Hosted payloads and synergistic design alter military satellite landscape

Military strives to increase bandwidth, link satellite and terminal design while turning to commercial suppliers for hosted payloads

- By Terry Costlow, Defense Systems
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America's two wars are winding down, but that isn't reducing the demand for satellite bandwidth. Rising demand is changing the communications landscape, changing the ways satellites and terminals are designed while also driving the military to increasingly employ commercial suppliers for hosted payloads that augment more conventional satcom and the Defense Department's own satellite communications.

DOD's trend to use commercial providers has dominated the industry for the past few years, overshadowing the military's continued efforts. Though many of the DOD programs have suffered significant delays, some projects are moving forward, and more launches are planned.

The first Advanced Extremely High Frequency satellite is operational and is being tested with terrestrial equipment, with hopes that it will bring dramatic improvements in secure communications protected against nuclear attacks and jamming activities. The National Reconnaissance Office (NRO) plans to launch four satellites this year. That follows a busy year in 2011, when six satellites were launched in seven months. The first launch of a Mobile User Objective System in February marks a step towards communications-on-the-move, letting mobile warfighters move data at 10 times the rate of today's systems. A second launch is set for next summer.

Although government agencies continue to launch hardened and high-security satellites, tightening budgets are making it more difficult to invest the hundreds of millions that are typically required to support a DOD launch. That's prompting planners in the Pentagon to seek help from commercial providers, who can often get satellites into orbit on shorter timeframes with lower costs.

"Many of the military satellites cost a billion or two per copy. Commercial satellites often cost closer to $150 million to $250 million," said Richard DalBello, vice president of government affairs at Intelsat General.

These commercial satellite providers have been handling an increasing portion of the military's overall communications capability, freeing military satellites to handle top-level security data. That's an important step, since much of the traffic sent over satellites isn't top secret.

"Ninety-five percent of our geoint (geospatial intelligence) data and 90 percent of the signal intelligence produced for NSA is classified at levels that are easy to distribute in the field, it's not top secret. But only five percent of the soldiers in the field have access to it," said Bruce Carlson, NRO's director.

Increased bandwidth will help make this data available to more than five percent of field soldiers. One technique for adding bandwidth that emerged over the past couple of years is a hybrid military/commercial approach that lets commercial service providers carry proprietary equipment into orbit.

Hosted payloads, in which military equipment is carried aloft on commercial satellites, are receiving increased interest. To date, only a handful of hosted payloads have been launched, but many observers feel the concept will have far greater appeal as the government establishes guidelines for this concept.

"We believe hosted payloads will be a low-cost alternative. The budget crunch presents a huge opportunity for hosted payloads," DalBello said. "We're very much at the beginning of a new field of hosted payloads."

Intelsat and Boeing collaborated to provide a 20-channel UHF-hosted payload on its IS-22 spacecraft set to launch this year. It will give the Australian Defence Forces (ADF) continuity of service and augmentation their UHF capacity. The ADF estimated that it will save $150 million by using a hosted payload compared with a free-flyer UHF satellite.

These hosted payloads can provide high-security communications that are encrypted by military users. But they won't typically be hardened against nuclear attacks, because one of the cost cutting techniques is to share power supplies and other equipment that's already in place for commercial components.

"When you start talking about satellites that are hardened to survive nuclear attacks, you're definitely looking at military satellites, not commercial," DalBello said. "Satellite operators encrypt the command links to their satellites, but typically are not involved in the encryption of traffic. This is typically done by the customer."

Growing demand

The United States is winding down its military operations in Iraq and Afghanistan, but most observers don't expect that to reduce demand for satellite bandwidth. The desire to monitor more areas is driving a huge increase in the amount of imagery and other data gathered by a range of sensors.

"ISR is the coin of the realm, there is an unlimited appetite that won't fade even as we phase down in Iraq and Afghanistan," said James Clapper, Director of National Intelligence.

The desire to keep troops out of harm's way is a key factor that's driving the surge in unmanned aerial vehicles (UAVs). Many UAVs carry weapons so they can strike from a distance while warfighters remain safe, while others provide surveillance information that helps warfighters complete their missions with a minimum of danger.

These unmanned aircraft often travel far from ground stations, so they must rely on satellites instead of line-of-sight links. Engineers have devised many techniques that trim the size of video

imagery sent by these UAVs, but they still generate huge volumes of data that consumes much bandwidth.

“UAVs are very spectrum hungry, they are very much a part of the need for increased spectrum,” DalBello said.

At the same time, the push drive to let individual warfighters connect by using smart phones and tablets will drive demand upward. Although some of this data will be classified, much of it will be fairly mundane information that requires little protection.

“A lot of warfighters’ communications can be sent over commercial satellites, things like unclassified e-mail,” said Vince Squitieri, program manager for the Communications Program Office at the Navy's Program Executive Office, Command, Control, Communications, Computers and Intelligence (C4I).

New design strategy

As satellite technology evolves and competition increases, design practices are changing rapidly. Engineering teams working on orbiting equipment, ground stations and terminals are no longer working in isolated silos.

The size of the terminal, as well as its power requirements, can be reduced by making minor alterations on the satellite side. A growing number of programs are designing equipment simultaneously so they can make adjustments.

“We view this as a triad, with satellites, ground stations and terminals all working closely together,” said Rick Lober, general manager of Hughes Defense and Intelligence Systems Division. “The designers of our Jupiter Ka band satellite that will launch this year worked in close proximity with team designing the ground gateways and terminals.”

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This change in design strategies is occurring in conjunction with another shift that lets terminals communicate over different bands. That makes better use of available satellite bandwidth by making it easier for users to communicate over the most effective data channel for their requirements. At the same time, it lets warfighters and vehicle designers use a single antenna instead of multiple alternatives.

“Our multiband terminals let you operate in many bands, replacing three legacy terminals: protect EHF on wideband satcom, super-high frequency and global broadcast services,” Squitieri said. “That’s important not just because it enhances a warfighter’s capabilities at reduced cost. It reduces training and logistics, you only have to handle one terminal instead of three.”

This reduction helps give warfighters access to all the data they want by creating more room for other equipment. On a ship, this savings comes both below deck, where a multirack system can be replaced with one rack of electronics, and above deck. Eliminating an antenna on a ship can bring significant savings because of all the protection that’s needed and because tracking systems on ships are often quite large.

“That’s critical with all the C4I people want. It’s a great challenge topside to install terminals. The maritime environment is tough with heavy wash over the deck and the controls need to stay on track with the satellite during a storm,” Squitieri said.

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