PCTEL™
simplifying mobility

The Changing Global Security Environment

A greatly changed global security environment makes it important for the United States to field a balanced military force capable of meeting the challenges posed by both conventional and irregular warfare. Terrorist attacks on America have brought about a new, complex and dangerous era, whereby extremists and fragile states can wage irregular warfare to confront adversaries with greater military might. The military now envisions a future of "hybrid" wars.[1] Operations in this dynamic environment will likely span the spectrum of conflict from peacekeeping operations, to counterinsurgency, to major combat.

Responding to this changing global security environment has resulted in new development programs and the elevation of program priorities within the military. These ideas are reinforced by comments from Secretary of the Army Pete Geren at the LandwarNet Conference held in 2007[2]: 'We are facing an era of persistent conflict with ruthless enemies who can pop up anywhere in the world, in open warfare, and in an information war. American innovation and ingenuity in the time of this war have never been more important.' Secretary of the Army Geren continues by emphasizing the importance of LandwarNet: 'LandwarNet is central to changing how the Army fights – it seeks to integrate every element of Army modernization and seamlessly connect the Leaders to the Soldier on the battlefield. And connect the Soldier to the information he or she needs wherever and whenever he or she needs it.' LandwarNet is described as the Army's segment of the Global Information Grid with a goal to 'wire the Soldier into the grid.' Responding to the changing global security environment is central to the theme of LandwarNet with its goal to change the way our soldiers fight through the way he communicates.

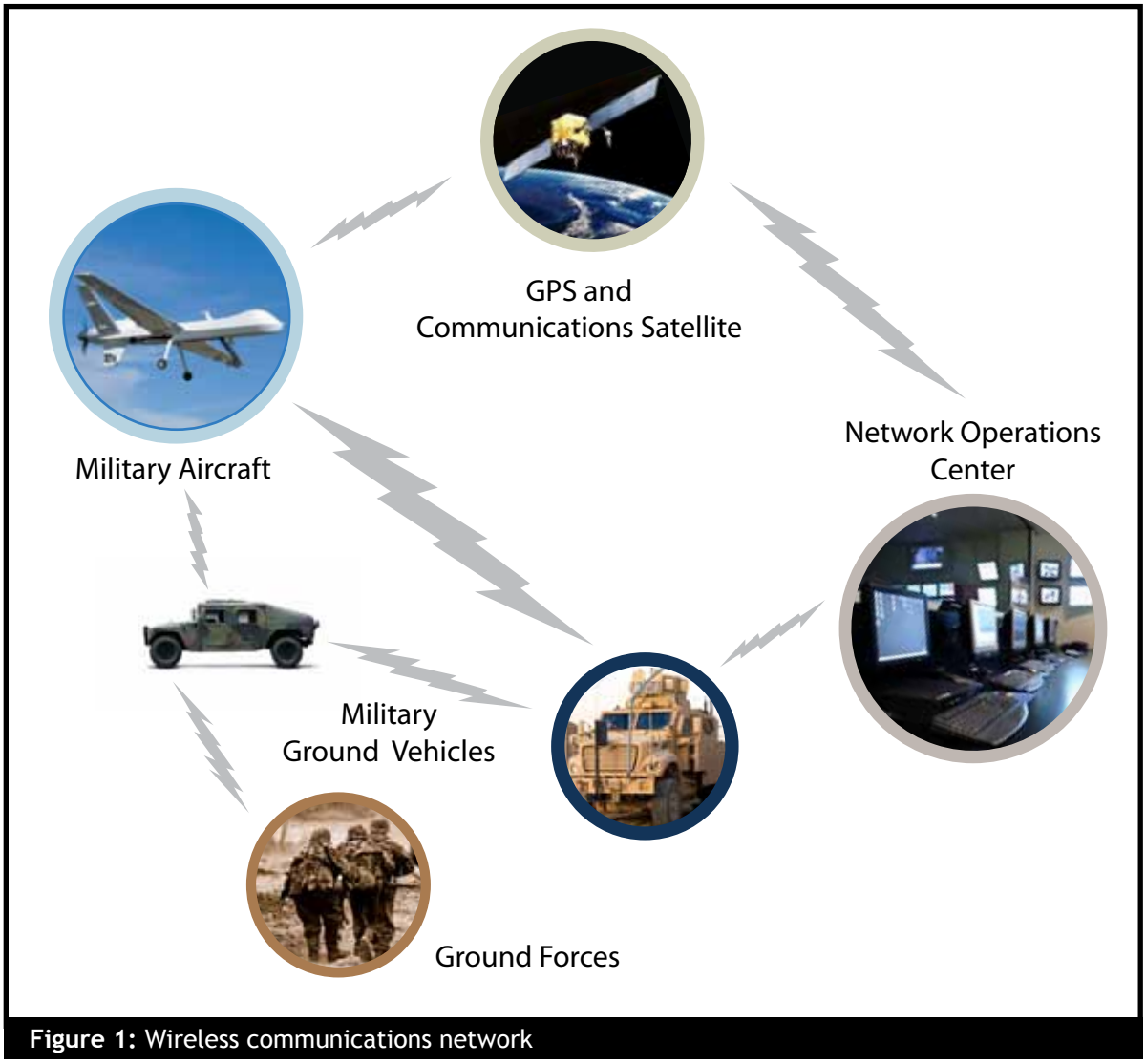


Figure 1: Wireless communications network

[1] National Defense, Aug. 2009. "Future of War, How the Game is Changing", p. 29.
[2] http://www.army.mil/-speeches/2007/08/21/4578-landwarnet-conference-remarks-by-the-honorable-pete-geren-secretary-of-the-army-in-ft-lauderdale-fla-august-21-2007/

An additional example of dynamic priorities in response to the changing global security environment is found in the Army's Future Combat Systems (FCS) program. In June 2009, the revolutionary FCS program was cancelled. However, select FCS elements, such as the unattended ground sensors and Small Unmanned Ground Vehicle, will go forward in an evolutionary manner.

These programmatic changes and reprioritization of military initiatives are strongly influenced by the global security environment. If there is a signal coming from the present administration, it seems to indicate that the time for revolutionary systems is over, and emphasis will be placed on procuring solutions that work right now, or have a high probability of working in the future.[3]

Wireless technology will play an important role in the development of these future evolutionary systems, such as the LandwarNet goal to wire every soldier into the grid. **Figure 1** shows an example of a typical wireless communications network. Military missions in this new hybrid environment of traditional and irregular warfare often require the mobility that wireless technology can provide. Both electronics and antennas are typically enclosed in small, ruggedized packages where harsh environmental conditions require protection from dust, chemicals, humidity, and extreme, fast changing temperatures. Specialized antennas are needed to communicate with satellites, aerials, or land-based communications infrastructure as shown in **Figure 1**.

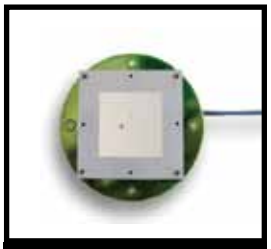


Figure 2: L1/L2 GPS with ceramic patch

GPS satellite communications has become a standard technology for both commercial and military users. Standard passive L1 (1575.42 MHz) GPS antennas have evolved into multiband and dualband amplified units that also include the L2 frequency band (1227.60 MHz). These dualband L1 and L2 antennas can be found in different physical form factors, depending upon the application. A stacked patch technology, shown in **Figure 2**, provides for a very small overall size of less than 50mm x 50mm x 2.5mm. **Figure 3** shows another version of this antenna with a Quadrifilar Helical Antenna (QFHA) element for greater gain, but still fitting within a small physical package. Various Low Noise Amplifiers (LNAs) are available for suppression of external out-of-band radiating signals.

Figure 3: L1/L2 GPS with Quadrifilar Helix Antenna

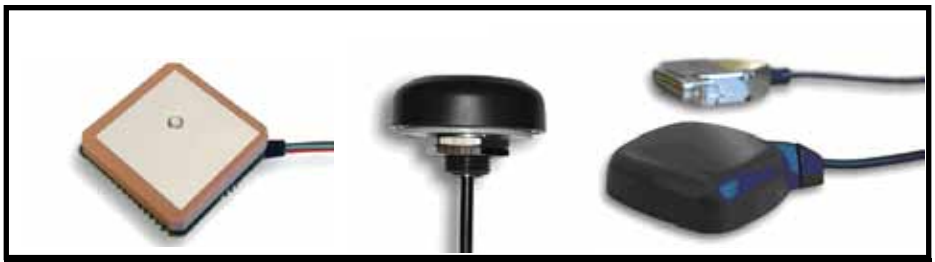


Figure 4: Precision GPS Navigation units with integrated receiver.

Often it is desirable to integrate the separate functions of the GPS receiver and the antenna into a single small package. **Figure 4** shows three variations of a precision GPS navigation unit that combines a GPS antenna with integrated 16-channel, high sensitivity, quick time-to-fix receiver. Device output configurations include CMOS, USB, and RS232. In **Figure 4**, three mechanical mounting options are shown: embedded (for custom integration into specific form factor enclosure), magnetic and permanent through-hole.

Communication with land-based infrastructure requires high performance and ruggedized mobile antenna platforms. **Figure 5** shows a low profile wide bandwidth mobile antenna with separate RF and GPS ports. This antenna provides efficient voice and data communication to multiple communications bands, from 698 MHz to 6000 MHz, including GPS (1575.42 MHz), UHF voice data (698-960 MHz), PCS/DCS (1710 - 2170 MHz), WiMAX (3300-3800 MHz) and licensed and unlicensed wireless broadband data (2200-2700 MHz and 4400-5900 MHz). Typical gain for this wide bandwidth omni ranges from 1 dBi at the lowest frequency to more than 5 dBi at the highest frequency.

For point-to-multipoint fixed station applications, or multiple antenna mesh wireless data applications, compact multiband omnidirectionals are an effective antenna choice when higher gain is required. **Figure 6** is a multiband data omni that covers the 2.3 to 2.7 GHz and 4.9 to 5.9 GHz frequency bands. This compact antenna is less than 30 cm in length with 5 dBi minimum gain in the lower band and 6 dBi gain in the upper band.

[3] The Year in Defense, Fall 2009, Editors Forward.

Figure 5: Low profile wide bandwidth mobile with GPS

Specialized antennas are needed to provide control information to drones and remote weapons used in surveillance or precision strikes. Unmanned Aerial Vehicles (UAV's) have deployed in certain irregular warfare environments to increase soldier awareness and, in some cases, to help identify Improvised Explosive Devices (IEDs). Munitions guidance antennas increase the chances of striking a target. Example applications are shown in **Figure 7**.

Leading edge wireless radio technology, coupled with the appropriate antenna technology, are needed to provide today's soldier with the right communications infrastructure. In today's changing global security environment,this is now more important than ever.

PCTEL, Inc. (PCTI: Nasdaq) is a leading supplier of specialized military antenna systems. PCTEL's antennas are equipped with features enabling them to achieve a high level of performance under challenging environmental and operational conditions. Munitions Guidance Antennas used for purposes such as controlling missiles are highly ruggedized; Portable SATCOM Antennas are miniaturized for laptop and portable radio communications; Precision Aviation Antennas are GPS and GEO augmented; Airborne Antennas have standardized mechanical features for integration into airframe platforms; and SATCOM and Asset Tracking Antennas have specific mechanical features and configurations for embedding into electronic and mechanical enclosures. Customization of these antennas allows them to function under extreme conditions, including severe vibrations on an aircraft or missile, and severe weather conditions such as sandstorms, while still facilitating reliable, high-speed communication and data transmission.

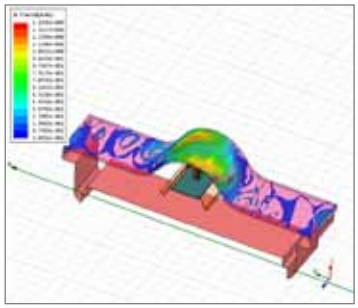
Figure 6: Multi-band 802.11 abgn omnidirectional base antenna.

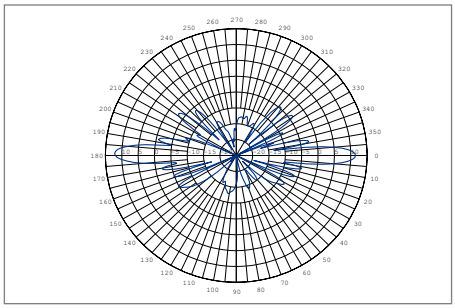
Figure 7: UAV and munitions guidance applications

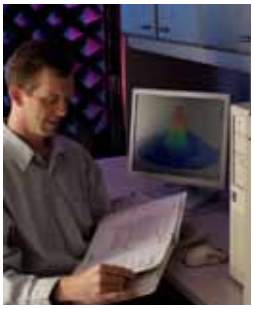
HARM with GPS L1 and L2 antennas

For more information on PCTEL's antenna product portfolio, visit www.pctel.com.

Editorial contributions made by Josh Singer.







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