Leveraging Space for Asymmetrical Advantage

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It seems like only a few years ago that Space was a thing of imagination and science fiction. Clearly, tremendous accomplishments have been achieved since America launched its first satellite in 1958. Over the past four and a half decades, Space has become increasingly important to our national interests. Advanced systems critical to the Nation's security and economic well-being have been launched into orbit. Stock market transactions, credit card purchases and electronic banking are now completed quickly and precisely with the aid of networks and communications facilitated by satellites. Similarly, digital television, wideband Internet access and cellular telephone conversations are made possible through Space-based satellites.

Today, Space power represents a decisive, asymmetrical advantage for the United States and, in particular, for military and intelligence activities. Space extends the range and capabilities of communications, improves missile early warning and enhances situational awareness beyond any terrestrial capability. Space systems have also brought better intelligence and synchronized combat operations by enabling the collection of new types of data and information. The bottom line is that we can no more imagine a day without the capabilities provided by Space-based products and services than we can imagine a day without on-demand access to water and electricity.

It is Not Just About Tanks Any More

Over the past decade, military operations have moved from being just "supported" by Space assets to being truly "Space enabled." Space technology has dramatically improved since Operation Desert Storm, which is often described as "the first Space war," particularly due to the use of Global Positioning System (GPS) and long haul communications satellites. In comparison, during Operation Iraqi Freedom (OIF), some 50 satellites comprising five types of military satellite constellations were used for surveillance, communications, navigation, intelligence, weather forecasting and missile early warning.

Retaining an asymmetrical advantage in Space is becoming increasingly difficult, and while the U.S. will continue to dominate Space in the coming decade, other nations are no longer content to be bystanders. The United States currently accounts for a far greater percentage of the Western military satellites currently in orbit; however, the number planned in the future is expected to tip in the favor of civilian uses. These additional satellites will increase capacity but also increase risks. Risks will grow as more businesses – private and public – launch satellites into orbit. Countries worldwide continue vigorous Space programs that provide highly accurate imaging, precision navigation and timing, and near-instantaneous global communication. In fact, nearly one-third of all Western satellites that will be launched over the next decade are predicted to belong to countries other than the United States.

The value of U.S. Space assets has not escaped the notice of our adversaries. Indications are that some nations of concern have used available technology in an attempt to control and disrupt communication systems and others types of U.S. equipment.

Services and products available from commercial sources are becoming increasingly more available to potential adversaries, to include non-state actors. Using the Internet, countries, groups and individuals have acquired high quality, Space-based products and services, thereby reaping the operational benefits of Space without the necessity to build their own capabilities. As an example, satellite imagery, some with one meter or better resolution, is available for purchase in the open commercial marketplace.

Actionable Information: Building the Case for Space-Based Systems

The U.S. Army is changing, and in conjunction with our sister services, is incorporating new capabilities at a rate not experienced in our Nation's history. This change is particularly significant in the quantity and quality of data and information being made available to our military leaders.

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The bottom line is that we can no more imagine a day without the capabilities provided by Space-based products and services than we can imagine a day without on-demand access to water and electricity.

The information is immensely varied and includes voice, imagery, video and other data to support operational requirements. In the future, the quantity of data and information will continue to grow as more sources and sensors become available.

The challenge for today's commanders is that they are inundated by too much data but not the right information to support military decision-making. It is not just the information that matters, but getting quality, actionable information. Timely, actionable information is the basis for synchronized and precise engagements on the battlefield. It shortens the kill chain and enables Joint Warfighters to engage the right target with the right munitions at the right time with the minimum chance of collateral effects. Properly exploited, actionable information produces knowledge of the environment, the enemy and friendly forces. In the words of General (Retired) Gordon Sullivan, former Chief of Staff, Army, "Information is the currency of victory on the battlefield."

The increased dependence on Space assets in providing actionable information means it is imperative that our military forces have unfettered and unimpeded access to Space-based products and services. Assuring access can also mean denying our adversaries the benefits of Space-based capabilities. Space situational awareness is the first step to protecting our Space assets and the capabilities they provide. It is also the foundation for Space control. The Army does ground-based Space control in coordination with the Air Force.

Contributing as a national resource to America's Space surveillance capabilities, the Ronald Reagan Ballistic Missile Defense Test Site (RTS) at Kwajalein Atoll conducts Space-object identification and provides orbital information on foreign launches. Radars conduct deep Space and near-Earth satellite observations, providing data on some 10,000 objects. Other radars provide high-resolution, near-real-time images of Space objects. As such, RTS fulfills a vital role as part of SMDC/ARSTRAT's support to U.S. Strategic Command.

The high ground of Space provides an unparalleled potential for extending the means of gaining information on enemy forces. To a much greater extent than in the past, this information is being made available in near-real time. Space-based capabilities planned or projected in the future include the Space-Based Surveillance System (SBSS), Space Tracking and Surveillance System (STSS), Space-Based Infrared System High (SBIRS-High) and Space-Based Radar (SBR).

The SBSS is being developed to detect and track objects using optical sensors and an Orbital Deep Space Imager system. Data generated by the SBSS will provide detailed images of space objects, including satellites and orbital debris. The National Aeronautics and Space Administration (NASA) is also expected to use information from the SBSS to assist in debris avoidance for the International Space Station and in support of Space Shuttle missions.

The Space Tracking and Surveillance System (STSS), previously called Space-Based Infrared System – Low, will provide support for missile defense and counter-space situational awareness by tracking ballistic missiles throughout their entire flight, but particularly during the midcourse portion of their trajectories. STSS sensors are being developed to sense extremely dim targets and track and discriminate objects without burning rocket motors. This system will also assist in discriminating between re-entry vehicle warheads and decoys during the midcourse phase of flight and then cue ground-based tracking radars. STSS satellites are currently scheduled to launch in 2008 or 2009.

The Space-Based Infrared System – High (SBIRS – High), scheduled for launch in 2008 or 2009, will consist of four geosynchronous earth orbit satellites and sensor payload on two other host satellites in highly elliptical earth orbits over the North and South poles. SBIRS-High satellites will detect and report missile launches faster and more accurately than the Defense Support Program constellation of early warning satellites. They will also will detect and track shorter-range missiles with greater accuracy. Data from SBIRS-High satellites and sensors will be processed by Multi-Mission Mobile Processors (M3P), which will disseminate missile-warning messages to theater and strategic users. The M3P is the planned replacement for the Army's existing Joint Tactical Ground Stations (JTAGS), which are aging and increasingly difficult to maintain. The initial M3P systems are scheduled for fielding with the 1st Space Brigade in 2005.

Space-Based Radar will be capable of tracking and targeting stationary and moving enemy combatants in near-real time, day and night in all weather conditions over a large portion of the Earth on

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a near-continuous basis. By combining Surface Moving Target Indication, Synthetic Aperture Radar imaging and High-Resolution Terrain Information data, SBR will be able to provide access to the Earth's surface unreachable by other intelligence, surveillance, and reconnaissance (ISR) sensors. The constellation's near-continuous surveillance capability will also complement other air, ground, sea, and Space-based sensor systems. The constellation is currently scheduled to begin launch in 2012 and ultimately could comprise a mix of Low Elliptical Earth Orbit and Medium Earth Orbit satellites.

Two other capabilities recently demonstrated their extraordinary contributions to enhancing the quality and quantity of information for Joint Warfighters: spectral imagery from Space-based satellites and Blue Force Tracking (BFT). Much has been written about the impact that unclassified imagery, delivered in a timely basis by Army Space Support Teams (ARSST), provided in the planning and conduct of operational missions during OPERATION IRAQI FREEDOM. The benefits of spectral imagery are likely to further increase in the future, especially as Army units conduct operations as part of coalitions. Spectral products derived from commercial sources may be shared with Allied forces, unlike imagery obtained from National Technical Means.

Commanders and Soldiers have long known the importance of having timely and accurate information on their own location, the location of the other friendly forces and the location of the enemy forces. The technology that perhaps gained the most praise for these essential operational requirements was Blue Force Tracking, or BFT, primarily due to its contributions to fratricide prevention and enhancements for situational awareness.

At the start of OIF, Coalition Forces arrived in theater with seven distinct BFT systems. Unfortunately, each of these systems had separate hardware, software, and means of transmissions, from unsecure line-of-sight to the use of encrypted satellite communications (SATCOM). Despite significant workarounds, BFT demonstrated its utility in preventing fratricide, tracking friendly forces and combat identification. The article elsewhere in this edition of the Army Space Journal provides additional information on the various systems and the great work being done to enhance our BFT capabilities.

Connecting the Dots for Enhanced Capabilities

Space is an integral part of the Army's future. In fact, the 2020 White Paper—Space envisions Space empowering Future Force units — Brigade Combat Team Units of Action (UA) and Units of Employment (UEx and UEy) — routinely exploiting "military and civilian Space systems to support decision dominance and decisive victory."

As part of a Joint, Combined, and/or Interagency Team, the Future Force will rapidly deploy formations to conduct entry and shaping operations to facilitate access by other forces, engage enemy forces and establish the conditions for follow-on success. The Future Force will then conduct decisive operations to achieve decisions based on: simultaneous operations, control of the operational tempo, and direct attack of the enemy's decisive points and centers of gravity. This new concept of operations will exploit superior knowledge of the battlefield, the enemy and friendly forces to wage relentless attacks against the enemy in near-simultaneous fashion.

Enabling this synchronized application of combat power will require the development of a secure grid that provides seamless capabilities to Warfighters: the Network. The Network, envisioned as a system-of-systems that encompasses all levels of battle command, will link commanders on-demand with the necessary voice, data, and video communication, command, and intelligence capabilities. Individual Future Combat Systems (FCS) systems and dismounted Soldiers will also be part of the Network.

The Network will be used to gain informational superiority, locate and identify the enemy and kill at a distance before the enemy can engage the FCS systems. The Global Information Grid, or GIG, which is being formed based on networks and communications systems, will provide the means for forces at all levels to achieve situational understanding and establish, maintain and distribute a relevant common operating picture for Joint Warfighters.

Support of this new CONOPS will require expansive increases in bandwidth availability, which is already in great demand. For example, during Operation Noble Anvil, the American component of the NATO action in Kosovo is estimated to have used from two to two and a half times the bandwidth used during Operation Desert Storm (ODS). Operation Enduring Freedom (OEF) in Afghanistan used some seven times the amount used during ODS and OIF used approximately 42 times the amount available during ODS.

In the near-term, bandwidth demand will continue to grow much faster than the available supply, particularly with sensors competing with communications to provide commanders operational information. This situation is not expected to improve in the near-term, and military SATCOM bandwidth will be limited, even with heavy dependence on commercial sources, until the Space-Based Transformational Communications System is operational. In fact, during OIF, U.S. forces relied on leased commercial bandwidth for 70 to 80 percent of the 3.2 gigabytes of bandwidth of SATCOM during the peak fighting. However, several Space-based SATCOM options are being developed to help fill Joint Warfighters' bandwidth requirements.

The Wideband Gapfiller Satellite (WGS) system, which will augment and eventually replace the Defense Satellite Communications System III (DSCS-III) Service Life Enhancement Program (SLEP) satellites, will provide communications during all levels of conflict short of nuclear war. These

satellites will transmit several gigabytes of data per second, up to ten times the data flow of today's satellites. The first of the WGS satellites is scheduled for launch in 2005.

The Advanced Extremely High Frequency (AEHF) satellite system is currently programmed for launch in 2007. The AEHF system will consist of satellites covering the globe and provide nearly worldwide secure, survivable, and jam-resistant SATCOM. Each of the AEHF satellites will provide a much greater capacity of the 1990s-era MILSTAR (Military Strategic, Tactical & Relay) satellites operating today.

Transformational Communications, which will use laser communications to substantially expand bandwidth and speed data transmissions is envisioned as a constellation of transformational satellites (TSAT) in geosynchronous orbit to support the military's future communications requirements. Envisioned to be many times more powerful than the AEHF, TSAT will revolutionize the U.S. military information networks. With laser cross-links between satellites that will exchange data at the speed of light, TSATs will become the key transport mechanism of the Network. The first satellite is scheduled for launch in 2012.

Turning Capability into Reality

Trained professionals are vital to integrating Space into the Army and leveraging Space as an essential combat capability for our Joint Warfighters. Establishment of Functional Area (FA) 40, formation of the Army's Space Cadre, conduct of the Army's Space Operations Officer Qualification Course and training and deployment of ARSSTs are only a sampling of our — and the Army's — realization of the importance of Space to warfighting. This importance will grow even more in the future as the new UEx, starting with the 3rd Infantry Division, receive their organic Space Support Element (SSE). Articles elsewhere in this edition of the Army Space Journal provide additional discussion on the Army's Space Cadre and details on the composition, equipping, and manning of the SSEs.

Leveraging the new technological capabilities — only a few of which were identified in this article — is entrusted to Space professionals serving as staff officers, members of the ARSSTs, or with the SSEs. Awareness of capabilities and their risks, how the UAs and UExs will fight and expertise in division-level operations are but a few of the essential skills. They must also be proactive, continually informing and training personnel on the value-added benefits that Space can provide to the unit.

Secretary of Defense Donald H. Rumsfeld recently said, "The United States cannot use 20th century thinking to fight in the 21st century; capabilities should not always be equated with numbers — one smart bomb is better than 10 dumb bombs; and, the country must think in 21st century terms." This statement is especially appropriate given the significant capabilities that Space can provide to the Army and our Joint Warfighters. The articles in this edition of the Army Space Journal provide great insights into the work being done to leverage Space for our asymmetrical advantage. I encourage you to read them and share the insights with those you support. Secure the High Ground!