Commercial Operators Partnering with the Military to Meet Global Bandwidth Demands

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In his memoirs following World War II, Army General Omar Bradley observed that "A piece of paper makes you an officer; a radio makes you a commander." Bradley could never have imagined that, one day, communication satellites would take the radio to space, and that pilots in the US would fly unmanned aircraft into hostile territory half-way around the globe through a geostationary satellite link. The development of global positioning technology, the almost-instant access to satellite imagery, and the advent of broadband satellite connections to mobile flying platforms have forever changed how the men and women of the US military turn strategy into action in both war and peace. Some of the best minds in the military are today engaged in planning how space systems can further transform the task of the commander and the warfighter.

The armed force's heavy dependence on space-based networks has created two fundamental challenges for military leaders. First, they must continuously push the envelope of satellite technology to meet the explosive demand for global communications capacity. Second, they must continue to serve the legacy networks and terminals deployed around the world and in daily use by the men and women of the military. Maintaining the balance between today's globally deployed equipment and tomorrow's technology requires complex planning and significant resources.

Commercial satellite companies have historically played a vital role in helping military and intelligence leaders overcome the hurdles inherent in meeting these twin challenges. Because of the size of their global constellations (Intelsat flies a fleet of 51 satellites, its rival Stirling Energy Systems, Inc. [SES] operates approximately 45 spacecraft) the commercial operators have the flexibility to respond to military needs by designing new systems and networks, moving existing satellites to new locations, or shifting commercial customers from one satellite to another. Using these techniques, satellite operators can find additional capacity for military communications, or fill a bandwidth "gap" between the demise of one military satellite constellation and the launch of another. The international role of commercial providers has become even more critical in the past decade. Broad engagements in Iraq and Afghanistan have consumed the lion's share of military bandwidth and nearly all of the available commercial satellite capacity in the Indian Ocean Region.

Satellite bandwidth is the "fuel" that powers today's military communications. The deployment of each new unmanned aerial vehicle (UAV) requires a significant amount of bandwidth that must either be acquired on an existing satellite or on a new satellite launched for that purpose. As consumer demand for multi-channel television programming has driven an exponential increase in demand for satellite capacity, each new UAV delivered will, by definition, increase the military's bandwidth needs. Put simply, the number of information nodes used in the battlespace that can send and receive satellite signals has outpaced the supply of new satellite systems placed in orbit to process those signals.

This disparity in supply and demand has happened for two reasons. One is that military planners, focused on the long-term needs of the military, are intrinsically geared towards "next generation," government-owned-and-operated networks. Government procurement officials historically have ordered up global constellations of spacecraft with multiple features and advantages for as many users as possible.

Ambitious plans in any arena almost always encounter setbacks and delays, and creating a global constellation of state-of-the-art satellites is certainly ambitious. Recent examples of this fact include the cancelled Transformational Communications Satellite (TSAT) program and the now-delayed Mobile User Objective System (MUOS) program. The administration decided to cancel TSAT, its flagship program to provide global net-centric communications, as a result of the programs technological risk, high cost, and development delays. According to recent congressional testimony, MUOS, which was supposed to provide continuity for the nearly defunct ultrahigh frequency follow-on (UFO) satellites, is now about two years behind its planned schedule. MUOS, when implemented, will provide cell-phone-like, narrow-band services to military users anywhere on Earth over the ultrahigh frequency (UHF) radio band. This system highlights the important challenges facing satellite planners when they attempt to transition from legacy to next-generation hardware.

A second and perhaps more critical reason bandwidth supply often lags demand relates to the way the military buys com-

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mercial capacity. Commercial satellite customers, recognizing the strategic need for long-term access to space capacity, are accustomed to signing long-term (up to 15-year) contracts with satellite operators, often pre-committing to capacity prior to a satellite's launch. Satellite operators then implement fleet plans to meet the long term needs of their customers. These successful customer-operator partnerships are the foundation of the commercial satellite industry.

With the partial exception of the US Navy, the services are not geared to contract for long-term commercial satellite capacity. Instead, they acquire it on a year-to-year basis with supplemental funds appropriated by Congress. When a new commercial satellite is launched, it is not unusual for the majority of capacity to already be contracted. In these cases, the military often gets only what little capacity remains in the commercial satellite constellation. Buying the excess capacity on a satellite may prove sufficient for military needs in peacetime. However, the ever-lengthening engagements in Iraq and Afghanistan have shown conclusively that the military needs to partner with the commercial space industry to meet bandwidth needs in wartime.

Figure 1. Predator Unmanned Aerial Vehicle.

The surge in bandwidth demand for UAV operations in Afghanistan is one important example. The technology to fly and control UAVs was developed under a government research program without much long-term insight into how much satellite bandwidth the aircraft would require. The early Global Hawk and Predator UAVs designed for intelligence, surveillance, and reconnaissance (ISR) had relatively simple sensors for imaging small areas.

That basic function has evolved into craft equipped with precision targeting and missile launching capability and sophisticated sensors transmitting real-time feeds of large swaths of ground—all controlled by a mission team thousands of miles away. A Predator currently has a data-return capability of 3.2 megabits per second (Mbps), but that is expected to increase to 45 Mbps within five years because of the increase in sensor variety and capability. In the same period, a Global Hawk's data-return rate is expected to grow from 50 Mbps to 274 Mbps. Today, there is no satellite flying—either commercial or military—that could handle the Global Hawk's projected bandwidth requirements.

Existing government satellite fleets have proved incapable of providing all the bandwidth needed to support the expanding data requirements of UAVs in Iraq and Afghanistan. When US operations in Iraq and Afghanistan started in 2001, the military turned to the commercial industry for Ku-band capacity. At the time, the commercial satellite industry had surplus capacity and was able to meet this new requirement. Today, more than 90 percent of the satellite bandwidth used in the region by the military is supplied by commercial satellite companies. The Department of Defense's (DoD) demand for commercial services, combined with the robust growth of the economies in Africa and the Middle East, have resulted in frequent capacity shortages in the Indian Ocean region.

The availability of commercial Ku band for UAV traffic is not the only bandwidth challenge facing the US military today. The provision of UHF capacity to the US military provides another powerful example of how commercial firms can be called upon to provide bandwidth in response to military shortfalls. The commercial Marisat satellites launched in the 1970s filled the UHF-capacity gap until the Navy's Fleet Satellite Communications System (FLTSATCOM) went online in 1981. Even then, Marisat continued to provide service to military forces alongside the FLTSATCOM constellation. A decade later, the Intelsat constellation of Leasat satellites provided UHF capacity in the period between FLTSATCOM's end of life and the first UHF UFO system launch in 1993.

The UFO satellites are now nearing the end of their useful life. The constellation designed to replace them is the now-delayed MUOS system. Vice Admiral Harry Harris, the deputy chief of naval operations for communications Networks, told a Senate subcommittee this spring that by May 2010, the UFO constellation is expected to reach "an unacceptable level of availability." Harris also said that despite allocating 80 percent of the government's narrowband UHF capacity to the Iraq and Afghanistan theaters, military UHF networks have only been able to satisfy about 20 percent of user tactical demand. With the UFO constellation dying and MUOS not expected to be operational until 2012, there will be another "gap" in military capacity that, unfortunately, commercial operators will not be able to fill because there is very little commercial UHF bandwidth available.

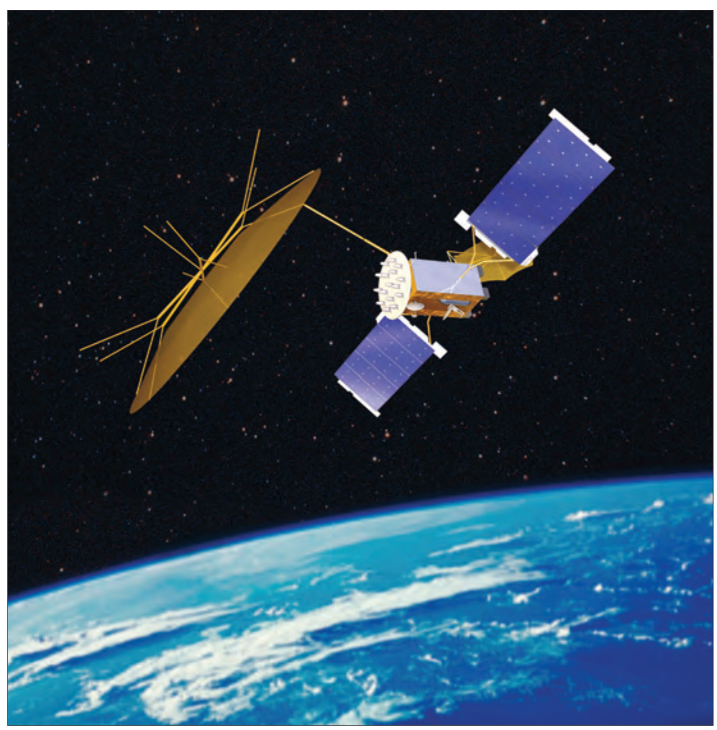

Figure 2. Mobile User Objective System Information (MUOS).

Figure 3. Intelsat 22 Satellite.

does not take into consideration what may be a rapid increase in demand for the MUOS system once soldiers, sailors, and marines realize how easy it is to use.

With the existing UFO constellation approaching end of life and the MUOS system being short of new terminals, there could be a 10-year gap that the commercial industry could fill by launching new UHF capacity for the legacy terminals. This could be done most easily and cost effectively by adding a UHF hosted payload to a number of commercial satellites. This is exactly the approach taken by the Australian Defence Force (ADF) in contracting with Intelsat earlier this year for a UHF hosted payload for military communications in the Indian Ocean region. The Intelsat 22 satellite will be launched in 2012, just three years after contract signing.

Because the UHF bandwidth is reserved for government use, commercial companies only build and launch new UHF capacity with government sponsorship in hand. The earlier Marisat and Leasat constellations came out of such arrangements. However, since the launch of the final Leasat spacecraft in 1990, no commercial company has been called upon by the US military to provide additional UHF bandwidth. There is some capacity available on satellites operated by America's European allies, but not nearly enough to meet the expected capacity shortage in the next few years.

Even with MUOS on the way, the commercial industry may be able to assist with a continuing UHF shortage. The reason is that any fundamental change in satellite technology orphans existing terminals when users transition to all new ground equipment. This is expensive and disruptive, especially in the case of UHF, because many terminals are embedded in vehicles, aircraft and ships and cannot be easily changed out. As a result, current plans assume that the first few MUOS satellites will carry two communications payloads: the primary payload to send and receive the MUOS waveform that requires new ground terminals, and a secondary one that can still communicate with the existing, older UHF ground terminals.

The US military currently has about 40,000 legacy UHF terminals in use around the globe. When the first MUOS satellite becomes operational in 2012, only about 4,000 new MUOS terminals are expected to have been built, according to an analysis by the US Government Accountability Office (GAO). The GAO estimated that the full complement of 40,000 replacement MUOS terminals will not be ready until around 2021, when the first satellite reaches the half-way point in its expected service life. Moreover, estimating how many terminals will be needed

Hosted payloads also offer the potential for significant costs savings. Following the ADF purchase of a hosted UHF payload, the Honorable Joel Fitzgibbon, Australian minister of defense, stated that this program had saved the Australian taxpayer over $150 million when compared with launching a dedicated satellite.

The same steps could be taken to get bandwidth capacity into space to meet the operational requirements of UAVs. Although US operations in Afghanistan may wind down in the next couple of years, the US military has grown so accustomed to the ISR benefits of UAV operations that domestic and global demand for the vehicles and the associated satellite bandwidth will likely continue to grow. With so many regions of the world in turmoil and budget dollars tight, UAVs provide an ideal method of gathering ISR data before committing troops.

A number of top military officials speaking in public forums recently have made clear that they view the commercial satellite industry as a trusted partner and that the government needs to find a better way to work with the industry in both ordering and procuring urgently-needed satellite bandwidth. These officials have admitted that continued delays and cost overruns in military satellite projects have impeded our nation's ability to deliver the next generation of space capability, and that the frailty of existing systems directly impacts military operations every day.

Such candidness is refreshing, and reflects a new awareness that could help resolve current problems with how the military contracts for its commercial capacity. The cancellation this past year of the Air Force's TSAT constellation, after an

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investment of nearly $3 billion, displays the harsh reality of budgetary concerns that will likely cloud the next generation of military spending programs. The military has already shown a willingness to sign long-term commercial contracts for the basic mapping mission of the US government and the gathering of medium-resolution remote-sensing data. The same approach could be applied to the full range of military needs. However, it is most urgent in dealing with the shortage of UHF bandwidth worldwide and ISR capacity for UAV operations in specific parts of the globe. Based on the model established in the imagery industry, long-term stable contracts could be used to ensure continuity for legacy UHF services or for dedicated Ku or Ka band ISR capacity.

With its fleet of 51 satellites, Intelsat normally has a number of replacement spacecraft in some stage of procurement. Today, for example, Intelsat has nine satellite projects in various stages of development. Hosted payloads offer the quickest and most cost-effective access to space for a military customer. A military payload could be hosted on a number of spacecraft that will be going into orbit over any of several vital regions in the next few years. Such payloads could be operated for the military by the commercial provider under a lease arrangement, or could be owned and operated by the government much as military satellites are.

Fifty years have passed since the first communications satellites began to make the world smaller by enabling global communications. In that time, we have seen a slow evolution from a tradition in which only government satellites served our military forces, to one today in which commercial satellites provide more than 90 percent of C- and Ku-band satellite bandwidth to the military in the most active theaters of operation. Commercial firms should now be called upon to provide vital UHF capacity as well. By most measures, the commercial satellite industry has proven through decades of service to a range of customers that it can deliver assets to space more quickly and at a lower price than any comparable government-sponsored effort.

The lives of our warfighters depend upon communications in the field. The global bandwidth crisis is real, and the commercial satellite industry stands ready to become a true partner with the military in providing the satellite capacity to solve this problem. But partnership requires action and a defined set of roles and responsibilities. This should not be difficult. One way to carve out the role for commercial partners is to place consistent, recurring requirements on commercial systems and surge on military systems. Another option is to let the commercial industry build and launch capacity to serve legacy requirements while military will focus on more complex and enhanced features. Yet another option would be to divide requirements by security levels and utilize both systems appropriately. This balanced approach would provide improved diversity and redundancy as well.

There are many logical partnership arrangements. We should move quickly toward a solution that is prudent in this budget environment yet still maintains our space superiority and gives our warfighters the advantage they deserve.

Mr. David McGlade (BA, Communications, Rutgers University, New Jersey) is the Chief Executive Officer of Intelsat, Ltd., he heads the world's leading provider of fixed satellite services (FSS), with operations that include a global network of commercial communications satellites and terrestrial infrastructure serving over 200 countries and territories. Mr. McGlade is a 25-year telecommunications and media industry veteran with experience in cable TV, broadband and wireless. At Intelsat, Mr. McGlade is focused on continuously improving operations and on creating new revenue growth through enhanced communications service offerings for Intelsat's customers in the media, network services and government/military sectors.

During his tenure at Intelsat, Mr. McGlade led the company's 2006 acquisition of PanAmSat, a $6.4 billion transaction, which created the industry's largest satellite operator, with leading positions in each of the customer sectors served by the company. Revenue and revenue backlog for the year ended 31 December 2007 was approximately $2.2 billion and $8.2 billion respectively. This acquisition, and the subsequent highly successful integration, resulted in an attractive valuation expansion, reflected in the sale of Intelsat in February 2008 to a consortium of investors led by BC Partners. The acquisition transaction valued Intelsat at an enterprise value of $16.4 billion.

Mr. McGlade joined Intelsat in April 2005, following the company's acquisition by a group of private equity firms, collectively named Intelsat Holdings. Prior to joining Intelsat, he served as chief executive officer of O2 UK (previously BT Cellnet) since October 2000. Mr. McGlade has extensive experience bringing new technologies and converged services to businesses and other customers. As President, West Region, Sprint PCS, he launched the first CDMA network outside of Asia.