

WHAT'S IN YOUR BACKPACK, Mac?

TODAY'S AMERICAN COMBAT SOLDIER OR MARINE CAN CARRY MORE COMMUNICATIONS CAPABILITY IN HIS POCKET THAN AN ENTIRE REGIMENT HAD A FEW YEARS AGO.

by Tom Inglesby

What a soldier or Marine infantryman carries into battle has changed throughout the years. The boots on the ground are similar, but much better, and the communications in his hand isn't anything like it was even a few years ago. If you look at the development of connectivity for a fighting unit, it would shock even a 1960s science-fiction fan.

Let's revisit a little bit of warfare history. During the Revolutionary War, communications was largely by voice and horse; Paul Revere is the most famous example, but his harrowing midnight

ride was just one of thousands that alerted civilians and volunteer fighting units to enemy movements.

Fast forward to the days of the Civil War, where we saw a major change come about in the form of adopting a technology developed in France. Both the Union and Confederate sides deployed observation balloons capable of taking a man sky-high to watch the enemy and report on their movements by dropping written notes to the troops below.

John Wise, a "professional aeronaut" was the first to receive orders to build a balloon for the Union army. However,

the balloon was never used because it escaped its tethers and was shot down to prevent it from falling into Confederate hands. On the other side, Captain John Randolph Bryan offered to oversee the building and deployment of an observation balloon for the Southern forces. His balloon consisted of a cotton envelope coated with varnish.

Unlike the hydrogen-filled Union balloons, it was a French-style Montgolfière hot-air balloon because the Confederacy did not have the equipment available for generating hydrogen in the field.

Another new technology employed by both sides: telegraphy. The railroads had made movement of troops and material over great distances faster and easier; telegraph lines on poles along the railroad's right-of-way made movement of intelligence faster, too. It didn't take long for these two technologies to be combined. Soon, tethered balloons were equipped with telegraph keys.

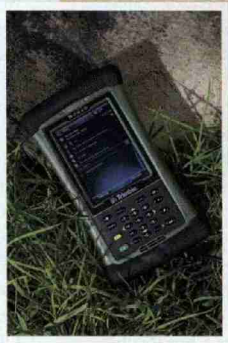
Balloons of various types were used in subsequent wars with varying success rates. They were deployed extensively along the Western Front in World War I, but this war was perhaps best known for deploying new communications technology: the use of flags or radio.

The mostly static trench warfare of World War I allowed wired communications, basically field telephones, to be used to keep in touch from one area to another. Unfortunately, many countries on the winning side expected future wars to be similar.

Not so Germany, which developed the rapid-movement "blitzkrieg" approach that proved so devastating in the early days of World War II. In 1940, the French High Command was not even equipped with radios, while it was radio capability within each tank, aircraft, and ground unit that allowed German commanders to control their forces and to use their air support so destructively.

Radio allowed German commanders to rapidly advance with their forces, to "see" the battlefield with their ears not just on the map, and to achieve much greater control and use of their forces. Radio also enabled the German senior commanders to efficiently control huge mobile forces, more than ever before in history, allowing large-scale cooperation and effective unity of command.

Meanwhile in the U.S., Galvin Manufacturing, the company that would later become Motorola, began work on what became the SCR-300 and SCR-300-A radios. Using 18 vacuum tubes, the quartz crystal-controlled backpack FM receiver and transmitter included



batteries, case, handset, and two lengths of whip antenna. The transmitter power was 0.3 watts with a range of three miles with the longer antenna. The entire SCR-300 assembly weighed 32-38 pounds, depending on the batteries. A smaller SCR-536 "walkie-talkie" radio, a handheld shoebox-sized unit, weighed five pounds with batteries and almost four pounds without.

Smaller, more efficient technology on the battlefield? This sounds like a prelude to using connected devices today.

IN THE TRENCHES

According to Marc LeGare, CEO of Proactive Communications Inc., and a former Battalion Commander in the U.S. Army, "In Korea we still relied on landlines and line-of-sight radios. Vietnam remained a line-of-sight radio environment. Today, commanders want to be where they can get a common operating picture of both friendly forces and the enemy. This now includes satellite transport technology, antenna technology, compression techniques, and power storage/generation for batteries. The difference between the two eras is likely summed up as 'Use when needed' versus 'Always on.' The rucksack of today is definitely not what it used to be."



Advanced communications are vital for soldiers in the field, and new technology is working to meet their needs. A variety of techniques are used including satellite, GPS, and powerful radios.

LeGare offers this assessment of the environment for battlefield tech: "My opinion is that the two greatest command and control (C2) innovations involve satellites. The first is the digitalization of combat forces. This allows individuals to 'see' themselves, the enemy (via spot reports), and their friends on a screen—in a vehicle, on a handheld device, or in an aircraft or operations center. Over extended distances, this type of information is transported by satellite signals. The hardened micro-computer and battlefield networking architectures are two technologies that support this C2 innovation.

"The second is the use of UAVs (unmanned aerial vehicles) of various types and functions. The ability to unobtrusively search, track, and shoot beyond line of sight or to observe and record without being seen, and to send the information to the individual on the ground is incredible."

LeGare sees satellites as very valuable tools. "Again, satellites transport the information back to ground stations for dissemination and distribution, or provide raw information to the individual. The technologies here are well documented and include cameras, micro-antenna systems, compression techniques, etc.," he says.

DAN LAMOTHE SENIOR WRITER AT MARINE CORPS TIMES PASSES ON THIS ANTIDOTE:

In May 2010, I was in northern Marjah, Afghanistan, with a small group of Marines from India Company, 3rd Battalion, 6th Marines. There were about 30 U.S. forces and 15 Afghan soldiers in total, sleeping in and patrolling from a vacant schoolhouse. The Marines were ambushed frequently by insurgents with machine guns and sniper rifles—I know, I got caught in two ambushes in a week.

One morning, I woke to find the platoon sergeant worried. Drones had picked up intel that nearly 100 Taliban fighters were gathering at a mosque a half-mile away. With only 30 trigger pullers on post at the time that would be a significant issue. The schoolhouse had a high cement wall, but all that separated the front driveway from the outside world was barbed concertina wire.

That morning the Marines sprang into action. Additional sandbags were placed in windows. Rifle magazines were loaded and stacked. Everyone avoided the open courtyard until people got a handle on the situation.

With radios and ISR (intelligence, surveillance, reconnaissance) assisting, Marines determined where the fighters were, their threat level, and acted accordingly. Our outpost was put on alert, and three helicopters hovered overhead, something Taliban fighters hate because it gives U.S. forces the advantage. The threat eventually passed, but it could have played out differently had Marines not had the technology to determine the threat level and notify everyone quickly. They had advanced warning, and it probably prevented an ugly situation. ☺

Because of the size of the early radio units and their highly visible whip antennas, infantrymen carrying radios were an obvious target for snipers. “The military wants to downgrade the size of radios for a significant reason: safety,” says Dan Lamothe, senior writer at *Marine Corps Times*, an independent newspaper covering Marine operations. Lamothe, who has been embedded with U.S. Marines on several occasions, continues, “It’s well understood that in a firefight, one of the first troops who will draw fire is the man carrying the radio, since he appears tactically important and sticks out like a sore thumb when he puts an antenna up three feet over his head. I witnessed this firsthand last spring: The gear worked, but it could definitely be improved in that regard.”

Conceptually, the military is pushing to cut the size and weight of nearly every piece of equipment it uses in the field, including everything from radios to batteries to body armor. “Individual Marines and soldiers frequently carry more than 100 pounds on their backs, weighing them down and rendering them less useful on the battlefield,” acknowledges Lamothe.

He adds, “The military spends hundreds of millions of dollars on communications and electronic equipment each year to equip individual squads of Marines and soldiers. The Marine Corps alone—the smallest of the four branches of service—will receive more than \$700 million for communication/information projects next year, providing some sense of how important electronic gear has become.”

DEVICES FOR SOLDIERS?

Laura Cavey, associate director for federal data sales at Verizon Wireless, notes, “I have been out on several appointments recently within the Army, Air Force, and Navy and cellphones are a hot topic for them, something they want to embrace. The key right now is the certification process and making sure those devices are secure in order to deploy them. But absolutely the

smartphone is going to become a tool in their arsenal and it will be as important as anything else they carry.”

She adds, “One of the other big movements that I see is in tablets. We are working with RIM ... seeing if we can come up with things that are military specific. I think it’s going to come down to what form factor people want to use, smartphone or tablet.”

With a more drawn-out design cycle and approval process, not to mention information security concerns, military radios and accessories are still evolving much slower than smartphones and tablets. Recent advancements in information security and the adaptation of a more commercial business model within DOD (Dept. of Defense) procurement has allowed advanced technologies into soldiers’ hands faster than ever before.

Jaime Rubscha, practice lead for defense programs at Product Development Technologies, explains, “As smartphones and tablet PCs continue to impact the next generation of tech-savvy soldiers, the DOD is working to bring these technologies into their missions. As these smarter technologies develop, radio accessories are playing an important role in how networked data is shared by various types of military personnel. Different branches and units within the military have their own user-specific needs, creating a wide variety of accessory options for use with tactical radios. This allows each soldier to carry (only) what he or she needs.”

James Mustarde, marketing director for Twisted Pair Solutions, agrees, saying, “The success of today’s battlefields relies upon a network of well-informed, geographically dispersed forces and is contingent upon their ability to share information in realtime with commanders. As such, superior situational awareness has evolved to be the anchor strategy for all wars, giving unified communications technologies a place among the most critical and deadly battlefield weapons.”

For the military, a huge competitive advantage is achieved through a single, secure, and highly scalable

unified-communications environment. Twisted Pair Solutions' WAVE technology provides the tools to deploy and sustain communications among battlefield networks of differing capabilities and performance. Network managers can configure the system to support any network type, enabling full communications interoperability across multicast, unicast, and mixed-mode networks while keeping bandwidth requirements to a minimum.

The range of add-ons can be vast, from GPS and soldier-worn cameras to more advanced accessories like biometric sensors that monitor a soldier's health, or a live UAV feed viewable in a pair of glasses or on a wristwatch. With the proper additions, these radios essentially become "wearable computers" and allow for even easier, lighter, and more mobile access to information.

GPS is now being integrated into the radios and the units are becoming smaller, lighter, and more capable than in the past. The same goes for cameras. As Rubscha says, "Ten years ago no one ever thought they could take a camera into the field and have photos and video go over a link through a radio so that a command center that's miles away is able to see what the soldiers in the field are seeing. This is allowing them to make realtime decisions while their teams are in field. There is even an application that runs on an iPad that controls a UAV. Soldiers down on the ground use their iPads to fly the UAV around."

Tablets are not the only computers finding their way into combat. **GammaTech** Computers, Fremont, Calif., developed a rugged notebook computer that is protected by a magnesium alloy case 20 times stronger than ABS plastic. Anti-shock mounting design protects the device's LCD and hard disk drive from damage and data loss that would usually occur with sudden shock or drop. GammaTech includes multiple security features such as fingerprint technology and a smart-card reader, all in a form factor, weight, and dimension that is similar to commercial notebooks.

Trimble Navigation, a company noted for its GPS equipment, produces the Nomad, a rugged Windows-based handheld computer with camera that makes it easy to track information and communicate in a variety of ways. Marines in the field can connect to secure radios or other devices with Bluetooth wireless or serial cable and, naturally, it has built-in GPS. It was designed from the inside out to survive the battery of MIL-STD-810F tests for drop, shock, vibration, and temperature extremes the Nomad handheld may face in the field.

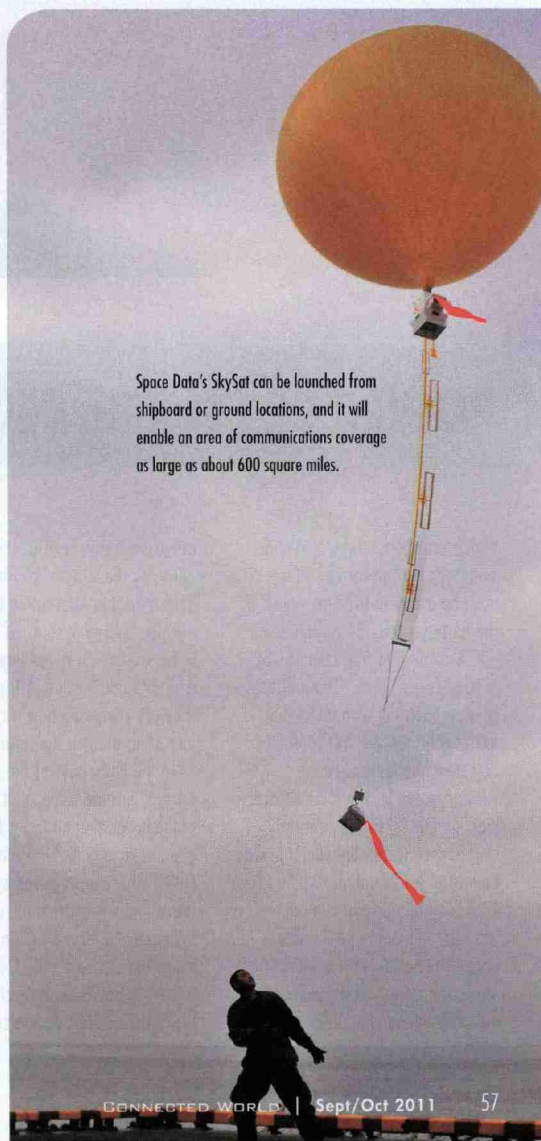
Popular in movies, but not found in the field in quantity, are satellite phones. Two products that offer connectivity via satellite and Internet are mobile satellite communications systems by KVH Industries, Middletown, R.I. Mounted on vehicles, they provide connectivity for phone calls, Internet, email, etc., whether the vehicle is parked or in motion. Both the TracPhone V7 and TracPhone V3 work with KVH's own global mini-VSAT Broadband network, which provides the service. The TracPhone V3 is a new product, recently introduced in February 2011.

Satellites are very expensive and require specialized radios to communicate with them; standard radios have a limited range depending on their frequency. But if you can bounce the standard radio signal off a satellite, you get better range without the need for specialized equipment. Hey, guess what, we've come back to balloons! Yes, the 19th-century technology

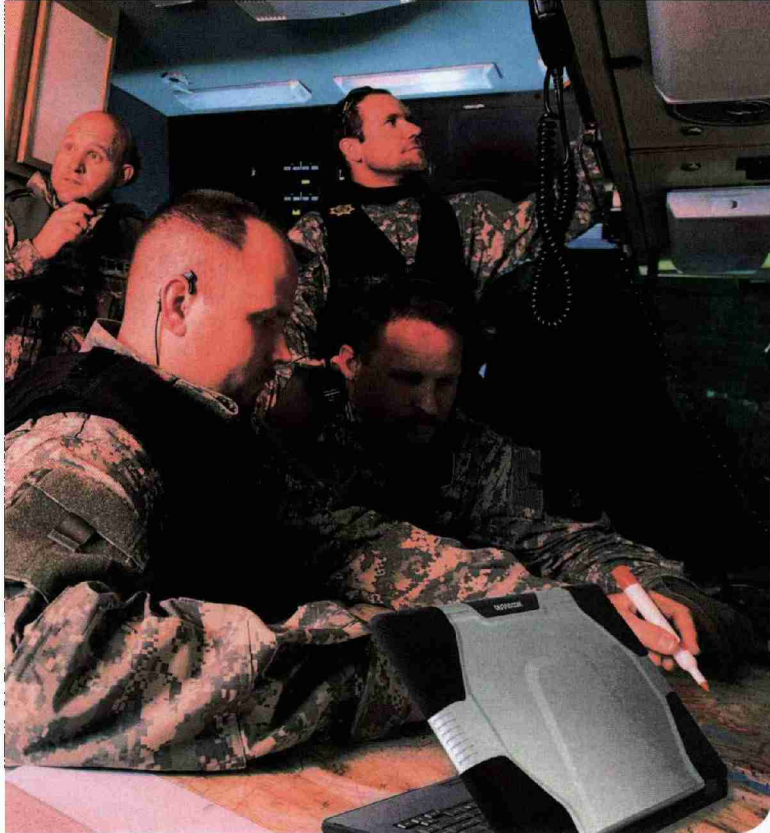
for communications in a war is now being used to provide communications in war, 21st-century style.

BACK TO THE BEGINNING

The SkySat developed by Space Data, Chandler, Ariz., is a variation of the weather balloon and carries a package of secure radio relay equipment. The SkySat can be launched from shipboard or ground locations to provide a high sub-orbital (60,000-85,000 foot) target for radio signals. By adjusting the altitude of the balloon to catch prevailing wind




Space Data's SkySat can be launched from shipboard or ground locations, and it will enable an area of communications coverage as large as about 600 square miles.



directions, operators can maintain a reasonable area of coverage, about 600 square miles, by circling the balloon.

"The balloons are up pretty high but when we level them off they're a lot closer than satellites. You get the same type of coverage but at a much lower cost," claims Gerald Knobloch, CEO of Space Data. "The big advantage is you can take existing devices, use the same cellphone, radio, two-way pager, or other wireless devices to talk to the balloon but you get the coverage of a satellite. That was the genesis of the idea."

Technology is changing the face of combat just as it is changing the world around civilians. Rubscha tells a personal story: "One of my friends got out of the 82nd Airborne about three years ago and when he started playing with one of the new radios that allowed him to see network data and situational awareness information in the field he was completely amazed. That goes for everybody who's starting to get these capabilities; it's making them better soldiers." 

POWER FROM THE PEOPLE

With all the technology a combat soldier or Marine carries, there must be a way to provide power. If the batteries die, the fighter could die. According to Dan Lamothe of *Marine Corps Times*, "The military is experimenting with items that aren't common yet, but could one day save hassles and sweat.

"For example, the Marine Corps Warfighting Laboratory recently sent experimental, lightweight solar panels to 3rd Battalion, 5th Marines (3/5) in Afghanistan. The panels were light enough and flexible enough to be folded into backpacks but could power rechargeable batteries needed for radios and

other electronic devices. It's still early for the system, known as the Solar Portable Alternative Communication Energy System, or SPACES, to be proven but it was popular with 3/5 and Marine officials say they are reviewing how it could fit into other units in the future."

In the early days of the Iraq conflict, ground troops had supply problems getting batteries for their gear, especially night vision goggles (NVG). These units have become an increasingly important advantage to U.S. troops in urban fighting, and it was more than a little frustrating to have a \$6,000 paperweight if the batteries died. To overcome the

logistics issues, individuals were buying AA batteries and asking family and friends to mail supplies.

This need, and the recurring use of AA batteries for personal electronics carried by troops, led one girl to start a drive to send batteries overseas. Liz Lulu, the founder of Troop Batteries, passed away on May 12, 2006, at age 13. In Liz's memory her family is trying to fulfill her dream of sending 1 million AA batteries to soldiers and Marines serving in Iraq and other countries overseas. Before Liz died she had collected about 550,000 batteries. By April 2010, the number collected reached 805,000.

Millions of Americans have "Support the Troops" bumper stickers and ribbons on their cars. It's a good sign for returning service people to see, but an even better one is to help those still in the war zone.

If you want to help, many Websites such as Troop Batteries, www.troopbatteries.com, can be of service. Check out the Veterans of Foreign Wars site, www.vfw.org, for example, where you can donate calling cards for in-country service personnel to call home through their Operation Uplink program. That's a positive way to support the troops. 