

C4I SYSTEM FOR THE LAND FORCES, PRESENT AND FUTURE

*Major General Dan GHICA-RADU, PhD
Lieutenant-Colonel Ștefan PREDA*

For the time being, the military system is trying to define the commander's priorities to command his troupes. In time, the definition according to which 'command' is the authority and the responsibility with which a commander / chief is legally invested in order to exercise on the military structures, including the authority of using the resources available for planning, conducting and coordinating the forces necessary to accomplish the given mission.

Warfare has become increasingly complex, and the concept of "command" has evolved into 'command and control'(C2). Control has become the inner part of the command itself and represents the commander's authority on the activities or part of the subordinated structures' activities including the responsibility to give orders and directives.

The technological development of the last century has had major effects upon the military phenomenon, therefore communications are playing an extremely important role not only in the exercise of command and control, but also in dealing with more sophisticated and complex weapon systems. Therefore we are talking now about C3 (command, control and communications).

The expansion of the information component in the battle space which includes the collection and dissemination of the military information leads to the development of a new aspect of C3, the C3I, i.e., command, control, communications and military information.

C4I SYSTEM FOR THE LAND FORCES, PRESENT AND FUTURE

Nowadays, dealing with a large amount of information and the necessity of making the decision in a short time have imposed the presence of the computers in daily work, and so we are talking now about C4I (i.e., command, control, communications, computers and military information).

The command, control, communications and military information (C4I) represents an integrated system of doctrines, procedures, organizational structures, personnel, equipment and communications put in place in order to support the command and control process in all stages of the operation.

The C4I system is designed to ensure the information exchange between the military structure and the technical assets working with information in the battle space, beyond the visible or invisible limit. All the communications and military information systems starting with the ancient signaler to the modern, computer based systems are only a technical development with the same purpose – the information transmissions between military structures.

The fundamental objectives of C4I are:

a. The unity of efforts accomplishment: the C4I systems must support the combat and support forces to combine the commander's and branch chief's ideas and assessments with those of the subordinated structure. In this case, the expression of the experts' opinion is granted during the decision-making process and the command and control in real / almost real time or accomplishment of the given mission is ensured.

b. The forces capabilities exploitation: the C4I system has to be planned as an extension of processes and human senses, and as support for the military personnel to react in accordance with real events in order to make decisions. C4I systems allow the staff to act efficiently during the high tempo operations. C4I should have a very short time of response, should be easy to exploit and understand especially during high stress operations.

c. Accurate data basing of critical information: the C4I system must be able to respond information requests and, therefore, information has to be stored and maintained where it is needed. In this way the delay in getting or transmission of information and the stress of communication networks are reduced.

d. Information fusion: the C4I systems have to provide a complex and accurate image of the battle space according to staff requests. This is done by information fusion – i.e., reducing to a minimum the amount of necessary information and distributing it conveniently into the system in order to be used in the operation. Therefore, the brief, significant and accurate information will improve the unity of efforts, reduce the level of uncertainty and allow the force to act as a single body, exploit in its own benefit the modern battle space conditions and fight wisely.

Major General Dan GHICA-RADU, PhD
Lieutenant Colonel Ștefan PREDA

The C4I system provides the commander with necessary means to put in practice authority and command of the subordinates and support forces in order to accomplish the mission. The command staff uses the information in the decision making process and coordinates the actions of own forces to get the advantage of influencing the enemy.

To reach this goal, the information flow which makes the best out of the information circulation, has to be set up. C4I systems are designed to provide a continuous data flow, in real time, in every moment and place, in peacetime or in crisis, upon the users' demand. Because of the different manners of conducting military actions and of the modern battle space traits, the C4I system has to be efficient, no matter what structures, missions or military actions the forces are engaged in.

The deep changes in the global security environment which have taken place these last few years compel the combat forces to be involved in military actions which do not occur exactly in the same type of action or environment. The quick shift between offensive and defensive action, between decisive and non-combat actions, synchronized and unsynchronized actions have forced headquarters to operate frequent changes in action concepts and plans common for other kind of information flow. In addition, the high chances of a force to be ordered to participate, at short notice, in military actions in different parts of the world have lead to fundamental changes in the databases, regarding society, culture or environment-related information.

The improvement of technology used in troop's mobility, sensors and weapon systems have rendered the time for action shorter, the pace of operations higher, the control of the battle space accurate and the information amount larger. If these elements are not properly managed is likely to face with modification in soldier's reactions and finally in unit's actions.

C4I provides the subsystems necessary for information exchange and decision-making process into command and control process of the units. To conduct highly efficient operations, the unit HQ or its combat component must have information at its disposal. This kind of information has to be relevant, essential, and timely, presented in such a manner in order to be easy to understand, quickly used by the end-user and proper for the mission accomplishment. The command and control support system is the main tool of the force commander in collecting, processing and disseminating information.

Due to their complexity, multinational operations call for different military structures to act in a unified manner. Multinational forces may have particular organization and running C4I systems in point of technology, doctrine, operational standards, which can cause disorder and conduct to the increase of information

C4I SYSTEM FOR THE LAND FORCES, PRESENT AND FUTURE

requests and of doubt level. The lower the interchange between echelons, the higher the level of doubt, or much more information request for the C4I system is being received. After establishing the specific command and control structures for multinational operation, the commander sets up the demands for the C4I system according to some principles, as follows:

We must keep in mind that the C4I system as the overall resources at commander's disposal is limited and it has to be efficiently managed. To do so, the commander should start by analyzing the force, the command and control infrastructures based on critical information, and the minimum information for the decision-making process.

The activities which make the exploitation of C4I resources more efficient are:

a. *Balance of the objective – forces – assets ratio* goes to planned and complementary engagement of forces and systems involved in international activities. Forces and technical assets which make up the command and control support system have to be organized on missions in order to collect, transmit, process and protect own information while carrying on the command and control war which means to annihilate the opponent's similar capacities.

b. *Information and communication resources management* means to plan and put in place the information transport infrastructure according to the estimated mass of information flow.

c. *Electromagnetic spectrum management* represents one essential factor in the process of exploitation and operation of available resources. The frequencies distribution and usage is fundamental for radio assets operation. At the basis of the electromagnetic spectrum resources management are the international laws and they are considered national resources. The frequencies have to be managed and coordinated by unique principles established at the tactical, operational or strategic level through a variety of national or international ways.

d. *The information priority* is also important in order to establish the demands related to C4I networks size and system support centers, e.g. the engagement of C4I assets for transmission of reconnaissance information could reduce the capacity of operating other information through the network by some users who need the force commander's decisions during the operation.

e. *The training level of the personnel involved in C4I matters* is the most important side of C4I systems because of the great impact the level of ambition has against the system resources efficient usage.

f. *The user-friendliness*: in most cases, end-users are not specialists and therefore the simpler the operation of the system, the higher degree of using its resources.

Major General Dan GHICA-RADU, PhD
Lieutenant Colonel Ștefan PREDA

The present C4I system at the Land Forces level is organized and divided in two components, stationary and mobile in order to meet the forces' operational and administrative liaison needs for command and control purposes.

The general rules of engagement of the C4I systems are as follows:

- a) from the upper echelon down to subordinated echelons and two echelons downwards;
- b) from the echelon that is supporting to the supported echelon;
- c) from the structure that is providing troops to the structure that is supplied;
- d) from left to right between neighbor units.

In special situations it is suitable to produce and apply different rules which meet all the specific information requirements.

In the projection, design, organization and production of the C4I system for the Land Forces the following information tides have been considered, for conducting, cooperating and warning purposes, as follows:

- liaison with the higher echelon;
- liaison for the administrative command of the subordinated forces: territorial military organisms, military education institutions, units, small units and subordinated formations;
- liaison for the operational command and control of the subordinated forces: operational tactical commands of divisional type, brigade type, large unit commands and directly subordinated units;
- liaison with the echelons which cooperate with us: NATO commands, Joint Operational Command, Air Force Staff, Navy Staff, Interior and Administration Ministry, officials belonging to the Romanian Intelligence Service, Protection and Guard Service, Special Communications Service, officials belonging to the local or central Public Administration, agencies, institutions and civil economic societies responsible for, and involved in, sustaining the national defense effort.

To provide an effective and timely act of command and control, the IT and communication system uses all the transmission means (fiber optic, battlefield cable, electromagnetic waves, satellite remote-sensor segment) which need a large spectrum of technologies (i.e., radio and antenna systems, cellular networks, satellite systems, antenna main lines, switch systems, management systems, command and control systems, etc.). The structure, the technologies and the equipment are joined to become an integrated IT and communication system.

During peace time, the administrative and operational command and control of the Land Forces are done from the peace displacement locations, through

C4I SYSTEM FOR THE LAND FORCES, PRESENT AND FUTURE

the national military communications infrastructure and through the exploitation of the elements belonging to the Garrison IT and Communications Centers.

During crisis and war, in the peace time displacement locations, the IT and communications system is augmented by the forces, means and equipment belonging to the units, small units and formations of communications, IT, maintenance and logistics belonging to the subordinated structures. From the temporary locations, the administrative and operational command and control is done through the exploitation of the elements belonging to the IT and Communications Centers of the Command Points and of the elements belonging to the Supporting IT and Communications Centers.

From the viewpoint of the capacity to meet the needs, the current C4I system uses: radio nets, communications based on the IT technology infrastructure (MILNET) and RTP/RMNC infrastructure.

The Land Forces Staff and a part of its subordinated large units and units liaise with the Garrison secret networks and radio network of the General Staff and has set up Garrison radio networks with the directly subordinated large units and units. For training reasons, the Land Forces structures have also set up training networks, sharing the working characteristics allocated through IT and communication orders.

In the Theatres of Operation operate radio networks for battlefield information and allied communication networks.

From the viewpoint of using the IT infrastructure, the Land Forces have secured and unsecured IT networks, all the units being currently able to release and receive files through "dial-up".

Equipping the military structures belonging to the Land Forces with modern IT devices and communications, interoperable with the ones existing in the NATO members' armed forces, has been achieved as part of the procurement programs; special attention is paid to meet all the needs, primarily those of the units and small units nominated to be put at NATO's disposal. In this respect, for the structures designated to accomplish NATO missions, the procurement has been oriented to setting up the battlefield mobile network, within which the communication equipment on short and ultra-short radio waves consists in the command and control infrastructure at very low echelons (i.e., squadron, platoon, company, battalion), because it allows for the easy installation, high mobility and timely exploitation. The Land Forces are equipped with radio stations with frequency jump, in a variety of constructive ways, hand-held, portable or mounted on vehicles, which ensure the partial equipment of the nominated structures within the Force Objectives, forces participating in regional initiatives and international missions.

Major General Dan GHICA-RADU, PhD
Lieutenant Colonel Ștefan PREDA

To ensure voice communications with the structures that are executing international missions, we are using communication equipment through satellites, portable or within the deployable communication modules and the managed radio networks/directions.

Beside the above mentioned equipment and capabilities, there is a significant number of analogical communication equipment, morally and physically worn-out, and the quality of liaisons is affected by the lack of unique parameter channels which meet the international standards, the EUROCOM norms and the existing standards within NATO.

To command the structures which have such equipment types, a hierarchical structure on a regular basis has been adopted, and the quality of liaison is affected by the lack of some channels with adaptable parameters, defined in accordance with international standards. This communication system type has a low level of viability, due to its strict hierarchical management mode, by the limited operational safety of the technical means employed and the lack of stored channels.

As a consequence of the limited financial resources and of the on-going restructuring process, we chose to upgrade the IT and communication installations built on the combat equipment, through the implementation of high-performance, NATO interoperable technique, and the perpetuation of a communication system of a hybrid type, to allow the progressive elimination of the analogical techniques, mainly based on a Russian concept – which might ensure a minimum of informational waves at the existing echelons. The more extensive participation of the Land Forces units and small units to applications, field exercises and international missions under the UN, OSCE and NATO command has highlighted the increasingly obvious limits concerning the possibilities of the existing systems and the need to rethink the procurement concept regarding the technical support needed to streamline the command and control process.

The insufficiency of IT and communication equipment could jeopardize the timely and qualitative accomplishment of the tasks. This should be compensated by a wise distribution of orders to ensure the absolutely necessary materials, by working methods to run the activities and the rhythmic procurement of the implied structures at optimal functional parameters.

In the future, the Land Forces are focusing on continuing the upgrade of the existing C4I system, and this is to be done through integrated IT and communication systems, for the combat structures, the supporting CS and CSS structures at battalion level, for the modern command points, mobile and with advanced C4I capabilities, integrated and information fire management capabilities of, integrated sensor systems and medical computer-assisted capabilities.

C4I SYSTEM FOR THE LAND FORCES, PRESENT AND FUTURE

In conclusion, the C4I system of the Land Forces ensures, in peace time, and with some limitations, the liaison needs for the administrative command and control. During crisis and war, the system could ensure the liaison needs for the operational command and control, limited in space and time, on some directions and only through engaging the national infrastructure or through extending the military infrastructure (RMNC) with support from the central or allied structures. The C4I upgrade continuation for the Land Forces still remains a priority, for the full accomplishment of the technical interoperability with the C4I systems of the other services of the Romanian Armed Forces and the armies belonging to NATO and EU state members.

BIBLIOGRAPHY

1. Dumitru Cristea, Roceanu Ion, *Războiul bazat pe rețea, provocare a erei informaționale în spațiul de luptă*, Editura Universității Naționale de Apărare „Carol I”, București, 2005.
2. Dumitru Cristea, *Sisteme C4I*, București Editura Militară, 2005
3. Nejat Ince, *Planning and Architectural Design of Modern C4I Systems*, 1997.
4. Lt.col. Hurmuz Paul, *Sisteme de comandă, control, computere, comunicații și informații pentru eșaloanele operative din Armata României*, Teză de doctorat, AISM, 2003.
5. Intelligence and Electronic Warfare Operations (FM 34-1), US, 1994.
6. Allied Joint Operations Doctrine (AJP-01), 1997.
7. Allied Joint Intelligence and Security Doctrine (AJP-2), Final Draft, 2001.
8. FM 6-0, Command and Control (Final Draft), US, 2000.

