclerc.

A little later the French design work on the weapons and equipment of the individual soldier, the British began. They proposed project *FIST* (Future Integrated Soldier Technology) and its subsequent variants V1 and V2.

Like other systems, the *FIST* system is a modular system that allows for the modernization of the individual components, depending on the tasks. The FIST V2 highlights five key components identified as:

- C4I - subsystem command, control, communications, computing and reconnaissance,
- vitality: arming devices with foresights,
- mobility: depends on the navigation, and the size and weight of equipment a soldier;
- viability: uniform, stealth technology, ballistic protection;
- maintenance: problems of logistics.

FIST communications system is to be provided to the company level. With higher levels has to be performed through an integrated communication system *BOWMAN*.

It is anticipated that each soldier will have a coded radio allows short-range communication between soldiers subunit. Sub-unit commander will have the ability to communicate with your supervisor or base (e.g. during patrol). Voice and digital data can be transmitted directly to the soldiers, or through communications with Headquarters relationships, which in turn may transmit the command, and

have the information and images obtained from the observation posts, from other soldiers, unmanned air vehicles, sensors and remote-controlled by the assault reconnaissance aircraft or satellites.

Based on : http://www.army-technology.com/projects/fist/fist1. (2011.09.13)

Fig. 3 FIST system

It is assumed that the soldier will be equipped with GPS, inertial navigation unit and a digital map depicted on the monitor display mounted on the helmet, or wrist, as well as the laptop managing the entire system. Thanks to the integrated GPS with digital compass, the soldier will have data as to its location, the location of other soldiers, but also subunit of the enemy forces, if they are detected.
Team equipped with a FIST system composed of eight soldiers and is intended as a unified platform. Each fire group (section) consists of commander, gunner and two grenade riflemen. The primary weapon is a rifle assault troops 5.56 mm SA80, used in various configurations. This one is equipped with extensive observation and foresight device, which is connected electronically with the eyepiece mounted on the helmet sends images to allow lead to effective fire behind the obstacle, the corner of a building or other object. Rifleman has a 40 mm grenade launcher M203 suspended (UGL - Under Grenade Launcher), sniper rifle is equipped with SA-80

version with a long barrel, a gunner in a light machine gun. Other weapons adapted to the system includes a portable launcher *FIST* MBT LAW antitank, rocket JAVELIN antitank guided missiles and grenade HEFG (High Explosive Fragmentation Grenade). In this system of arms to hit behind the concealment will be possible after measuring the distance from the rangefinder and a data transfer control system coordinates the projectile (grenade), who directed more than an obstacle to explode over the target, causing its destruction.

Analyzing the current state of weapons and equipment which have soldiers the Army Armed Forces, the observation suggests that the situation in this area, much improved, especially since the Polish Armed Forces are involved in stabilization operations in Iraq and Afghanistan. This is a permanent process is also associated with the transformation of structures of the Armed Forces and their professionalizing.

Using the experiences of NATO countries in the implementation of the concept of the future soldier, in 2006 the Polish Army General Staff developed the operational requirements for development work on the Individual Combat Systems (IWS), code-named *TYTAN*. Armament Policy Department has established task teams, whose goal was to conduct work in four main areas of interest:

- integrated equipment;
- weapons and equipment foresights;
- electronics, optoelectronics and software;
- personal protective equipment (ballistic, climatic, mechanical, against weapons of mass destruction).

According to the assumptions *TYTAN* program includes:

- modernization of an individual equipment and adapt it to modern standards;
- a new generation of combat uniforms;
- a new generation of tactical equipment;
- works in the field of electronics and optoelectronics equipment;
- study of a new communications system;
- creating a new camouflage pattern;
- testing a new generation ballistic shields;
- collect data in order to develop the concept of the army a soldier twenty-first century.

On the basis of the results of theoretical work, supported by experiences from the mission in Iraq and Afghanistan, in 2008, developed the initial tactical and technical assumptions for the project. According to these basic equipment *TYTAN* will be composed of the following modules along with the forming of their constituent elements:

- combat uniform (battle suit, pants, underwear, hats, gloves, shoes, socks);
- protection system (body armor vest, flak jacket, gas mask, filter clothes, knee and elbow guards, protection devices for vision and hearing, protective clothing under the jacket);

- weapon system (automatic rifle with grenade launcher suspended, knife - bayonet, pistol, rifle-grenade launcher, sniper rifle, the ammunition, grenades);
- observation and reconnaissance equipment (reconnaissance and observation tool - binoculars, dating modular complex, helmet set, night vision goggles, personal torch, laser pointer);
- elements of the management of activities - C4I (personal computer with the display device information, personal radio station, hub - a hub, the device microphone - earphone, the positioning system, an identification system for their - the remote system health sensors soldier power source);
- mobile able system equipment (integrated with clothing handles and pockets for assembly and handling equipment and weapons soldier, a separate system for handling equipment and weapons);
- supplementary equipment (individual package of medical, chemical individual package, a set of survival).

The *ISW TYTAN* in addition to basic equipment to enable the soldier tasks under different conditions, have come further developed specialized packages: high intensity, high temperature, low temperature, very low temperature, precipitation, engineering, food, climbing, to fight in urban areas and training.

Furthermore, system *TYTAN* is to ensure:

- the ability to self-realization of the tasks in the conditions of confinement, without food and water refilling time to 24 hours;
- ability to function under conditions of industrial pollution, chemical and biological agents during the 24 hours;
- the possibility of independent action on the ground effectively:
  - open, lightly-wooded up to 1000 m;
  - in buildings and in densely-built up to 400 m;
  - outside the combat vehicle.

The individual project implemented a management system (C4I) applications should integrate all the electronic components, computer equipment optronic instruments soldier and ensure the exchange of image data and audio between soldier and elements of its environment, as well as cost-effective energy management.

The computer, part of the system is to enable the exchange of information between all peripheral devices in near real-time, including: sight, helmet set, observation and reconnaissance equipment, navigation, sensor system health soldier, display information (helmet, manual, constant) and functional integration with the other soldiers, the commander of the team, and the adjacent bands by the base vehicle, the higher-level command. According to the assumptions C4I management system should:

- ensure the acquisition, collection, processing and transfer of the necessary information to the soldiers of the team and/or to the higher command level;

- configuration command to enable communication in the team and decide on the type of information sent to the soldiers and the higher command post;
- enable receive and display information about their own position and objects and allied troops to prevent the conduct fratricidal fire.

When analyzing the current and projected state of equipment of the Polish Armed Forces soldier, do not forget about being in a test phase C3IS JAŚMIN system, in particular the possibility that presents one of its modules, namely module designed for the individual soldier - DSS (*Dismounted Soldier System*). It consists of the following subsystems:

- **Data Processing Subsystem**. His main device is a Tactical Computer Terminal, which is used to support decision making on the battlefield according to the concept of network capabilities of NATO;
- **Data Manipulation Subsystem**. Allows to enter data into the system and facilitates access to environmental data operations;
- **Sensors Management Subsystem**. Designed to connect the various sensors and information sources, such as LCD (Light Chemical Detector), GPS (Global Positioning System), inertial navigation and a video camera. It automatically controls the sensors, providing information, which after processing are distributed to other soldiers and commanders;
- **Power Management Subsystem**. Supplies the whole equipment ensures continuity of his work;
- **Information Presentation Subsystem**. Shows information on the various screens, such as the HMD (called Helmet Mounted Display) and the LCD panel. This subsystem is used during the practical implementation of the task, because obtaining the view field (space) does not involve direct combat arms and gives the user easy access to environmental data operations;
- **Data Distribution Subsystem**. Enables communication with other actors.

The main equipment is a transceiver subsystem that provides voice communication and data transmission technology, IP (Internet Protocol).

Summarizing the above considerations it can be concluded that in all pending projects, the key intention is to fulfill the principle that the fact that the soldier could efficiently perform tasks and achieve goals must have suitably higher level of technological superiority consisting in increasing the combat capabilities (the parameters affecting them) through the introduction of the latest, technologically advanced weapons and equipment items.

Another proposal concerns the level of subunit commanders situational awareness, which is not only dependent on the input of technology, but also the efficiency of the network command and data exchange. Therefore, it can be assumed that the commander, according to the concept of network operations, will have an appropriate level of situational awareness only when the will be an element of the

system (network), which will have the possibility of obtaining information and its exchange with other users.
Because the future soldier is to be integrated into a future regime network-centric battlefield, while providing one of the most important of its components, it becomes necessary to provide it with proper weapons and equipment.

4. Unmanned flying systems

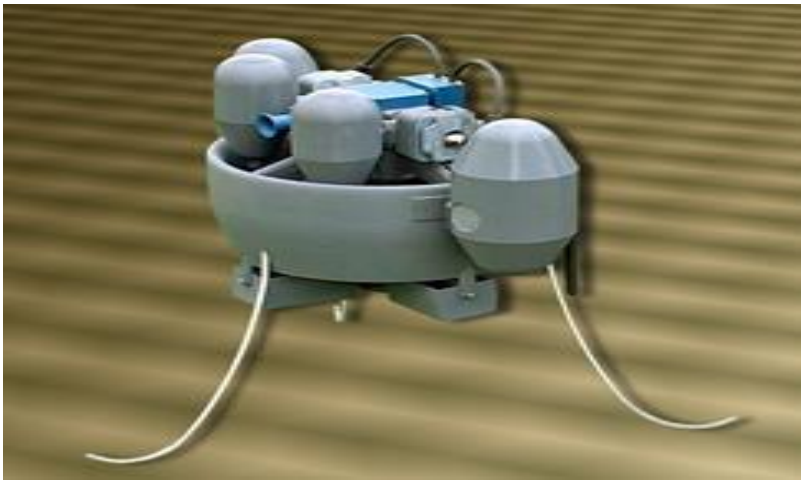
Another, no doubt a significant factor influencing the development of modern military operations is the use of unmanned flying systems – UFS.
To analyze the current state of development of the UFS and it is advisable to familiarize with developed in the U.S. Army Future Combat Systems document (FCS) 18 +1 +1 Systems Overview. White Paper. According to its assumptions of future combat system is to be connected (because it covers all types of troops and services) system of systems. It is assumed that it will build on eighteen separate systems, the network between these systems and the soldiers with their technologically advanced equipment. It has, therefore, is to include a twenty (18 +1 +1) different systems. Under the assumptions of the system will consist of:

- system of ground autonomous sensors, (*UGS - unattended ground sensors*);
- two autonomous ammunition systems: launched (*NLOS-LS - Non-Line of Sight – Launch System*) and intelligent (*IMS – Intelligent Munitions System*);
- three classes of unmanned ground vehicles: ARV (*Armed Robotnic Vehicle*), SUGV (*Small Unmanned Ground Vehicle*), MULE (*Multifunctional Utility/Logistic and Equipment Vehicle*);
- eight systems of manned combat and support vehicles;
- network between these systems;
- soldiers and their equipment;
- four classes of UFS[2].

Unmanned Aerial Systems division has been made on the basis of level of command: for platoon - Class I, the company - Class II, the battalion - Class III, brigade - Class IV. In this paper I will consider a platoon- company level systems.
Unmanned Air Vehicle system Class I (Class I UAV) according to the assumptions FCS is intended to provide opportunities reconnaissance platoon soldiers, tracking and searching purposes (Reconnaissance, Surveillance, and Target Acquisition - RSTA). Its key element is the aircraft vertical takeoff and landing, both designed to operate in urban areas and wooded. Can be controlled by the operator, as well as fly autonomously. Moreover, in order to ensure optimal flow of information, it will be able to interact within the network created with selected ground and air combat platforms. With this possibility subunits platoon level reconnaissance will have available information on the conditions which limit the scope of the larger unmanned aircraft. In addition, UAV class I device to act as

[2]*Future Combat Systems (FCS) 18+1+1 Systems Overview. White Paper*, ver. 19, s. 2, http://www.army.mil/fcs/ (15.09.2011)

a translation in a difficult communications in the area difficult to access. This system shall consist of two aircraft (for platoon), the control unit (mobile station flight control) and security features. Its mass (about 18 kg) is to enable the transfer system by a single operator. It is also assumed that the ship is characterized by an 8 kilometer radius of the tactical and persist in the air for at least 60 minutes[3].
System numbered among the first class is being developed by Honeywell Aerospace MAV system (Micro Air Vehicle), consisting of two miniature unmanned flying machines, batteries, flight control station, and video terminals. In accordance with the requirements of the whole system is made in a backpack carried by the operator. The system is built modularly and in addition to radio, and links for data exchange is equipped with a removable infrared camera, or daily, has also the possibility of installing other sensors equipped with an interface compatible with unmanned MAV system. The system allows recording video (10 minutes on the camera board and 60 minutes in the terminal ground flight control station). Provide on-board equipment to identify man-sized target at a distance of about 250 m and 125 m day night.



http://www.defense-update.com/products/h/honeywell-mav.htm (2011.09.13)

Fig. 4 Honeywell MAV (Micro Air Vehicle)

The system performs its tasks associated with the collection of information, mainly the method of hanging and stare (called Hover and Stare), or sit and stare (called Perch and Stare), since there is the possibility of placing it in a convenient place for observing the middle ground reconnaissance data collection .

[3] There, page 9.

Unmanned Air Vehicle system Class II (Class II UAV) is to have a wider range of possibilities than the UAV class I and twice the range of action. According to the assumptions, as a multipurpose aircraft should have the possibility of vertical takeoff and landing and to support company commander in the field of reconnaissance, security or early warning, detection and identification purposes (Reconnaissance, Security/Early Warning, Target Acquisition and Designation). Ships of this class will provide a system of measures that can be mounted on vehicles, so they can be delivered as close to the action area. This will provide increased surveillance and reconnaissance coverage. The system is to have the possibility of identifying targets in the day, at night and in poor visibility. It is assumed that this type of UAV is to be carried by two soldiers, operate within a radius of 16 km and persist in the air for at least 2 hours.

System currently meets the above requirements is the *Air Scout* and as a competitive project and the system under the name of OAV-II (*Organic Air Vehicle*). Until now, the third version of the already developed this system *GoldenEye 80*. The camera is a combination of technologies that use propulsion propeller arranged in a cylindrical hull (allows both vertical and horizontal flight device) with stealth technology, which uses a diesel engine drive. It uses sound damping system that causes the engine is quieter than helicopter cameras of similar size. The set of sensors on-board system includes a high resolution camera: day and thermal imaging and laser devices (the indicator targets and the laser beam detector). *GoldenEye 80* utilizes miniaturized navigation system and *GuideStar* flight control, which ensures the autonomy of the flight apparatus, while maintaining control and navigation during both vertical takeoff and landing, as well as horizontal flight without the need for operator intervention. An additional advantage of this object is the ability to self-avoidance, avoidance of obstacles by quickly changing the direction of flight, as well as reliability in conditions of limited access GPS.

Another example of an unmanned flying class II system is a system of OAV-II ship-based unmanned vertical takeoff and landing with a blade placed in a cylindrical casing.

http://www.piasecki.com. (2011.09.13)

Fig. 5 Prototype CLass II UAV Air Scout

The object will be equipped with cameras to allow observation of the forward and downward, which will send images to the ground terminal station flight control. Moreover, it can be equipped with various sensors and measures to detect mines and contamination of weapons of mass destruction.

In summary, having a UFS will provide its own source of reconnaissance aircraft, and this in turn will enable commanders to the lowest levels of self-command to collect information necessary for them in the field, especially in specific environments of the battlefield, in which the field of earth observation to be significantly reduced.

Opportunities of UFS presented in the paper reflect the level of requirements they must meet in relation to the information needs of the tactical level. These requirements meant that the reported structures are characterized by:

- the relatively small size;
- design modularity allows you to mount a set of sensors suitable for the mission;
- the use of stealth technology, making it difficult to detect by radar;
- low sound signatures;
- capability of vertical takeoff and landing (which excludes the need for a specially prepared landing sites and need to increase the mass of the system equipment, carried by soldiers with additional equipment startup and recovery of the vessel);
- surveillance capabilities in the day, at night, and in limited visibility conditions;
- resources and capability to detect: weapons of mass destruction, contamination, detection and identification purposes, to determine their distances, the laser beam detecting device sent by the enemy.

These requirements are designed to allow the fulfillment of the essential role of UFS which provide information from the battle space in near real-time. Thanks to them much faster than before the commander will have the knowledge about the situation in their immediate vicinity. Possessed information superiority will provide situational advantage, which in turn will obtain favorable action. However, due to the density of the battle all sorts of means, the use of unmanned aircraft systems will mainly be indicated in specific battlefield environments, such as built-up areas, mountainous or wooded.

Advantages of the use of UFS in military operations include the elimination of flying personnel losses, high combat effectiveness, reduce losses in the aerospace, economical operation (particularly servicing, fewer take-off landings, reducing the time constraints of the tasks by remote control, etc.)

Noteworthy is the fact that using of UFS is a demand not only from the army. Also, civilian users see them as the feasibility of various non-military tasks, particularly

associated with high risk of losing life or health, for example, during the reconnaissance aircraft disaster areas, or natural disasters.
Most experts predict continued, vigorous development of unmanned aviation. It is assumed that in the third decade of the twenty-first century, unmanned aerial vehicles will utilize 50% of the airspace. Further development is also associated with new tasks that may arise against UFS, for example, air transport of large loads over long distances, providing supplies to the battlefield or evacuation of wounded.

5. Network centric support systems command

The development of information technology caused the avalanche build-up of new, previously unknown ability to communicate and rapidly expanded their areas of application. Data transmission technologies (technologies used mainly on the internet) adapted to the needs of civilian users also gave new possibilities for systems used in the military. This allowed to increase the military capabilities of communications and IT systems for transmission, processing and data analysis. However, the challenge is how to organize a network of communication and appropriate sharing and making it available for common situational awareness.
The possibilities of using network-oriented access to shared information gave rise to the concept of network-centric battle. The network-centric concept emphasized a new quality, which is the environment in which the fight will be carried out, mainly fight news. The growing importance of operations other than war, the huge advances in technology and asymmetric forms of warfare led to the identification of the need to move away fro the battlefield in favor of fighting the perception of the environment as an area of network-centric battlefield.
The essential purpose network-centric conception of the struggle is to design such a set of interconnected elements of space combat, so you can use an increased amount of available information that will be transformed into knowledge necessary resources and consequently will get an increase combat capability.
To ensure the success and efficiency of the activities in line with the concept of action in the network centric environment, it is necessary to ensure a high level of information exchange between its components and the appropriate level for their use.
With regard to the military structures of the base material and the functional systems of network is a global information network (Global Information Grid - GIG), understood as a network structure whose elements are the nodal network layer:

- sensor network as a set of technical means of reconnaissance and information gathering (called Sensor Grid);
- network servers understood as an organized command posts system of decision-making centers (called Grid Command and Control) network;
- effectors identified mainly with advanced weapons systems, and active measures fight (called Shooter Grid).

Determining the extent to which the use of network technology in the armed forces can contribute to improve their military capabilities, it is not easy. But it should be emphasized that the new tactics, techniques and procedures (TTPs), which use is

made possible by drastically increasing the ability to share information in a huge affect on increasing the combat capabilities that extend the capabilities of commanders and enable them to communicate their intentions and decisions more quickly, accurately and precisely. The ability to continuously monitor the performance of tasks allows to change the decision according to the situation. An important advantage is the ability to share information to the command of the new approach, namely the use of a common battle space awareness to achieve a high degree of synchronization operations, while preserving the ability to immediately adapt to changing operational situation.

Dynamically changing external and internal conditions pose many challenges, mainly the new threats that are asymmetric and form a new space unpredictability of military operations. One of the many factors influencing this space is a significant expansion of the package of tasks performed by the army, resulting from participation in peace support operations - mainly in the Balkans, the stabilization operation in Iraq or counter-terrorism in Afghanistan.

Purpose and especially to perform the tasks envisaged by the army, require the use of a wide range of command support systems and simulation activities, which should greatly enhance the sharing of information, to enable rational decision making, and consequently result in more efficient use of forces.

These conditions became the impetus for a series of reviews and assessments carried out in various bodies. Their results led, inter alia, for use in a military exercise carried out in the NDU, the first time in the scale of the Polish Armed Forces, Command Support System JAŚMIN. System capabilities allow, inter alia, the graphical representation of the current situation and mapping of the planned activities, and the collection and processing environmental data of current activities. C3I JAŚMIN is able to perform and present:

- structure and equipment;
- display the current situation;
- alarm sensors display;
- planned activities;
- command/short orders and reports.

During the exercise was also used Action Tactical Simulator, which allowed a short time after entering the data to simulate the system planned by the command post personnel for action, and thus their evaluation and comparison of options under consideration of the course of action (COA). The simulator has been developed under a project implemented by the Cybernetics Department of Military Technical Academy and Management and Command Faculty of NDU.

The conclusions of the exercises and theoretical considerations allow to conclude that the use of command support systems will allow, inter alia, eliminate the inertia of the existing specific information, resulting from delays in the flow of data.

In an environment of network-command support systems, the actual picture of the situation will be much more extensive, and most of all current and close to the actual operations. Generate a shared picture of the situation of combat with the

use of data and information transmitted in real time, will provide commanders with the knowledge and situational awareness at any time, anywhere, without needing to ask for information to other participants in the activities.
Under the conditions of application of modern IT infrastructure, commanders, and in particular the staff a command post functional cells, will have a clearer picture of the situation and the high level of knowledge of the totality of the conditions of its own activities. This will allow the implementation of the command of far greater degree of probability of success in action, than in conditions considered to be traditional.

6. Summary

Summarizing the above considerations it is clear that the analysis and evaluation of the phenomena of contemporary and future battlefield indicate that new technologies and means of struggle undoubtedly will affect the rules for the use of troops, both in current and future operations. Application of modern combat systems will shape the image of military action, will force changes in how and when and where to use your potential. Network variety of related sensors at all levels and levels of information system will create conditions for the implementation of tasks in an environment previously unknown to have full knowledge of the phenomena and situations occurring on the battlefield in near real-time. Therefore becomes necessary verification number to date operating practices and assumptions.
Also anticipated that the effectiveness of military operations to increase significantly, mainly by increasing the timeliness, completeness and reliability of the information about the current status of space combat.
Noticeable is that the current emphasis on the growing importance of changes in the organizational - as a determinant of technical change and development of military operations, including operations other than war. It is anticipated that a change of tasks and how their conduct will require increased capacity and maneuverability for fire crews. Therefore, the aim is to equip them with modern means of combat and transport. In view of the large involvement of the armed forces in various operations outside the country, it becomes necessary to have highly mobile units, suitably equipped and capable to act in a relatively short time.
It should also be aware that today's challenge is to design and produce the modern means of combat, but their implementation and use in practice. For emphasis here should be that new technology brings with it increased demands on each of the user. The use of modern means of warfare should be extremely efficient and expedient, professionally carried out by appropriately trained staff for that.

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