Internet in the Sky

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To handle a flood of battlefield data, the U.S. military is upgrading and expanding its space-based communications network.

Military communications capacity is not keeping up with increasing demand. Fighting forces in Iraq traded armor for information and speed to score decisive victories such as the capture of Saddam International Airport during their dash to Baghdad in April 2003. But intelligence, reconnaissance and surveillance data banks are beginning to overflow, particularly with a burgeoning fleet of unmanned aerial vehicles pumping bigger and better images into the digital stream.

The problem is the lack of the proper equipment to process and transport information. "A new, broader range of efforts and capabilities [is] needed if we are to provide the nation's civilian leaders with advanced, nontraditional tools for solid situational awareness anywhere on the planet," says the chief of U.S. Strategic Command, Adm. James Ellis Jr.

To help solve the bandwidth shortage, the military services plan to acquire tens of billions of dollars' worth of new satellites. Described by one senior officer as "the crown jewels" of the nation's defense, they reflect the military's changing approach to war. During the past two years, the services have been developing what they call a "transformational communications architecture." The plan is to help create a nimbler, more lethal military force to which information is as vital as water and ammunition. It also intends to topple barriers and to promote cooperation between the services and intelligence organizations.

The Military Satellite Communications Joint Program Office at Los Angeles Air Force Base is responsible for procuring a handful of satellite systems to help build the network. The first of Boeing's Wideband Gapfiller Satellites is scheduled for launch next year. Lockheed Martin's Advanced Extremely High Frequency satellite system is expected to debut in 2007. Early next decade, the Transformational Communications Satellite (TSAT) System promises to provide the first truly mobile combat information service. "This is all about making the net work," says program director Christine Anderson. "You can't be very portable when you have 20-foot dishes."

"The Army's vision is one seamless battlefield, which is linked without the bounds of time or space, to knowledge centers, and deployment bases throughout the world," says Brig. Gen. Robert Lennox, deputy chief of the Army Space and Missile Defense Command. "[We seek] capability to command on the move, so you're not stopping and having to set up a satellite receiver in order to be successful, and [to] fight at a tempo that now today we can only imagine."

The enterprise does not belong exclusively to any one military service. Neither is it limited to communications satellites. For instance, beginning in 2008, the Navy will replace its Ultra High Frequency Follow-On satellite network with a Mobile User Objective System. The new satellites will provide telephone and fax services through wireless hand-held receivers and other user terminals on what is known in Defense circles as "the GIG," or global information grid. Retired Air Force Gen. Howell Estes III, who once headed the North American Aerospace Defense Command, envisions an array of sensors - for everything from meteorology to missile warning - riding on the grid.

One potential passenger is Space Based Radar, a system capable of monitoring enemy movement day and night in all weather conditions more thoroughly and reliably than radar-equipped aircraft can. The Air Force intends to begin with a couple of prototypes later in the decade, and during the next 10 years grow the constellation to at least 20 small satellites.

The AEHF and TSAT satellite programs form the backbone of the transformational communications architecture. The AEHF system is designed to provide nearly worldwide secure, survivable and jam-resistant communications. Each $477 million AEHF bird has up to 12 times the capacity of the 1990s-era Milstar satellites operating today and serves as many as 4,000 networks and 6,000 users at once.

Ten times more powerful than the AEHF, the proposed TSAT is the linchpin of the Defense plan to revolutionize the battlefield information network. The goal of the $10.9 billion TSAT system is to create an "Internet in the sky," says Peter Teets, Air Force undersecretary for space and director of the National Reconnaissance Organization. In remarks prepared for the Strategic Forces Subcommittee of the House Armed Services Committee in February, Teets said a constellation of TSATs will make it possible for "U.S. Marines in a Humvee in a faraway land in the middle of a rainstorm to open up their laptops, request imagery and get it downloaded within seconds." Traveling through TSAT at the speed of 1.5 million bits of information per second, a 120-megabyte radar image from an unmanned aerial vehicle could reach its user in less than a second. The same trip through AEHF would take two minutes; through Milstar, 12 minutes.

TSATs would extend the information grid to deployed and mobile users around the globe, creating a new capability for combat communications on the move. The fighting forces could trade big, bulky receiving equipment for 12-inch-diameter dishes and have intelligence, surveillance and reconnaissance information at their fingertips almost as soon as it is gathered. Transformational Communications Satellites would move the Defense Department closer to its goal of a single space-based communications network with independent but interoperable systems. The network would support Defense, the intelligence community and NASA. TSATs would be the key transport mechanism of the network, in which satellites would operate as information routers the same way hub computers direct data from senders to receivers within the land-based Internet.

The Air Force recently awarded initial design contracts and will select the TSAT system's builder in 2006. The first satellite is scheduled for launch in 2012. Orbiting 22,241 miles

high, the satellites will be equipped with lasers to relay information among themselves and with EHF and Ka-band radio frequency antennas for space-to-ground communications. Five TSATs working together would guarantee around-the-clock coverage as far as 65 degrees north and south of the equator.

To help pay for the five and a spare, the Air Force scaled back its acquisition of AEHF satellites. It says a combination of three AEHFs and one TSAT can provide the same coverage for a period of 14 years. But the General Accounting Office has expressed doubts about the readiness of the laser optic and advanced data handling technologies that make TSAT work. Because senior military commanders have similar concerns about postponing communications improvements, the Air Force is considering whether to buy another AEHF satellite as a backup and delay TSAT's development. A decision is expected in November.

But nothing can change without discipline in acquisition, says Strategic Command's Ellis. Today's process is "slow, lean, and with insufficient surge capacity or room for error or unanticipated events," he says. "The careful monitoring of programs is essential, with realistic planning, minimizing requirement creep and effective program management."

The plan faces stiff political challenges. "Working with the Congress on transformational kinds of issues . . . has always been a difficult task," says Estes. Anderson sees a stable funding future for transformational communications in general, but Col. (Select) Ronald Grundman, deputy director of Space Based Radar, predicts tough times ahead for that Air Force program. "There are still those with green eyeshades that say we can't afford to build [it]," he says. "There are also going to be those who will say we can't afford to lose the global war on terror."