

The growing demand for better military communications

With the greatest shift in military thinking since WWII, the DoD is developing new ways to fight the wars of the 21st century — ways that will depend on COTS technology.

By Roger Lesser

How important is communications technology to winning the war on terrorism? Ask the members of the Triple Nickel. This elite team of Special Forces was the first military unit to arrive in Afghanistan. (While they were the first military members, they were not the first Americans.



Land, air and sea forces are seeing a shift in how wars of the 21st century will be fought. With increased emphasis on communications, wars may be won or lost on the information battlefield.

When they arrived, they were met by representatives of the CIA.)

Together, the Special Forces and CIA laid the

ground work for defeating the Taliban and Al Qaeda forces in Afghanistan.

In its first days on the ground, Team 555 depended on communications equipment to call in air strikes and coordinate other efforts. (An insightful article detailing Team 555's actions can be found at the *RF Design* Web site. Check the link to the Washington Post, April 3, 2002 article by Dana Priest.) From ground and airborne communications to the use of GPS and satellite technology, communications, as always, will be the key to winning this new kind of war.

FY 2003 DoD budget looks to upgrade electronics

Is the communications capability used by the military all it can be? The simple answer is no.

It's no secret that since the collapse of the Soviet Union and the end of the cold war, defense budgets have waned. Because of this, many OEMs and component manufacturers have turned to commercial communications markets — and rightfully so. Over the course of 10 years, the DoD saw its budget shrink by as much as 50%. There just wasn't a market there. But is there today?

While many believed that with the election of President Bush there would be an immediate influx of funds to the military, it didn't happen. After the events of 9/11, this changed dramatically. While significant FY 2002 dollars have been targeted for home defense (including propagating the war in Afghanistan), it is the FY 2003 budget that is telling. The budget request sent to Congress asks for \$369 billion for the DoD, plus an additional \$10 billion to fight the war on terrorism.

When the budget is broken down, spending on electronics system is expected to increase by as much as 9% to an estimated \$70 billion. While much of this money will be spent on operations and maintenance (about 35%), a significant portion will be spent on upgrades and new acquisitions. Command, control, communications and information (C⁴I) or C⁴ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) will be on top of the agenda. For example, the DoD notes that money for leveraging information systems will double. Also, consider a recent statement released by the DoD concerning the president's defense budget request:

"The military cannot win the battles of the 21st century by working in isolation, much less in competition. The budget invests \$5.5 billion in a superior command, control, and communications infrastructure that moves a high volume of warfighting information, plus \$826 million to develop a new communications system to provide survivable, secure communications for the warfighter."

DoD looking to commercial off-the-shelf technologies

So, the money is expected to be there (at the time of this writing Congress had yet to have its say). But is it

worth the effort of commercial-oriented companies to look at the military market? The answer is a definite “affirmative.”

While many believe that the military still buys only mil-spec products, the truth is that it is mandated to look at commercial off-the-shelf technologies (COTS) first. This mandate came from William Perry (secretary of defense from 1994–1997) to reduce the dependence on more expensive military specification products. The DoD continues to support that mandate. Case in point, last year, for the first time, the DoD spent more on COTS (by a small margin) than on mil-spec. And it is looking to do more.

Another example of the DoD’s support of COTS is the Joint Warrior Interoperability Demonstration (JWID). Since the early 1990s, the DoD, through the Joint Program Office (JPO), has sponsored JWID in an effort to evaluate COTS technology. This year’s demonstration, being held in early May, will evaluate as many as 35 technologies. As of the time of this writing, results are unknown. But if the

last few JWIDs are any indication, opportunity for commercial communications technologies to be adopted for military applications definitely exist.

DoD acquisition process getting better, but still a hurdle

Historically, doing business with the military was a drawn-out process. But is it getting any better? Agilent Technologies’ Gary Heimbinger has seen some improvement. “Working with the government has gotten better,” Heimbinger said. “I don’t think there is any doubt there has been an improvement.”

And making it even more responsive is an important goal for under secretary of Defense for Acquisition, Technology and Logistics, E.C. “Pete” Aldridge. Aldridge believes the process is “taking far too long,” and he has established a goal of improving the system. He notes, “We’re looking at making contracts more commercial-friendly. Many commercial firms do not want to do business with the Department of Defense.

“We have some burdensome rules and regulations. I think we can relax some of the rules that would make a company want to do business with the Department of Defense,” Aldridge said. “Because of all these rules and regulations,” Aldridge notes, “it’s a shame that we cannot take advantage of their technologies. We want to make sure we give them the opportunity and to reduce the barriers.”

21st century warfare and communications

Adapting to the new realities of 21st century warfare is going to be a must. It will require quick response to a range of threats. It will also require a real paradigm shift for the military — a shift that will require all the services to work much closer together. The bond that will tie them together? Information.

The new approach is called Network-Centric Warfare (NCW). The DoD 2002 report to Congress on NCW noted: “NCW is no less than the embodiment of an Information

Age transformation of the DoD. It involves a new way of thinking..." In fact, the report notes: "Network-Centric Warfare is to warfare what e-business is to business." It is a warfare for information superiority that can be brought to the battlefield within minutes.

Vice Admiral Arthur K. Cebrowski and John J Garstka, in their book, "*Network Centric Warfare: It's Origin and Future*" (2nd edition available online at www.dodccrp.org/) note that the significant shift is from the platform to the entire network. In essence, instead of having systems and people operating independently of one another, they are linked. For the military, this means everyone from senior leadership right down to the soldier can share information or get direction.

The authors point to Metcalfe's Law, "which asserts that the 'power' of a network is proportionate to the square of the number of nodes in the network." And the nodes in the military network can include information-gathering (from sensors to EW), data analysis and management and,

most importantly (in my opinion), the ability to communicate in the real time possible.

The services looking for new communications capability

With any new approach comes the challenges of making it a reality. To make NCW work, each of the services has been vigorously working toward technologies that will support communications flow and interoperability.

The Air Force Research Laboratory, Wright-Patterson AFB, OH, has identified "core technologies" that "strive to improve the information transport capabilities of wireless communications channels for airborne warfighters to satisfy intransit visibility, situation awareness and command/control operations needs." A mouthful of words that underscore the NCW philosophy.

Richard Hinman, senior engineer with the Air Force Research Laboratory, notes that there are some communications shortcomings the Air Force is working to overcome. "A lot of emphasis is being placed on airborne

communications. Unlike ground communications where you may have options such as wireline communications, airborne communications offers a real challenge," Hinman said. "One of the biggest challenges is antennas."

Hinman notes that the design problem is two-fold: first, finding the right technology to base the antenna design on and, second, minimizing the installation cost. One of the primary efforts to resolve the antenna issue is the use of phase-array antennas. "We are interested in phase-array antennas for a number of reasons. They can normally be built with a desirable profile for aircraft and, secondly, they usually have the kind of antenna gain we like so we can increase the communications capacity of the links," Hinman said.

These links go back to the core of NCW — to get not only voice, but data to the warrior. "The real burden we're facing is in the data world. There is still a need for voice, but there is a growing need for data," Hinman said. "This is an area that is just burgeoning."

Hinman notes that COTS may offer

solutions. “We always keep an eye on what is going on in the commercial world to make use of it as best we can. We try to leverage, where possible, the technology.”

Communications for the land warrior and for sea duty

Airborne communications is obviously important to the Air Force, but so is ground communication. Again, for the NCW to be effective, it must work in concert. To do this, the U.S. Army and Navy are actively pursuing new communications systems.

The Army’s Land Warrior program continues to be one of the cornerstone systems available to empower the soldier by incorporating a number of technologies to support both voice and data communications. While there are a number of subsystems, three are noteworthy. First is the computer/radio subsystem, which consists of two modules. The first is a computer and interface that link up all the other subsystems. This uses COTS technologies, including a Pentium processor.

The second module is the “communications box.” This subsystem incorporates a radio, as well as GPS and other navigation capabilities.

A third subsystem that supports the computer and communications subsystems is the software subsystem. This subsystem also includes command and control software. Noteworthy is the fact that software is based on COTS technology. (Go to www.rfdesign.com for a complete system overview.)

The U.S. Navy is also active in developing new communications systems. While one immediately thinks of shipboard, or fleet communications, the Navy faces a large problem with its shore-based communications

One of its major programs to resolve this is called the Navy and Marine Corps Intranet (NMCI). The focus of this program is to provide the Navy and Marines with an integrated and interoperable peace-time information access, but also a wartime asset for voice and data communications.

The Navy, realizing that shore-



The U.S. Army has been developing the Land Warrior to incorporate advanced communications capability — much of which is based on COTS technology.

based infrastructures were as complex as they were varied, looked to industry to see how it integrates



At sea with the USS John C. Stennis Battle Group, en route to support Operation Enduring Freedom - The U. S. Navy is facing serious bandwidth issues in providing advanced fleet communications. (photo by Photographer's Mate 3rd Class Margaret M. Taylor.)

computing and communications. Using commercial industries as a model, NMCI began to take shape. The program, which began in 2001, has a target budget of nearly \$7 billion dollars and is expected to be completed by 2003.

Once complete, the system will link as many as 300 Navy and Marine shore-based facilities. Ships at sea will eventually be connected as well.

The challenge of ship board communications

While the Navy fixes its land-based communications problems, it is faced with a significant fleet communications problem. Because of world events and the war on terrorism, one estimate has the Navy broadband requirement increasing by nearly 700%.

While the Navy attempts to upgrade its fleet communications as part of the NCW (Information Technology 21st century or IT-21), it is faced with a major obstacle — lack of spectrum.

The debates rage between the Pentagon, Federal Communications Commission (FCC) and Congress over the spectrum commercial carriers seek (primarily for 3G applications). The Navy, as are the rest of the services, is attempting to hang on to the spectrum.

The International Telecommunications Union (ITU) is pushing Congress for the Pentagon to let go of the spectrum so 3G and other mobile technologies can grow.

One individual leading the charge for DoD spectrum is Assistant Secretary of Defense for C⁴I, John Stenbit. Last August, during a reporters roundtable, Stenbit noted that the issue is one of risk. "I don't believe it is a money issue," he said. "I believe it is a risk management issue. I believe there is an enormous asymmetry in the risk." And in this case, the risk is real as we fight the war on terrorism.

In final analysis, the need for more, and improved, communications has moved to the forefront in planning for future wars. And with it, the opportunity for commercial products has moved forward as well.

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