Space Technology

Vital capabilities for warfighters

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By LTG Joseph M. Cosumano Jr.

Consider for a few moments the challenge of accurately predicting the possibility and utility of technological developments. In 1895, Lord William Thomson Kelvin, the Scottish mathematician and physicist, noted, "Heavier-than-air flying machines are impossible." Eight years later, in 1903, just a few months before the Wright Brothers successfully made history with the first manned flight, Simon Newcomb, an astronomer observed, "Aerial flight is one of that great class of problems with which man can never cope." These gentlemen would surely be surprised today with the extent that powered flight has affected our lives.

The statements by Kelvin and Newcomb show the difficulty of predicting the outcome of a particular type of technology, but they also point to the importance of drawing upon the correct lessons when forecasting the future. GEN Tommy Franks, former Commander, U.S. Central Command, reinforced this point when he observed, "Neither Desert Storm nor Operation Enduring Freedom or any of the other operations that we have conducted tell us precisely about the future. We are pretty sure that the future is going to have certain characteristics and we ought to pay attention to them so that, while we may be tactically surprised, we do not permit ourselves to be strategically surprised."

In this regard, while we may not be prescient with how a particular type of technology will be used, compelling evidence clearly supports the growing importance of Space as a warfighting medium. What is also clear is that Space technology is vital to enhancing capabilities on the future battlefield — one demanding great flexibility and adaptability.

The use of Space technology by the U.S. military has changed radically since the launch of the first U.S. satellite into orbit in January 1958. Today, in support of Operations Enduring Freedom and Iraqi Freedom, Space-based assets furnish our military and coalition forces with robust and uninterrupted communications, around-the-clock Intelligence, Surveillance, and Reconnaissance, accurate and responsive imagery, and near real time navigation and positioning data. These capabilities along with early warnings of tactical missile launch, Blue Force Tracking, combat identification, and innovative systems that enable access to broadband communications add essential enhancements to operational effectiveness and efficiency.

Emerging threats to our homeland, friends, and allies necessitate development of new capabilities — and several Space technologies are showing great promise, particularly in the areas of Space-based radar, imagery, communications, and enhancements for situational awareness and combat identification.

Space-based missile early warning, currently supported by Defense Support Program satellites, provides detection and warning of missile launches and nuclear detonations. However, the capabilities of this system are limited, particularly against the cruise missiles and theater ballistic missiles that are being so widely proliferated and pose such a looming threat to U.S. forces. The Space-Based Infrared System (SBIRS) will ultimately replace the current Defense Support Program satellites, and provide significant enhancements in the areas of missile warning, missile defense, technical intelligence, and battlefield characterization for warfighters and the National Command Authority. The satellites for the SBIRS High portion of the program are currently scheduled for launch in 2006.

The follow-on capabilities of Space-Based Radar extend our capabilities, even beyond those projected with SBIRS. Space-Based Radar will provide day-night, all-weather, 24-hour detection and tracking of moving targets, in addition to 3-D radar mapping data. Significantly, this system will offer capabilities currently obtainable by the Airborne Warning and Control

Farewell from the Commanding General

In September 2001, in the inaugural issue of this journal, I stressed the importance of normalizing the Army's use of space with seamless integration. This observation followed publication of the report of the Commission to Assess United States National Security Space Management and Organization. This report was a milestone document that emphasized the importance that space and space activities have to the security and well being of the U.S., our allies, and friends.

Related to changes directed in the report, the Army was responsible for implementing actions to:

- Enhance space professional military education
- Maintain a cadre of space qualified officers
- Integrate space activities into military operations
- Establish space requirements
- Research, develop, acquire, and deploy space systems unique to the Army

To an extent that we could not have envisioned just a couple years ago, we have made remarkable strides in all of these areas — and you, as space professionals, have made it happen.

We have made great progress in creating a knowledgeable and experienced cadre of space professionals. Outstanding officers have been selected to serve in Functional Area (FA) 40 and are contributing immeasurably to leveraging space as a vital component to warfighting. More than 140 officers are now serving in FA-40. These talented officers bring a wealth of invaluable technical expertise to their assignments. In support of space knowledge, SMDC has established a Space Operations Officer Qualification Course, which has now conducted five classes. Space knowledge is also infused to the Army at large in space electives at Fort Leavenworth, KS, and by maintaining an instructor at the Interservice Space Fundamentals Course. The Training Division at FDIC is working diligently with other Services to assure synchronization of efforts regarding space instruction.

Space professionals, most recently during Operations Enduring Freedom and Iraqi Freedom, brought space-based products, services, and expertise directly to our Joint Warfighters. This responsive support continues even today in forward deployed locations and with reachback support.

Great progress has also been achieved in integrating space requirements for the Army's Future Force and the Joint Space Force. As the Army Service Component Command to the U.S. Strategic Command, SMDC will now provide coordination of Army resources in the accomplishment of USSTRATCOM's missions in its five mission areas.

Research and development efforts have also made landmark progress. With the activation of the Program Executive Office for Air, Space, and Missile Defense and the extraordinary developments in our technology-oriented infrastructure, we are well poised to continue delivering cutting-edge equipment into the hands of our warfighters.

In conclusion, I wish to extend to the entire community of space professionals my most sincere appreciation for your great efforts and tremendous support. President George Bush perhaps captures best the importance of your work when he said on August 14, 2003, "Each of you has chosen, you have made the choice, to fill a great calling, to live by a code of honor, in service to your nation, for the safety and security of your fellow citizens." Best wishes as you continue to face the challenges of the 21st Century.

"Secure the High Ground"
— LTG Joseph M. Cosumano Jr.

System, Joint Surveillance, Targeting, and Attack Radar System, and Rivet Joint aircrafts systems and move them into Space, reducing vulnerability against personnel and individual airborne platforms.

The Future Imagery Architecture (FIA) promises to enhance substantially the quality and timeliness of Space-based imagery. The envisioned system will include satellites with infrared sensors, high-resolution electro-optical cameras and/or all-weather radar capable of taking highly detailed images. The number of satellites will be greater in number than those in the current inventory of imagery satellites, thereby enabling more frequent visits to areas of interest. The satellites will also be farther out in Space and much harder to detect. Synthetic Aperture Radar (SAR) may be one of the exciting technologies that support the FIA. The radar will be able to detect hydrologic changes and make discrimination between various types of vegetation and ground cover. Its ability to acquire imagery at night and in areas with persistent cloud clover will significantly complement existing and future optical systems. Advances in hyper-spectral imaging will also augment information furnished by traditional imagery, and will provide better battle damage assessment and terrain characterization.

Expansive demands for bandwidth, the necessity to move large volumes of imagery and signals intelligence information from operational collections systems, and the importance of facilitating compatibility across Department of Defense and other government agencies' created the necessity to develop an

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improved communications architecture. The Transformational Communications Architecture (TCA) is being designed to support those requirements. The TCA will ultimately tie together Space-based and ground networks, and will include all types of communications capabilities. Pushing the data down to the lowest tactical level faster and more securely will be achieved using Space-based satellite transmissions. Achieving these faster transmission speeds will require technologies that go beyond those offered by line-of-sight radio frequency (RF) transmissions that can be easily disrupted.

Laser communications, which transmit eye-safe light from one photon-detector receiver to another using low-power infrared laser, demonstrate great promise to increase data rate payloads while minimizing the risk of interference with other communications systems. Speed of data transfer will expand significantly, literally allowing warfighters to have real-time access to whatever is being received. Freeing up the radio frequency bandwidth for other types of uses will provide a collateral benefit.

Operation Iraqi Freedom offered a glimpse into the capabilities of Blue Force Tracking (BFT) and combat identification technologies. Space-based BFT systems like the Grenadier Beyond-line-of-Sight and Mini-Transmitter provided tremendous enhancements for Special Operations Forces and several aviation units, but their potential was limited by the degree data could be disseminated and displayed for the commander's common operating picture. However, technologies currently in development will profoundly revolutionize this exciting area.

Radio Frequency (RF) "Tags," with stealth capabilities to transmit and/or receive from a radar platform may ultimately serve as the basis for systems that expand our current capabilities in battlefield surveillance, BFT, and combat identification. Tags will help to identify friendly assets by adding a unique identification to their radar return. By combining a Global Positioning System (GPS) receiver with a Tag, and using the Tag to transmit the coordinates to a Space-based platform, the location can be determined with great accuracy. The capabilities provided by GPS-III promise to extend the accuracy of the position, velocity, and timing signals while expanding anti-jam capabilities. Reducing instances of fratricide on the battlefield is central to this enhanced situational awareness. This technology, supported by the enhanced capabilities of GPS-III, may also revolutionize the way logistical supplies are tracked and non-intrusive inspections are conducted.

Technologies beyond the future Army are not certain, but as Space technologies evolve, smarter, faster, more capable sensors, energy devices (kinetic and laser), and communications enhancements, will emerge to provide a wide range of capabilities and enhancements for effective battle management. Clearly, we are only at the beginning of the exciting journey for Space technology.

Sir Winston Churchill once noted, "It is no use saying, 'We are doing our best.' You have got to succeed in doing what is necessary." This statement is particularly relevant as we consider the implications of our work. While the future is uncharted territory, its direction is one that can be affected by our actions today. We must succeed, and Space technology is part of that process. The pathway being laid by the team of Space professionals at Space and Missile Defense Command will help assure that success. Secure the High Ground.

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"Capabilities Catalogue," researchers and developers will continue to improve the GMD system. They will use the Alaskan base as a test bed for the interceptors. The integrated test bed will provide for more realistic tests and data that will be used for further system development and refinement. It will also expand to test weapons and sensors from throughout the entire integrated ballistic missile system, a system of layered defenses designed to protect the Nation and its allies.

History tells us that sometimes people do not see the advantages of new inventions, and we must beware of being too conservative or unimaginative. For example, early Gatling guns and machineguns faced Army conservative pressure, and the fear that too many rounds would be fired, creating logistics problems. Early repeating rifles were discouraged because the Soldier would fire his ammunition too quickly. As a result, in some clashes Soldiers with single-shot rifles faced Native Americans with repeating rifles. When Alexander Graham Bell tried to make the case for his telephone in London, he was informed that his "interesting" invention might have some limited use in America with its great distances, but in Great Britain their multitude of messenger boys would suffice. In the 1950's, a government panel of experts reported that the U.S. government would never need more than five computers. Just imagine where the military would be if someone hadn't seen the possibilities and pushed forward.

From a requirement to a solution, the military's combat developers, engineers, and researchers provide our military with equipment that makes Soldiers more effective. They help us stay ready for war so we can better achieve peace.