

# Transforming Marine Corps C<sup>4</sup>

by BGen John R. Thomas

*'Networked systems and sensors may be more important today than sheer numbers of weapons platforms.'*

—Secretary of the Navy  
Gordon R. England,  
February 2002

The days are rapidly fading when hand and arm signals and single-channel radio alone will suffice as the primary means of communications for an infantry unit commander. Expeditionary maneuver warfare (EMW) and sensor-to-shooter capabilities offered by network-centric warfare rely on access to global networks. The opportunity to exploit this “digital dimension” of the battlefield, once enjoyed mainly by those in senior headquarters, now extends down to the last tactical mile. Consequently, assured access to “the network” is key to successful warfighting. The challenge for the Marine Corps is to enable this access to every element of the Marine air-ground task force (MAGTF).

The much discussed transformation of the military depends on the transformation of its command and control (C<sup>2</sup>) networks. While basic communications principles have not changed, what has changed is the dramatic increase in the effectiveness of network-based information systems as opposed to stovepiped systems. Access to information within and across the five elements of the MAGTF is becoming the lifeblood for full spectrum dominance of deployed Marine units. The change in decision support, from hierarchical C<sup>2</sup> systems to end-to-end, network-centric operations, is the basis for command, control, communications, and computers (C<sup>4</sup>) transformation.

## The Basis for Change

EMW requires the speedy and agile decisionmaking afforded by network-centric operations that transforms information superiority into combat power. The Marine Corps approach for network-centric operations begins and ends with the individual Marine aided by a seamless, end-to-end, meshed network comprised of sensors, C<sup>2</sup> nodes, and weapons platforms.

EMW builds on the doctrinal concepts of ship-to-objective maneuver and sustainable operations ashore as the Marine Corps prepares for the fundamental transformation brought about by the convergence of the MV-22 Osprey, the Joint Strike Fighter, and advanced amphibious assault vehicle. Our expeditionary ethos demands proficiency in network-centric operations that combine planning, enhanced situational awareness (SA), and decentralized decisionmaking through secure, flexible, redundant, tailored, and assured information flow. Information technology (IT) supports new relationships on the battlefield among intelligence, surveillance, and reconnaissance (ISR) sensors; C<sup>2</sup> nodes; and weapons platforms. By web enabling key applications and improving and maintaining a robust C<sup>2</sup> infrastructure, we enable increased information flow and the ability to increase the tempo of operations. C<sup>4</sup> networks are no longer pipes simply delivering information. Rather, they are the catalysts for speed of command and process change, enabling a greater focus on achieving the desired effects of operations. They also reduce forward deployed footprints. Receiving engagement quality information from ISR assets and providing it to weapons platforms requires common, shared, SA from commanders and staffs to individual Marines.

Deployed networks support MAGTFs operating either ashore or from a robustly connected seabase. They create a shared data environment that is seamlessly integrated into joint strategic, operational, and tactical networks.

The C<sup>4</sup> department is meeting the challenge of network-centric warfare through a combination of initiatives. Importantly, we must construct the architecture on which our future networks will be based. Working in close

cooperation with the Marine Corps Combat Development Command as it develops and refines our warfighting concepts and the Systems Engineering and Integration Division of the Marine Corps Systems Command as it develops and integrates interoperable materiel solutions for networking, the Director, C<sup>4</sup> has committed to the preparation of an enterprise IT architecture. This enterprise architecture includes the expeditionary warfighter segment, known as the MAGTF tactical data network (TDN), and the Supporting Establishment, soon transitioning to the Navy Marine Corps Intranet. Together, this network is known as the Marine Corps Enterprise Network (MCEN). To ensure seamless integration, the Marine Corps Information Technology Network Operations Center provides end-to-end management and security. Therefore, the MCEN consists of a globally interconnected, end-to-end set of information capabilities, associated processes, and personnel for collecting, processing, storing, disseminating, and managing information on demand.

The importance of the Supporting Establishment to the warfighter cannot be overemphasized. Previously, our MAGTFs were defined by four elements: the command element, the ground combat element (GCE), the aviation combat element, and the combat service support element (CSSE). Today, a comprehensive MAGTF cannot be established without including a fifth element—the Supporting Establishment. This is most apparent in the information area and acknowledges the global reliance on Marine Corps IT capabilities. At the user level, enhanced capabilities, offered through new systems fielding and a new look at where and how we employ existing IT assets, will allow us to build the deployed network to meet the demands of warfighters in network-centric operations.

As we improve our tactical flexibility and strategic agility, we must tailor our communications packages to a wide range of missions. Critical warfighting information must be available in our operational, support, and intelligence systems. This requires an increase in available satellite terminals providing the necessary reach to operate beyond the littorals, yet remaining connected to

MAGTF, naval, joint, and national security systems. The Marine Corps is increasing the bandwidth available at the group and regimental levels with the global broadcast system and various other wideband satellite communications systems. This will facilitate targeting, intelligence, and logistics information flow. The resultant shared data for air, ground, service support, and command elements of the MAGTF creates a powerful synergy for transformation.

As the MAGTF TDN graphic in Figure 2 illustrates, Marine forces deployed beyond line of sight will be able to connect via airborne relay provided by unmanned aerial vehicles, MV-22s, and satellite links to seabased forces, and be able to reach back to supporting elements for C<sup>2</sup>, SA, and sustainment information. Systems such as the Defense Advanced Global Positioning System (GPS) Receiver and the data automated communications terminal (DACT) connected via the MAGTF TDN allow for increased SA at the company and platoon level. This increases a commander's ability to rapidly receive information from sensors and systems and deliver it to weapons platforms by using the network as a force multiplier.

The ability to connect through satellite communications enabled Marine Corps forces in Afghanistan, operating well beyond the littorals, to provide communications for C<sup>2</sup>, intelligence, and logistical support. Marines were able to reach back to the Supporting Establishment from forward operating locations by connecting to the defense information systems network and selected intelligence networks for the common user services of voice, data, and video. This strategic agility to operate deep in Afghanistan was provided by the well-trained Marines of the joint task force enabler package, a forerunner of the first-in command and control system.

The Marine Corps is in the process of fielding several new systems that will greatly increase capabilities. Revolutionary in its effect on MAGTF warfighting capabilities will be the fielding of the joint tactical radio system (JTRS). The purpose of the JTRS program is to develop a single, interoperable, joint radio that will provide a secure, software-programmable, multiband, wideband mobile

network backbone. JTRS promises to provide wide area network access and increased information exchange capabilities down to the last tactical mile.

The TDN (comprised of HMMWV-mounted gateways and transit-cased data distribution systems) and its sister component, the digital technical control, are being fielded now throughout the Marine Corps. These systems of interconnected gateways, routers, and servers provide Secure and Nonsecure Internet Protocol Router Networks (SIPRNET and NIPRNET) from the major subordinate commands down to battalion level and form the backbone of the MAGTF TDN. Within the GCE, the fielding of the enhanced position location reporting system (EPLRS), a digital data radio, and the two DACT variants (a ruggedized, hand-held personal digital assistant and a mounted, ruggedized laptop both equipped with digital mapping, GPS, and preformatted messaging) will provide tactical SA from the infantry platoon level up through the GCE headquarters.

At the regiments, air groups, and CSSEs and above, TDN will be linked by significantly enhanced wideband satellite capability in the Marine Corps. The fielding of new lightweight multiband satellite terminals (LMST) to the communications battalions will augment legacy ground mobile forces satellite terminals. LMST fielding, together with the current fielding of the extremely high-frequency (EHF)-based secure mobile antijam reliable tactical terminal to the Marine divisions and Marine expeditionary forces (MEFs), represents a revolutionary increase in wideband satellite connectivity for MAGTFs. Together they provide the commanders of all elements of the MAGTF with reliable satellite communications to Marine Corps, joint, and multinational units within a given theater. They also provide reachback to national assets or resources such as intelligence information. These spacebased systems, when networked with terrestrial multichannel systems such as the AN/TRC-170 and AN/MRC-142 radios, create a robust, reliable, wideband network to support multiple commanders across a wide geographic area. The Marine Corps is, in effect, building a tactical internet with access to higher level networks.

The Marine Corps is also fielding a family of systems specifically designed to automate and standardize the combat operations centers within the MAGTF. The unit operations center (UOC) is designed to add commonality and consistency, as well as state-of-the-art technology, to the combat operations centers from the battalion to the MEF headquarters. Designed with modular and scalable technology, the UOC will provide commanders with user-friendly consoles and displays to receive, assimilate, and display friendly and enemy data to aid in the decisionmaking process. UOC will host such applications as the global command and control system (GCCS), tactical combat operations, advanced field artillery tactical data system, and the intelligence analysis system as well as other key C<sup>2</sup> and logistics systems. By providing common suites at each level of command, commanders and staffs can more readily share information and gain a common tactical picture of the battlespace.

The Marine air command and control system (MACCS) provides the means for translating the MAGTF commander's intent into aviation-specific C<sup>2</sup> capabilities. It integrates aviation functions in air defense, air support, air traffic control, and command center operations and planning. The key component of the MACCS of the future is the common aviation command and control system (CAC<sup>2</sup>S), a modernization effort to provide the aviation commander with the necessary hardware, software, equipment, and facilities to effectively command, control, and coordinate air operations in a joint and coalition environment. The CAC<sup>2</sup>S system incorporates the jointly mandated modules of the theater battle management core system, the system that plans, develops, promulgates, and executes the air tasking order and accomplishes the MACCS missions with a suite of operationally scalable modules tied to the MACCS organic sensors and weapon systems. Capable of supporting any operational contingency, CAC<sup>2</sup>S workstations incorporate common messaging, database, network, security, and display services in support of joint automated aviation planning, SA, decision aid, and tactical air operations.

These technologies comprise a system of systems that will yield a truly flexible, scalable, and integrated MAGTF data network that allows seamless communications among commanders, elements, and support personnel. Importantly, the fielding of more and greater capabilities to major subordinate commands has allowed a shifting of assets in order to provide increased wideband connectivity to the outer edge of the MAGTF. Wideband terrestrial systems, once critical for connectivity at higher levels, may now be redistributed to the forward edge of the network. By leveraging existing capabilities we will more quickly realize the effects of network-centric operations.

### **Connecting the Naval Force**

The development of the naval C4 architecture is as important to the enterprise network as is any element of the MAGTF. This vital connection—that of Marine to ship—is paramount to the provisioning of C<sup>2</sup> and information services to deployed Marines. The concepts of EMW—ship-to-objective maneuver, seabasing, sustained operations ashore, and other basic tenets—absolutely rely on the interoperability of Navy and Marine Corps C<sup>4</sup> systems. The C<sup>4</sup> department continues to spend considerable effort engaging with the Navy to assist and capitalize on Information Technology 21 (IT-21) efforts. IT-21 systems encompass the majority of shipboard C<sup>4</sup>ISR capabilities, including SIPRNET, NIPRNET, GCCS-maritime, and super high-frequency (SHF) and EHF satellite communications, to name a few. The timely fielding of these systems and their integration into the network must be closely synchronized.

The synchronization of C<sup>4</sup> system installations on amphibious ships with the fielding of complementary Marine ground C<sup>4</sup> systems is the first step to achieving naval network-centric operations. The recent installations of the digital wideband transmission system (DWTS) aboard amphibious shipping, coupled with the AN/MRC-142 product improvement program/shore mount accessory kit fielding, provides the landing force with a wideband, line-of-sight, ship-to-shore, and ship-to-ship voice, video, and data capability. DWTS provides the same

capabilities among elements of the embarked landing force of an amphibious task force while underway. Programmed improvements in high-frequency automatic link establishment aboard amphibious ships will significantly increase the access of the deployed commander to the network and will provide greater capability to the lowest levels of the MAGTF in sensor-to-shooter environments.

The Navy-Marine Team has also made considerable progress at identifying requirements and resources to install a ship-to-shore EPLRS network. The EPLRS data radio aboard ship, completely interoperable with the EPLRS fielded to Marine infantry regiments and battalions, is the interim solution for providing the landing force with an Internet protocol network to pass data to the ship while transitioning from ship to shore. These efforts complement the ongoing coordination with the Navy on installation and configuration of wideband SHF and EHF satellite communications (SatCom) on amphibious ships. The fielding of EHF SatCom systems to both the Navy and Marine Corps offers considerable improvement to our capability to establish wideband connectivity from ship to shore. We will continue to work closely with the Navy to ensure that the naval team leads the way in network-centric warfare. Documenting this work in the naval C<sup>4</sup> architecture is an important step forward in formalizing the way ahead.

### **Forging the Way Ahead**

Providing the network infrastructure described above requires the right leadership and the right training. As we focus on building the network we must ensure that our C<sup>4</sup> training and education meets the needs of all Marines who will employ and maintain tomorrow's C<sup>4</sup> systems. Our overarching manpower goal is to ensure that we have trained Marines with the appropriate skills to install, operate, and maintain the C<sup>4</sup> systems we employ. Efforts undertaken recently to achieve this goal are consolidation of C<sup>4</sup> warrant officer training at the Command and Control Systems School at Quantico, establishment of enlisted participation in the information resource management master's degree program at the Air Force Institute of Technology, and acceleration in the implementation of new

training at the Marine Corps Communications Electronics School at Twentynine Palms. As we invest time and resources to train our smartest communicators, we must also provide an environment that encourages retention and career progression.

At the same time, commanders and their staffs require increased training opportunities to effectively exploit the information provided in network-centric environments and to speed the pace of decisionmaking. Training for staffs in C<sup>2</sup> becomes more critical as the transformational concepts of the 21st century are developed and fielded in a network-centric environment that provides increased reliability, accuracy, and speed of information for decisionmaking. Technology provides incredible opportunities for the future, but our greatest resource will always be the Marines who make it work.

These changes, represented by the network described above, and our Marines provide the means for vastly improved decisionmaking at the edge—a transformational concept the U.S. Marine Corps is well prepared to meet. While others are talking about network-centric warfare, the Marine Corps is building the network.

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