

VSATs increasingly vital to mission success in the field

Terminals bring a range of inputs to mobile users but size limited by power source, specifically batteries

BY TERRY COSTLOW

Much of modern combat has shifted to quicker strikes by small teams, making light communications gear a critical part of many missions. Very-small-aperture terminals (VSATs) continue to increase the amount of data warfighters can access, though continued size reductions are becoming harder to come by.

Electronics continue to shrink and engineers devise better ways to reduce power consumption so batteries can last longer. However, antennas and batteries

are limited by physics and chemistries, so they can't match the rapid size decreases of electronics. Antennas and batteries account for a large percentage of a VSAT's size and weight, and reductions in these components will come slowly.

Nevertheless, warfighters are still benefiting from technical improvements. For example, more data is shifting to Internet Protocol so that voice, video and imagery can all be beamed to remote users.

"Almost all of these VSAT systems use some form of IP data protocols to support the trend in 'everything IP'" said

Tim Shroyer, chief technology officer at General Dynamics Satcom Technologies. "Through the use of TCP/IP those systems can thus support voice, video, or data traffic using the same transmission protocols, and thus overall efficiency can be optimized."

HANDHELD TO SATELLITE

This drive to combine Web-based technologies and satellite communications is opening the door for another change that is following consumer trends. New recruits are familiar with tablets and smart phones, so military planners are trying to give them powerful satellite communication hardware in those form factors.

"We're developing a service that uses

handheld radios to connect to satellites," said David Myers, global commercial officer at Harris Caprock. "They use a different waveform, so you don't need a big antenna. It's a project we feel will be ready in a year or less."

He noted that the role of handheld systems is growing rapidly as tablets and smart phones become less expensive tools that are understood by most incoming troops. Another benefit is that Android and Apple portables can operate with little stored data, so if they're lost, enemy forces can't glean much, Myers said.

Until satellite-compatible handhelds become readily available, users will have to be content with improvements in bandwidth and data availability. Satellites such as Hughes Network Systems' EchoStar XVII, launched in July, carry the latest technology giving military users more capabilities in terminals that maintain existing form factors. These satellites provide



Compact terminals are delivering a broader range of IP-based data that covers anything from voice to photos and video. (Pictured is General Dynamics' Warrior man-portable terminal.)

higher bandwidth, which is becoming a necessity for the growing number of warfighters who need high-resolution imagery to complete their missions.

"Satellites are more and more powerful, permitting much smaller terminals today to support high-data-rate links that would

only have been possible with larger fixed terminals in the past," Shroyer said. That causes a reconsideration of the size and quantities of terminals needed to support several different requirements."

For Special Operations Forces and others who move quickly, for example, size is of paramount importance. For most satellite communications, 60-cm (23.6 inches) parabolic antennas are among the smallest available now, though some can be as small as 30 cm.

These compact dishes can be used with more than one band, giving warfighters more flexibility. For example, the Panther from L-3 Global Communications Solutions can be connected to X-, Ku- or Ka-band systems.

These antennas are not getting any smaller, but they are getting lighter. "Our carbon fiber antenna only weighs around 30 pounds," Myers said.

The effort needed to position these



Very-small-aperture terminals are seeing wider use in quick-strike operations that require quick setup and small size.

antennas varies widely. Many systems automatically lock onto the satellite, but the motors and electronics that automate this task add weight and bulk. Users with severe weight limitations can eliminate automation by making tradeoffs between available communications bands.

“L-band is flexible enough that users can be 12 degrees off from the satellite and not interfere with other satellites,” said J.J. Shaw, director of naval programs for government services at Inmarsat. “They’re 30 degrees apart.” With Ku, C, X and Ka, you need more precise pointing accuracy because satellites are packed in more closely. If your terminal is not pointed accurately, it can interfere with other satellites.”

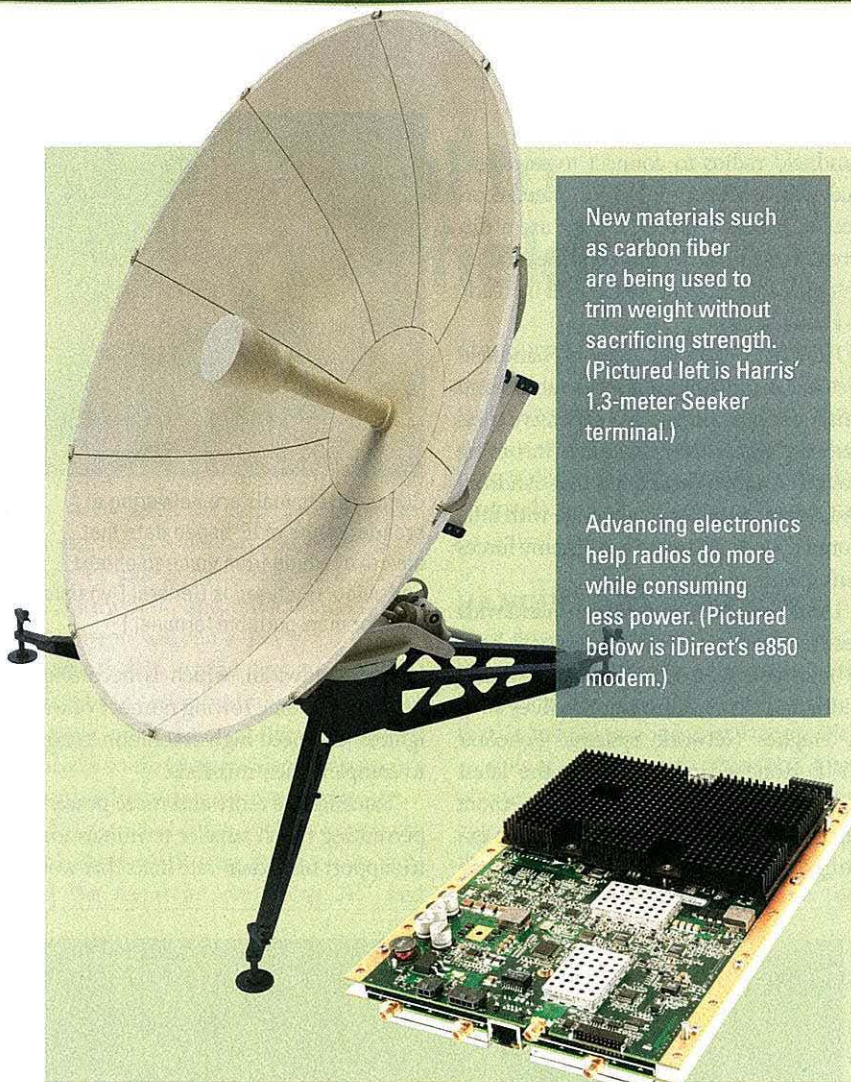
POWER PLAYS

Though terminals are getting smaller and more mobile, their power sources aren’t. Battery technology isn’t making major strides despite widespread research supported by both automakers and portable and consumer electronics companies. Military buyers would like to see greater advances.

“Little has been done to significantly improve power management to reduce power demands,” said a Defense Intelligence Agency official who requested anonymity. “Likewise, there has been no significant progress in battery technology. In short, providing power remains the single, heaviest constraint on reducing the footprint of VSATs to make them more lightweight and deployable.”

However, military users may eventually benefit from usage by other users such as nongovernmental organizations that use solar power. NGOs and other groups that don’t have the rapid response times or short duration assignments of military users are helping to advance the technology. For example, most terminals have inputs that can easily connect to alternative energy sources.

“The terminals must be able to operate on low voltages like the 24 or 48V you usually get from solar or wind turbines, as well as on standard ac or dc inputs like 110V,” Myers said.



New materials such as carbon fiber are being used to trim weight without sacrificing strength. (Pictured left is Harris’ 1.3-meter Seeker terminal.)

Advancing electronics help radios do more while consuming less power. (Pictured below is iDirect’s e850 modem.)

FLUCTUATING MARKETS

The market for these terminals is being buffeted by many factors. The U.S. drawdown in the Middle East and the budget cuts by most governments are roiling markets. However, some observers note that the drive to quickly establish communications in new environments is driving increased usage.

“Man-portable remotes are the fastest growing segment of our sales,” said Karl Fuchs, vice president of technology at iDirect Government Technologies, which makes the routers that link to VSATs.

Others note that as VSAT communications increases, the man-portable segment is being surpassed by other applications such as UAVs that carry satellite antennas. Ground-based ISR components are also seeing increased usage, both in remote sites and on land vehicles.

Shroyer noted that U.S. customers often feel that terminals should be sophisticated enough to automatically acquire the satellite and begin communications. The auto-acquisition motorization systems make terminals heavier and more power hungry than units that are pointed manually. While the U.S. market for man-portable VSATs is flat or declining, it’s growing elsewhere.

“Internationally, General Dynamics is seeing more acceptance for non-motorized, lightweight manpack terminals,” said Shroyer. “In those markets, the user is expected to be more highly trained in order to manage the pointing of the VSAT terminal antenna and to optimize RF settings. Manual VSAT terminals can be much lighter and less costly to procure, while still being capable of supporting relatively high data rates.”