the Army Space Journal

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A Professional Journal for Army Space Operators

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Space Tech

Where is it leading ground forces?

What you didn't know ...

As we put the final touches on this Fall 2003 edition of *the Army Space Journal* focused on Space technology, I keep going back to the human factor. In this edition we have added a new section titled *"The Flipside,"* which includes a historical feature on Sergeant Major Edgar A. Perry on page 60. Edgar was just an average Joe — a bit down and out — who came into the Army and did his best. He made himself better. He stood out. He was selected by his superiors for more challenges and responsibility. I guess the point is that even before a Civil War when they were volleying cannon and musket balls — some human characteristics about our Army became true. Before he was selected as sergeant major, Edgar was in a bit of a tight spot. He hadn't been honest with the Army — he had lied in his enlistment paperwork. Neither had he come clean with his family — they didn't know he had joined the Army. So, in the fall of 1828, Edgar told the company commander the truth.

Fast-forward to the late 1950s in our Army. Another story. An Army lieutenant colonel is commissioned by the Army to create a series of drawings to illustrate the Army of the future. His drawings are on pages 14-15. Imagine having the job of trying to illustrate what our Army will look like 40 years down the road. There is no "back to the future" to help prod the creative juices. We found the lieutenant colonel's artwork and story last year buried in the Army's archive in downtown Washington, D.C. What I like about the futuristic artist is courage.

I don't think it's too far out there to say that the same human factors are true as we delve into Space technology and current Space operations. Really, both Edgar and this artist are not unlike the men and women who've accomplished great things in the history of Space and missile defense as technology evolved and developed from the early days until now. A stand out is the "Pumpkin-Chunking" article beginning on page 40. While the author explores technology development since World War II, he does it from the perspective of the human element. The beginnings of Air and Space goes to the Civil War when units used balloons to raise a photographer high enough to shoot pictures showing the other side of the battle line. Later, kites and pigeons carried cameras high up to remotely snap photos. The earliest missile related history shows primitive horse-drawn launchers with primitive rockets. When you consider that today we have sophisticated satellite and missile defense systems, I believe that human side must've come out during development.

A bit unrelated, but an appropriate editorial. Our Letters to the Editor section is growing, as are other sections in *the Journal*. If you have letters, please send the email to michael.howard@arspace.army.mil. In addition to the new historical spot in *the Journal*, we've added a Space News section beginning on page 58. The point here is that we are looking for ways to make this publication more useful. If you have ideas on future theme topics — or you have recommendations for already published articles to be highlighted in the Space News section, or have an idea for an historical feature — please email to richard.burks@arspace.army.mil.

One additional note. Four individuals have left SMDC over the last several months after creating and making this *Journal* what it is today. COL Glen Collins created this publication as a professional Journal intended to keep the Army Space officer in career Functional Area 40 informed on Space initiatives. Collins retired in October. It was Bill Furr who first brought me a copy of a Space magazine, suggesting we look at something similar for the Army. Furr left SMDC in October. Next it was BG Richard V. Geraci who envisioned the publication as not only professional development for the Space operator, but a way to make our customer, the warfighter, aware of Space-based capabilities. Geraci left SMDC in June. Finally, it was LTG Joseph M. Cosumano Jr. who constantly encouraged us to raise the bar across the board on this publication. Cosumano, as he likes to put it, is "transitioning" to civilian life in the near future.

I should tell you one more thing about Edgar. Edgar lied about his name. His real name is Edgar Allen Poe. What I think is fascinating, Edgar Allen Poe stood out in the 1st Artillery Regiment during his time as an enlisted man. His leaders saw his potential, even though he ultimately didn't find it as an Army officer.

Just something to think about as you read between the Journal covers.

— Michael L. Howard
Editor in Chief

Letters to the Editor

I spent my Air Force career working Space programs and since becoming a civilian, I have been supporting DoD Space programs (including working with Ed Zehner on the Joint Staff) as well as starting my dissertation on Space policy — I'd like to get a subscription to the Army Space Journal.

— Lawrence Cooper

I'm a Greek journalist working as Editor-in-Chief of the monthly Greek defense journal "Ptisi/Isorropia Dynameon" ("Flight/Power Balance"). Recently, in the Hellenic Army General Staff, I found an issue of the Army Space Journal (Special Edition, Operation Iraqi Freedom) and would be extremely grateful if you could add me to your distribution.

— Pericles Zorzovilis

I do not think that many people know about the Army Space Journal, but I will definitely spread the word to the DC area crowd. We all read Space News, and this would be a great addition. I am an Air Force Academy and International Space University graduate, so this is core to my business. Thank you.

— Roscoe Moore III

I am a U.S. Army Signal Corps instructor with the Joint C4I Staff and Operations Course (JC4ISOC), Joint Forces Staff College, in Norfolk, Va. Our four-week course is taught six times per fiscal year at the TS/SCI level. We are sponsored by the Joint Staff J6 and have been in existence since 1978. Our focus of instruction is at the strategic and operational levels (baseline is the JTF). Our Web site is www.jfsc.ndu.edu, then click on "Schools and Academic Programs", "JCIWS," and then "C4I Division" for course particulars.

I would like to request we be placed on your organization's distribution list for the Army Space Journal. We are trying to encourage more of the Army Space community to attend our course, and having this reference will help enlighten our faculty and course curriculum structure.

Please include us in your distribution.

— Reynold F. Palaganas

I am just starting the Naval Postgraduate School and studying Space Systems Engineering. I would like to receive the Army Space Journal. Thanks!

— LCDR Michael A. Porter

Letters to the editor are welcome and encouraged. The Army Space Journal reserves the right to edit for brevity and clarity. Unfortunately all letters cannot be printed due to space. You may send letters to the editor in chief at michael.howard@arspace.army.mil

LTG Joseph M. Cosumano Jr., Commanding General, United States Army Space and Missile Defense Command

Space Technology

Vital capabilities for warfighters

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

(See Capabilities, page 46)

Capabilities ... from Page 5

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.

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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.

Modern Warfare ... from Page 9

"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.

Space Exploitation

Making Space technology matter

MG John M. Urias, Deputy Commanding General for Research, Development and Acquisition, United States Army Space & Missile Defense Command and Program Executive Officer for Air, Space and Missile Defense

By MG John M.Urias

"Space … the final frontier." So began a popular TV series of several years ago. As our military transforms into smaller, lighter, more agile units with more responsive capabilities to address global uncertainty, the necessity of harnessing and exploiting this "final frontier" is quickly becoming one of the most important enablers for Army transformation.

We have long relied on Space as a means of extending reliable communications beyond line-of-sight and over-the-horizon, for providing early warning of enemy missile launch, identification of military and military-related construction, and detection of major military movements. It's important to additionally note Space as a provider of products to support position, location, navigation, weather, terrain, and environmental monitoring.

Traditionally, the exploitation of Space has primarily supported strategic concerns, but our recent campaigns in Southwest Asia and other hot spots around the world have increasingly shown the importance of Space support to warfighters at operational and tactical levels of warfare. Fluidity and flexibility are required to win on future battlefields, therefore, extending Space support as a complementary enabler to Intelligence, Surveillance and Reconnaissance (ISR) support across all levels of warfare is critical as it relates to real-time decision support and battlefield situational awareness.

Our involvement in Space is divided into four functional domains: Space support, Force enhancements, Space control and Space applications. The U.S. Army Space and Missile Defense Command (SMDC) has a proud lineage of supporting the development of Space systems, products, and services to support the warfighter across all four of these domains. SMDC is unique in that it not only develops requirements, but also sees these requirements through to fielding and operational use.

The Army has not had a research and development entity as a single agency focused on Space, as have the other military services. SMDC's science and technology (S&T) research, development, and acquisition (RDA) efforts have supported a wide range of Army customers with diverse views on the importance of exploiting Space services and products. Recently, this changed however, as the Program Executive Office (PEO) for Air and Missile Defense (AMD) was redesignated as the PEO for Air, Space, and Missile Defense (ASMD). Several of the Space research and development efforts of SMDC are being transferred to the PEO ASMD, and the PEO ASMD is realigning internally to provide for integration of Space into the system-of-systems concepts that are emerging to support Army transformation.

An exciting aspect of Space exploitation is the multi-dimensional and multi-mission applications of its technologies and products. For example, in our efforts to develop a Single Integrated Space Picture (SISP), we are exploring applications of volumetric displays, immersion technologies, biometrics, man-machine interface techniques, and information technology advances.

When applied across the entire family of interoperable pictures, these applications will enhance situational awareness and understanding, and support intuitive and timely decision-making. Other technologies initially developed with a primary focus on supporting Space systems have shown tremendous

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potential for supporting atmospheric systems in both military and commercial functions. One such example is Micro-Electro-Mechanical Systems (MEMS), which promises tremendous volumetric decreases, while at the same time, increases reliability in accomplishing critical functions within a system application.

As we look to Space, and the harnessing and exploitation of this "final frontier," we must leverage Joint and other Service activities through interoperability and common or standardized approaches. However, just one Service cannot provide the resources necessary to harness Space for the warfighter. The Department of Defense is not the sole activity involved in Space. We must therefore leverage commercial Space technologies and ventures to round out military capabilities to ensure our warfighters have the best products and services available to them. Commercial ventures in Space may be both a boon and a curse.

Not only can the U.S. military leverage commercial Space efforts, but our future adversaries can as well. In the past, Space control involved concepts for the destruction of enemy military capabilities in Space. Now, with the introduction of so many commercial ventures into Space, Space control must consider denial of Space services to an enemy without destruction of "neutral" Space platforms.

As we rely more and more on Space and Space products to support our warfighters, we also introduce vulnerabilities to our warfighters. For example, if a future adversary had a capability of denying Global Positioning System (GPS) support to our precision targeting functions, we would be denied a powerful technological advantage our warfighters currently employ. Therefore, as we look to Space, we must also look to how the technologies we are developing to support our warfighter can be made more secure and reliable.

One aspect of reliability is replication or duplication. To that extent, SMDC is exploring techniques and technologies for duplicating Space capabilities, by regionally focusing capabilities using within atmosphere platforms. Using Unmanned Aerial Vehicles (UAV), and an ultra-wideband signal transmitter, GPS functionality can be duplicated within a theater of deployment to ensure GPS functionality remains available to a warfighter, even if services from the GPS satellites in Space is denied them. High Altitude Airships (HAA) may provide an extended duration platform capability to replicate many of the Space-based sensor functionalities in supporting ISR and extended range communications within the deployed theater.

As you can see, we have our work cut out for us if we are to effectively embrace "the final frontier." The articles in this edition of the Army Space Journal will more fully develop how the Army is involved in harnessing and exploiting Space to support our warfighters. Space and Space products are essential enablers of Army transformation.

The Army has recognized the importance of Space and has reorganized within its development community to ensure that a focused effort achieves the integration of these essential products into our future forces, even as we improve the efficiency and effectiveness of delivering needed Space-based services to our current Force.

Technology for the Warfighter

New technology, joint forces advancing modern warfare

BG Robert P. Lennox, Deputy Commanding General for Operations, United States Army Space & Missile Defense Command

By BG Robert P. Lennox

Soldiers prepare by studying the art of war and training. Scientists and engineers prepare by thinking about, looking for, creating, and developing capabilities that will enhance the warfighters' effectiveness. Both often face difficulty in carrying out their charters. But the fact that neither gives up is what has made our Army the best, most advanced in the world.

I'd like to say that the SMDC Battle Lab - Space Directorate went from the learning of the requirement to the concept on the drawing board to the warfighter in the field in six weeks, but that's not exactly what happened. Two years ago, the Army Space Support Teams (ARSST) were requesting larger bandwidth so they could respond more quickly to requests for Space products and imagery (which are typically very large files and even larger when they are encrypted). As part of its experimentation plan in support of transformation, the Battle Lab had integrated a number of off-the-shelf communications products, encryption, computer systems, and some other items into the Space Support Element Toolset (SSET), a HMMV-mounted assemblage of "tools" with which the Space Support Team supported the commander and his staff. The Battle Lab tested their creation at Millennium Challenge 2002 in August 2002. It outperformed their expectations.

As the command was planning for Operation Iraqi Freedom, commanders knew that they wanted to send the ARSST forward with the best equipment. The Battle Lab responded by reengineering the SSET's capabilities into a smaller, transit case-sized version, procuring the various parts, assembling and testing twelve systems, and sending a mobile training and fielding team into theater with the Army Space Support Teams.

The new system, dubbed the SSET-Light, greatly enhanced the team's ability to provide accurate, timely, and effective Space products to the supported commanders. Besides offering the teams a suite of Space-specific software tools, the SSET-L made possible wideband communications connecting them not only to the HQ in Colorado Springs, but also to each other, Eagle Vision 1, an imagery ground station, and the Spectral Exploitation Cell - Transportable (SPEC-TR), in theater. With the SSET-L, teams could receive 2 megabytes of data per second and send up to 900 kilobytes per second. They routinely downloaded files of 100 megabytes and greater in minutes — and these were encrypted files. Previously, files of this magnitude would have taken hours to receive, if at all, or required FEDEX delivery. More importantly, the teams no longer needed to burden the supported unit's communications networks.

There is no doubt that the synergy created in this command by having the operational forces working hand-in-hand with the research and development people helps get operational needs filled quickly. Generally, that is how our military system works, i.e., the fighter has a need and combat developers work with research and developers and the fighter look for the solution through one of the DOTLMPF areas: doctrine, operations, training, leader development, materiel, personnel, and facilities.

Two years ago, SMDC produced a "Capabilities Catalogue" listing all the equipment and products along with their capabilities that had been developed by the SMDC Battle Lab, Technical Center, and the Army Space Program Office. From reading the descriptions of items, I could imagine that the people who worked in those organizations had either received a requirement that needed to be met or had seen a capability and knew that it had possible military application. It was also evident that they were already thinking about or making improvements to what was already in the field, e.g., the Grenadier BRAT (GB).

Almost forty years after the first V2 flew and when the nation still had no effective defense against a missile attack, President Ronald Reagan directed the Department of Defense to determine if it was technologically feasible to field a strategic defense to defend the nation against intercontinental ballistic missiles. Now, twenty years later, the Ground-based Midcourse Defense (GMD) system is advanced enough that President George W. Bush, has directed the system to go on line for initial defensive operations in October 2004.

Grenadier Beyond Line of Site Remote Asset Tracking (BRAT) and mini-transmitters (MTX) provide commanders with real-time updates, via Space-based systems, on the locations of their forces and other friendly forces. The GB weighs about 5 lbs and is best suited to permanent mounting on vehicles and aircraft. Its counterpart, the MTX, is about 2 lbs and is better suited to being carried by Soldiers. (The Grenadier BRAT and MTX are but two systems that the military has for tracking its forces.) The Army has now fielded more than 2500 of these devices that are enhancing the effectiveness and safety of its Soldiers.

According to the "Capabilities Catalogue," they could be upgraded with a target engagement capability that would allow forward-deployed Soldiers to report the coordinates of targets. In the two years since the publication of the catalogue, the Army Space Program Office has put the laser-rangefinder integration on prototypes and demonstrated them during a live-fire exercise (JCIET 2003) in August 2003. Soon they may be in the hands of our troops.

History is rich with stories of mankind finding new and better ways to do things. Englishman James Watt saw the possibilities and improved on Thomas Newcomen's steam engine that fired the Industrial Revolution. American Eli Whitney won the contract in 1798 to produce 10,000 muskets for the young American Army fearing a war with France. To do so quickly he put his idea of precision machinery manufacturing interchangeable parts to the test. He succeeded, produced the weapons, and his system of manufacturing soon became the standard practice for American business. (Fortunately, the war with the French did not occur at that time.) Starting in the Civil War, Thaddeus Lowe led the way by using the hot air balloon to gather intelligence on enemy troop movements. By the end of the century others were experimenting with cameras mounted on kites and on pigeons. Today we're using satellites and unmanned aerial vehicles and yes we are still using lighter than air ships ... the JLENS/RAID is deployed today in Afghanistan.

In the 1930s, German Werner Von Braun used the work of American Robert Goddard to develop the V2 rockets that terrorized London near the end of World War II. They came down from the stratosphere without warning, could not be spotted, nor shot down in flight; there was no defense against them.

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In mid-October, we activated the GMD brigade in Colorado Springs, Colo., and, in early December, we will activate the GMD battalion at Fort Greely, Alaska. Our missile crews and staff will be trained. And the technology, advanced through research and development, will provide them their initial set of missile interceptors.

Like a number of products I read about in the

(See Modern Warfare, page 46)

Capabilities ... from Page 5

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Modern Warfare ... from Page 9

"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.

The View From (Army) Space ...

By COL James R. Pierson

Americans are infatuated with technology. High definition television, flat panel plasma screen displays, wireless connectivity and nano-technology are just a few examples of our current focus. In fact, technology is at the core of our increasingly productive society. The Tofflers, well known futurists, declared that the way a nation makes money is the way it will wage war. Certainly this is true of the United States, as we continue to shed manufacturing jobs and become more of an information-based economy. Our military is quickly spiraling into net centric warfare concepts heavily reliant on information-based and other technologies.

We have relied heavily on the qualitative side of warfare in order to defeat the quantitative advantages of our adversaries. It has been the discovery and then, more importantly, the application of technology that has provided significant advantages to our military forces. This was true with the atomic bomb, is true with our prevailing situational awareness and will be true with technologies like laser communications and space-based radar.

GEN Schoomaker's focus is on the development of future transformational capabilities while maintaining the ability to "pull ideas and capabilities, technologies, back into the current force that makes us more ready today." It is critical that we develop the warfighting concepts that can focus our significant technological advantages and limited resources. The TRADOC 525- series of warfighting concepts and the Army's Transformation Roadmap and Campaign Plan are good examples of concepts guiding technology.

However, it is also clear that many times warfighters don't know what they don't know. Not knowing the art of the possible, warfighting concepts are sometimes inherently constrained. This is where the bridge between the combat development community and the science and technology base becomes invaluable. The technology base can open the thinking of warfighters to eye-opening possibilities.

SMDC is a cradle to grave organization. The span of the Command includes the Technology Center, a Force Developments and Integration Center, a Battle Lab and operational forces (1st Space Brigade (Prov) and the GMD Brigade). The ability to synchronize warfighting concepts with the right mix of technology, generate the appropriate combat developments documents, prototype and experiment, and then field a needed capability to our space and missile defense forces is a very powerful organizational construct. Have we realized the full potential of these integrated organizations? No, we have not. However, progress is being made on a daily basis and we must continue to break down cultural barriers that inhibit the seamless integration that future warfighting demands. Success stories can be seen in the attempt to transition Zeus, a laser mine-clearing capability, from SMDC into the Ordnance and Engineer communities, and the development of a comprehensive space control strategy that integrates the efforts of all elements of SMDC with the Army and joint communities towards a family of systems and capabilities.

As we all know, SMDC is no longer just space and missile defense. We need concepts, technologies and most importantly, capabilities, for all 5 of our mission sets - space, global missile defense, information operations, C4ISR and global strike.

As the Command's combat developer, I would be remiss if I didn't speak to the obvious but sometimes overlooked need for synchronizing the spectrum of doctrine, organization, training, material, leadership, personnel and facilities (DOTMLP-F). Successful fielding, and then employment, of cutting edge technologies demands that we also have a well thought-out and integrated plan to build the doctrines and TTPs,

I am an American Soldier.

I am a Warrior and a member of a team.

I serve the people of the United States and

live the Army Values.

I will always place the mission first.

I will never accept defeat.

I will never quit.

I will never leave a fallen comrade.

I am disciplined, physically and mentally tough, trained and proficient in my warrior tasks and drills.

I always maintain my arms, my equipment and myself.

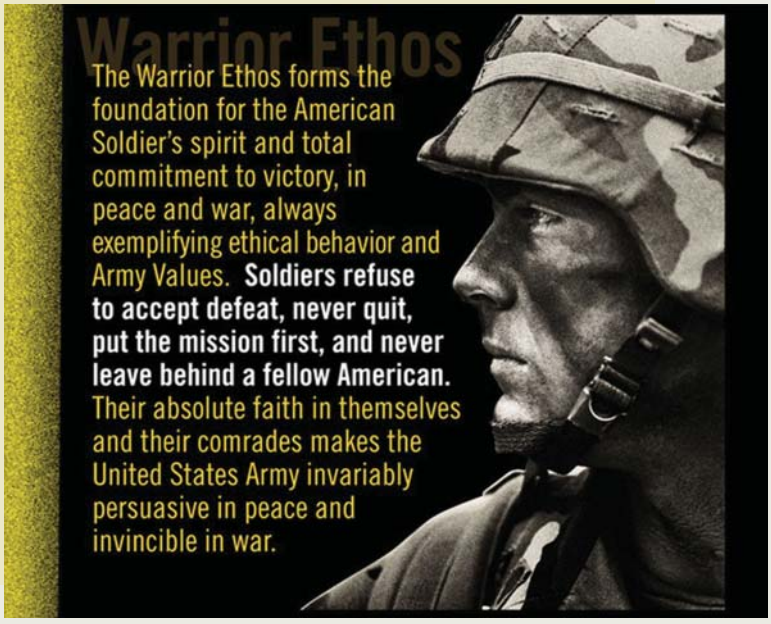
I am an expert and I am a professional.

I stand ready to deploy, engage, and destroy the enemies of the United States of America in close combat.

I am a guardian of freedom and the American way of life.

I am an American Soldier.

Soldier's Creed



MTOEs and TDAs, training bases, sustainment concepts and facilities required for our operational forces. Last, but certainly not least, we must always remember that it is the human element - our Soldiers and our civilians - that will ultimately dictate our success.

It is fitting that we follow up our previous edition of the Army Space Journal, focused on Operation Iraqi Freedom (OIF), with this edition. The application of technology to OIF Lessons will be a critical and important element in ensuring that we turn these Lessons into Lessons Learned.

Simply put, technology is a seed corn for the Future Force and our Army! The ability to balance our current operational needs with our requirements to transform the force is a major challenge. And we owe our Soldiers the very best that technology can provide.

Where is it leading ground forces?

Space — An Enabler

Implementing Space technology into Army operations has been evolutionary in nature and slow in progress, taking many twists and turns and slowly gaining acceptance as our ground forces are transformed. Now having gained momentum, Space technology has taken on the appearance of a steamroller promising to create mission effective Soldiers for the next millennium. This technology is the embodiment of a new vision, a transformation into a new world. The Army's future in Space is vital and essential. It protects our Soldiers via situational awareness, enhanced communications, speed of implementation, and operational overmatch that allows for better battle management and combat support (Force enhancement). With the potential of all but freeing our Soldiers from the "fog and friction" of war, Space has now become mission essential for combat operations.

LTG Joseph M. Cosumano Jr., commander, U.S. Army Space and Missile Defense Command (SMDC), recently emphasized: "Force enhancement embodies the warfighter's use of Space. It provides 'value-added' to the battlefield functions, enabling the land Force to accomplish its terrestrial mission. As the future Army matures, we will ensure that upgrades to Force enhancement capabilities address future requirements. Such capabilities include Beyond-Line-Of-Sight satellite communications; intelligence, surveillance and reconnaissance (ISR); position, navigation and timing; weather, terrain, and environmental monitoring; and missile warning."

BG Richard V. Geraci, former deputy commanding general for Operations, SMDC and deputy commanding general, U.S. Army Space Command, added: "We want the Army of the future to be strategically responsive, deployable, agile, versatile, lethal, survivable, and sustainable. Attaining these qualities requires a thorough examination of the required technological, doctrinal, and organizational changes, as well as their interdependencies and political impacts." He further stated: "Space-based ISR is a prerequisite to domination of the battlespace by the future Army. In many areas of the world, Space-based ISR will serve as the primary 'eyes and ears' of future combatant commanders — particularly during early entry and other 'transition' operations or periods. Satellite constellations of the Objective Force era will provide commanders with the all-weather, 24-7 view of the battlespace that commanders need to enhance situational awareness and optimize our chances for success."

The question of where Space technology is leading our ground forces requires an open acceptance to new ideas and visions. While both our American

and our military cultures are open to acceptance of new technology, it cannot be implemented so fast as to overwhelm our sense of stability and common understanding of reality and possibilities. We accept Space travel because we modified our thoughts and understandings through the technology of airplanes, electronics, jet engines, etc. It is impossible to explain Space flight or walking on the Moon to primitive men still living in some remote areas of the planet. We are all aware that many technologies once projected as science fiction are now reality.

In an earlier edition of the Army Space Journal, COL Glen C. Collins Jr., SMDC, said our inputs are "the key to developing the right Space equipment and organizations to meet those requirements." He also reiterated: "Units of Employment and Units of Action are being designed with Space-based capabilities in mind. The Army Space Command will be activated as a Table of Organization and Equipment (TOE) brigade with TOE battalions."

The Army must prepare for transformation and Space-based capabilities will be an integral part of this new Army. Space is an enabler. It will assist the military and revolutionize the way it fights wars. What was just a dream a few years ago is now a reality — Space Soldiers are here.

We can expect our future operations to continue to focus on safe, effective, efficient peacekeeping missions that protect the lives of our Soldiers, thereby minimizing casualties. To accomplish this, our forces may need to aggressively target the adversary's terrestrial Space assets while at the same time protecting our own. Superior intelligence is essential to achieving a "mean, lean operating machine"-type ground Force. The continued evolution of Space technology promises to enhance intelligence products in many areas of combat operations and help us achieve a winning battlefield environment.

Leveraging Space technologies for military utility offers a distinct advantage to our ground forces. Integrating technological advancements into our various operational options will provide unique future capabilities. Since advancements are progressing at steamroller pace, we must remain open to new ideas, capabilities, innovation, and change. As a nation, as a culture, as a military, we must be willing and able to integrate these emerging technologies to produce unchallenged superiority. To accomplish this, however, we must embrace quick and efficient acquisition processes, early testing, cooperative joint experiments, quick looks and developments of future ideas and possibilities, early prototypes and fielding, as well as proficient and expert training. Only with such a holistic approach will we be able to leverage the Space technologies that can provide the capabilities that will allow our ground forces to achieve decisive victory on future battlefields.

Fielding smaller, more mobile, agile, and self-contained ground forces and units means that they must be combat ready when embarking on peacekeeping missions (war zones, humanitarian efforts, political unrest, etc.). Space technology will help our ground forces make timely and accurate decisions to achieve victory. Communications and updated situational awareness will be in real or near-real time with precision targeting. Space will be the forward-looking observer — able to answer all the right questions (who, what, when, where, and how) and provide just the right information to the right place at the right time. Space technologies will give our Soldiers advanced warning capabilities, provide accuracy, radar imagery, detection, real-time or near-real-time digital and analog data useful to a warfighter, tracking, relay capabilities, position, navigation and time technologies, situational awareness, precise targeting, superior communications, vertical and horizontal integration capabilities, surveillance, intelligence, and much more.

As Space technologies evolve, smarter, faster, more capable sensors, energy devices (kinetic, laser, nuclear, etc.), communication enhancements, etc., will emerge and engulf military ground forces in a new world of Space capabilities and enhancements for effective battle management. But because we live in a time of constraints (limited resources, equipment, people, and budgets), we need to approach every decision as a series of trade-offs. We examine all the pros and cons. Our background in acquisition has taught us the criticality of the development and implementation phases to the future of our nation. As the Army transforms and matures, as its capabilities improve, and as its future becomes certain, there will be numerous trade-offs, hard decisions, and down-selects. The difficulty lies in selecting the very best from the many possible choices for our ground forces. Space technology is the new challenge. It is moving to center stage. We must be ready to seize every opportunity to enhance the battlefield capabilities of our ground forces. We carry the burden. We must make the right choices, choose the right developments, and field the right equipment. Our nation depends on us. Our future ground forces expect us to provide them the right leverage to win the war for peace!

1. The Army Space Journal, "Space 'Key enabler' for Army Transformation," Winter/Spring 2003, Vol. 2, No 1, pg 2.
2. The Army Space Journal, "Army Transformation War Game: Insights Concerning Space Operations," Winter/Spring 2003, Vol. 2, No 1, pg 4.
3. The Army Space Journal, "The View From (Army) Space…How Space Contributes to Transformation," Winter/Spring 2003, Vol. 2, No 1, pg 6.

Old Becomes New ...

Airships are out of the box

Michael M. Lee serves in the U.S. Army Space and Missile Defense Command's Space Technology Directorate. His professional experience includes radar technology development at the U.S. Army Missile Command and the PATRIOT Project Office, Lead Engineer for the In-Flight Interceptor Communication System for National Missile Defense, and the Transition Manager of the High Altitude Airship (HAA) Advanced Concept Technology Demonstration (ACTD). He was a key participant in the effort resulting in the approval of the HAA ACTD for initiation in FY03.

By Michael M. Lee

Over the next decade, the transformation of the U.S. military will continue at a rapid pace. Homeland defense, terrorist threats, near-competitor nation states, the spread of high technology weapons, and the proliferation of weapons of mass destruction make it imperative that our military develops new technologies to transform itself into an organization capable of countering these threats. One emerging technology being demonstrated is actually an innovative use of an old technology — airships. Combining the old airship concepts with modern sensors and communications equipment transforms these ideas into the emerging technology of a high altitude airship (HAA). This article describes the capabilities of the HAA: its military utility as an alternative to Space platforms (such as satellites) and unmanned aerial vehicles (UAVs), its potential as a communication relay, and its possible use by other government agencies.

The HAA is a Department of Defense FY03 Advanced Concept Technology Demonstration (ACTD), with a projected demonstration completion in FY07. The Missile Defense Agency is conducting the ACTD. The U.S. Army Space and Missile Defense Technical Center is supporting the ACTD as the technical lead for payloads and transitioning of the airship to a follow-on program. The objective of the ACTD is to demonstrate the engineering feasibility and potential military utility of an unmanned, un-tethered, gas-filled airship that can fly at 65,000 feet. The prototype airship will be capable of continuous flight for up to a month while carrying a multi-mission payload. The ACTD payload weight is 4,000 pounds and payload power is 10 kilowatts. The ACTD is intended as a developmental step toward an objective HAA that can self-deploy from the continental United States to worldwide locations (Figures 1 and 2) and remain on station in a geostationary position for a year (or more) before returning to the United States for service at fixed ground launch and recovery areas. The objective HAA may also increase in payload weight and power. These potential improvements will be determined during the course of the ACTD.

The HAA payload bay will house a variety of payloads supporting multiple missions and providing multiple capabilities to the warfighter. These missions include, but are not limited to, intelligence, wide-area surveillance, psychological warfare, communication relay, Space control, missile defense, and blue (friendly) force tracking. One way to better understand the HAA concept is to consider it as a "high mobility multipurpose wheeled vehicle (HMMWV) in the sky." Like the HMMWV, the payload will determine the mission that the HAA supports. Areas under investigation during the ACTD include the use of the HAA as a surrogate Space platform, as a surrogate UAV, and as a communication relay platform.

Examination of the HAA as an alternative to a Space platform or a UAV reveals that all three provide significant on-station time over an area of interest and all three are capable of carrying a variety of payloads. Generally speaking, the HAA falls in between the on-station time of a UAV (measured in hours or days) and a satellite (measured in years). However, the HAA is not envisioned as a replacement for the UAV or satellite, each of which has its own unique capabilities. Deployability, transit time to theater, logistical support, and operational/tactical employment concepts must all be considered in determining the type of aerial platform required for a given mission. For short duration missions, a UAV may be adequate. For a mission requiring an asset to be on station for years, perhaps a satellite is required. However, a distinct advantage of the HAA is its ability to provide a cost-effective alternative to UAVs and satellites.

In comparison studies between the UAV and HAA (where both conduct the same type of mission), one HAA provides the same capability as four UAVs, with the cost of the UAV life cycle being three times as much as

Figure 1

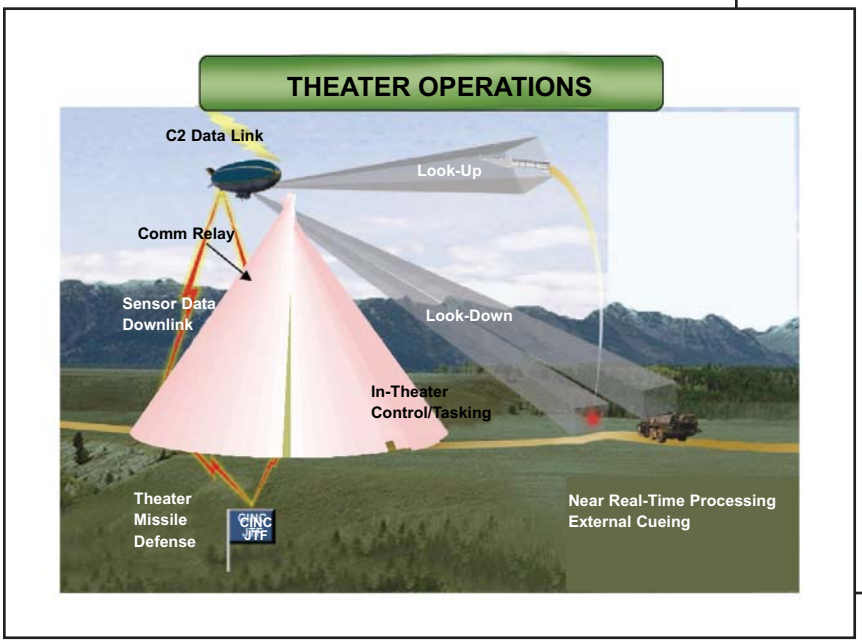
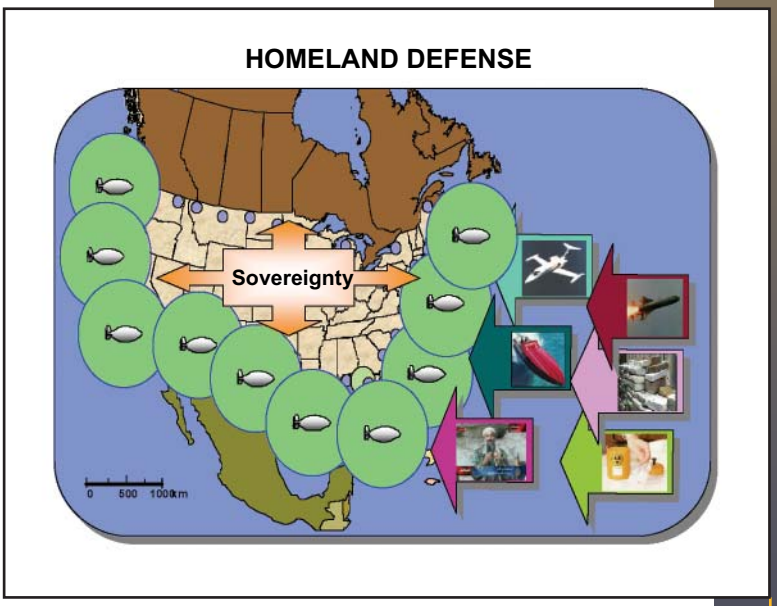


Figure 2

Figure 3



an HAA. This results in a 12:1 value for the HAA over the UAV. In a comparison study between the HAA and a generic satellite conducting a 24/7 mission over a specified area, approximately 50 satellites would be needed for one HAA. The resultant cost would be 50 or more times as much as an HAA — resulting in example of substantial value for the HAA. In a budget-constrained environment, these studies illustrate the fiscal rationale of using HAAs, but only if they meet the warfighter's mission requirements.

Another possible HAA perspective mission is as a communications relay platform. The Army is very interested in over-the-horizon communication relay and wide area surveillance. The Navy is very interested in servicing carrier groups for over-the-horizon communication relay. An aerial relay platform provides several advantages over ground-based relays. The HAA is less manpower intensive, immune from ground and artillery attack, and has a reduced logistics footprint. The HAA could also be deployed sufficiently to the rear of the theater for immunity from surface-to-air missile attacks. An example is the current communication relays in Korea. One HAA with the proper communication payload could replace all the communication relays currently located in the South Korean mountains. Not only would this improve the over-the-mountain communications, but it would also reduce requirements for ground facilities, personnel, force protection, and logistics support.

Given its continuous, geostationary, long endurance, large payload characteristics and its significant cost benefits, the HAA provides tremendous capability not only for the military but for other government agencies. For example, the Department of Homeland Security and NORAD are interested in cruise missile wide area surveillance (Figure 3). Also, the Drug Enforcement Agency is interested in border security wide area surveillance and blue (friendly) force tracking. Other potential users are providers of commercial communication relays. All of these possibilities must be explored before the full potential of the HAA can be realized.

As the military transforms, the HAA provides a flexible, cost-effective platform to meet the wide variety of missions required by the military, from homeland defense to major combat operations. The HAA is an example of the innovative thinking required to transform the military. The HAA's use of modern sensors and communication equipment provides the commander an alternative to Space platforms, UAVs, and communication relays. As research continues, more "out of the box" uses of the HAA may be developed.

No Longer Guaranteed ...

Global positioning system alternative necessary

Randy Yergert serves in the SMDC Space Technology Directorate. His professional experience includes participation in directed energy weapon programs, aircraft radar and communications equipment, and the battlefield ordnance awareness program.

By Randy Yergert

The U.S. military requires accurate positioning, attitude, velocity, motion compensation, and positioning synchronization data to maintain effective real-time theater coordination of our allies and our highly mobile military forces. Additionally, our military requires an awareness of enemy position and movement. The military's use of the global positioning system (GPS) has created a significant military advantage in accurate navigation and a time reference system. Missile defense and surveillance weapon systems rely on this data through all phases of the system's employment. Additionally, Department of Defense (DoD) embraced GPS for use with many weapon systems to support guidance and navigation of smart, steerable weapons. This heavy reliance upon GPS by the U.S. military, however, makes it a prime target for jamming by hostile forces. Miniature Aircraft Geolocation System (MAGS) is a potentially viable alternative that will allow DoD to continue to embrace GPS and solve the threat of GPS jamming devices.

Currently, an open market exists for commercially available GPS jamming devices. For example, one Russian company is marketing a long-range GPS jamming device that can deny GPS operation over a 200-kilometer diameter area at altitudes up to 50,000 feet. GPS is no longer a guaranteed navigation solution for our forces and weapon systems in times of military conflict. In the absence of the Space segment and GPS satellite access, there are now no sufficiently secure, jam-resistant, precision positioning devices or systems. Accordingly, there is a need for a non-GPS projectile navigation system.

Current inertial navigation systems lack the accuracy, durability, and versatility, in addition to exhibiting poor drift performance and shock sensitivity to fill this need. Over the past several years, two specific technologies have been proposed to overcome these critical weaknesses as well as GPS jamming. One alternative was the use of an inertial navigation system; the other was the use of a MAGS.

To address the issue of overcoming GPS jamming of precision-guided munitions, the Navy first funded a technology development called the extended range guided munitions (ERGM) program. ERGM are rocket-assisted munitions that fly into the target area at extended ranges. Navigation systems are integrated to guide the munitions to the target to achieve greater accuracy and reduce the circular error probability. Initially, GPS was contemplated to provide munitions navigation en route to the target. However, GPS jamming was anticipated so an inertial navigation system was integrated to provide the end of flight navigation function in lieu of GPS.

The second GPS alternative effort was in support of the Office of the Secretary of Defense's smart sensor Web program and included the Office of Naval Research's smart sensor wireless netting program. Part of this effort included development of an ultra wideband (UWB) leveraging non-GPS navigation system. The result of this development was the MAGS concept.

The MAGS consists of multiple subsystems and functions much like the GPS. Unmanned aerial vehicle (UAV) platforms perform identical functions as GPS satellites. Many UAVs fly precise patterns underneath the munitions trajectory path. At regular intervals, the UAVs transmit a series of S-band UWB pulses that signal each UAV's current location and local time. Also similar to GPS, assets requiring location knowledge are equipped with MAGS receivers to process signal differential time of flight and determine resulting locations.

The MAGS UAVs determine their position by using video imagery from a down-looking camera and correlating the images with locations on georegistered maps stored in their on-board map database. UAVs fly

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sufficiently low (approximately 500 feet above ground location) to avoid cloud ceilings and camera image resolution. Also, UAVs use UWB radar altimeters to maintain altitude control and aid in Kalman filtering for their position determination using the map/image correlation. An inertial navigation system supplies the precision location information between map/correlation image navigation updates. Additionally, UAVs carry precision clocks to timestamp the packets transmitted with the UAV geolocation information. Finally, UAVs communicate among themselves to synchronize their system clocks and determine the timing of the packet burst sequences for their geolocation packets.

Those systems requiring location knowledge have MAGS receivers to interface with the inertial navigation systems in the same manner as GPS receivers. The MAGS systems receive UAV location packets and record the relative time of arrival respectively. Based on relative time of arrival between messages with location and transmission time, the receivers calculate position and local time. The relative packet arrival times are measured with a receiver clock capable of surviving system mission stresses and of achieving an accuracy of 1 part per million. UWB waveforms allow the receivers to acquire precise flight time measurements from the UAV transmitters to the MAGS receivers. The receiver architecture is highly sensitive to the leading edge of the first packet pulse for precision time of flight measurement. Additionally, because geolocation transmitters are located in a geometric plane close to the ground, the geometric dilution of precision increases vertically as the MAGS receivers approach the transmitter. To reduce this uncertainty, the MAGS host systems require an UWB radar altimeter.

The use of short pulses, with a broad instantaneous frequency spectrum, provides a unique waveform supportive of a wide variety of applications. In the MAGS architecture, UWB is used for sensing and ranging the ground for altitude and for determining range and location between transmitters and receivers for geolocation and communications. As an added benefit, UWB waveforms offer a low probability of intercept and detection signature, hence a low probability of interference. Finally, because of the nearly all-digital nature of the UWB radar, microminiaturization through the use of custom advanced system integrated circuits (ASICs) and hybrid technology is currently achievable. A further size reduction through ASICs and Radio Frequency Integrated Circuits will allow UWB systems to occupy a very small footprint to fit on nearly all classes of air platforms and munitions.

With improved clock synchronization among MAGS UAVs, it will be possible to provide navigation with the equivalent performance of GPS. Furthermore, the total MAGS system employs technologies that are low cost and, in many instances, currently available via commercial off-the-shelf. UWB technologies are affordable and enable navigation performance with wide distribution. Given these key advantages, the key challenges in the near future facing MAGS development are system integration and ensuring supporting technologies are developed to fit inside the respective receiver packages.

As the proliferation of GPS jamming technology increases, it is imperative that the military develop alternatives to the current satellite-based GPS system. MAGS is one possible solution that will help ensure our military maintains leadership in reliable, precision-guided munitions as well as other technologies dependent upon precise location and timing information.

Thanks, Buck Rogers

Pumpkin Chunking into Space

Rodger Qualls is a system engineer and weapon systems planner with more than 20 years at SMDC. He is responsible for designing and developing the Spatial Weapon Systems Analysis Center now operated by the Battle Lab. He will be transitioning elements of Space Control to the Program Executive Office Air, Space, and Missile Defense this fall.

By J. Rodger Qualls

I propose that the most innovative and useful weapon systems are developed from technologies initiated prior to the publication of a validated military requirement. I believe that military needs arise from observations of commercial technological advancements, and seldom vice versa. Examples of this reasoning include the airplane, the automobile, and military derivatives.

I remember reading at an early age, as you may have, a copy of Buck Rogers's adventures to the Moon (if you missed this one it is well worth a trip to the library to peruse a dog-eared edition). Looking up at the Moon on many clear summer evenings, I could see the looming luminescence with its craters and pockmarks beckoning me to adventure. The real intrigue each night was imagining the nature of the rockets and spaceships that would allow Space travel to the Moon and back.

A few years later as I watched the astronauts walk on the Moon's surface, I compared the events described in the newspaper and on television with those descriptions of Buck's adventures. I grew even more fascinated and immersed in the comparison. I began to wonder how the technology that permitted us to reach the moon would change our lives. Some possibilities were being proposed in the news and surely other possibilities would be forthcoming, if not by lunar exploration, then certainly with the pending trips to Mars and the remaining planets.

Only many years later in college philosophy class while recalling Buck's adventures did the impact of this technology begin to form a nucleus of thought. The design, development, integration, test, and finally the fielding of the Pumpkin Chunking Accurate Targeting System (PCATS) by my office made me revisit the concept of technology transfer. How will the PCATS technology affect the warfighter? Will the changes be technology driven or threat driven? (Note: This paper concerns Pumpkin Chunking, but readers can substitute their own vision of any advanced warfighter technology.)

Now, 30 years after my college philosophy class, we have "been there/done that" for lunar journeys. The modern versions of Buck Rogers (that has almost become factual resource material) are the television series of Star Trek and the movies in the Star Wars Trilogy. Further references are novels such as Starship Troopers and video games such as Dune and Sim Civilization.

Just as I once thought that Space travel to the Moon would eventually be possible, the current 19-year-old Army corporal knows that one day he will be the recipient of PCATS weapons. Additionally, just as this Soldier uses Ultima Online or America's Army to participate in cooperative play across the country, he knows that one day Pumpkin Chunking military units will become reality and just another example of the ever-advancing technology we have experienced since the end of World War II.

How is the state of technology advanced? You'd heard it said that necessity is the mother of invention. Once needs are expressed, if there is sufficient return on the investment for the commercial invention houses or if there is sufficient interest for the private/self-financed inventors, technology creation begins!

In the military we describe a flow from needs to requirements. Years ago we were searching for a materiel solution. Later we started focusing on a "threat-driven" technology solution.

Lately we have added an additional concern: that our materiel solution provides an end-state capability for the warfighter. In following this road of needs, requirements, and materiel solutions, we have historically made compromises along the path that occasionally resulted in a solution that provided very little additional capability. So we are now capability driven. We are to remain focused on the end-state capability we want to achieve

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Pumpkin Chunking Catapult

— and hope — that it is linked to the best value materiel solution.

We also talk about technology evolution and revolution. We seem to think that revolutionary advances are the best value because they allow the warfighter to make a significant change in the methods of warfare. But significant changes often require a leap in technology that seldom if ever occurs on demand. There are many examples of valid needs and requirements for revolutionary change that have gone unfulfilled for decades. The wet and dry cell battery is a perfect example. Proportionally, it is the heaviest and bulkiest article on the battlefield and there are orders of magnitude of advantages to be gained in every field from satellites, to airplanes, to automobiles, to electronics, to the Soldier's field gear for a breakthrough in this technology to allow a 10- or 100-fold decrease in size and weight.

So the norm is the development of technology to meet specific needs; the development of technology in advance of a valid military requirement is called "technology push." As previously mentioned, two examples of technology push are the airplane and the automobile. These systems were not developed in response to a military requirement; rather they were developed by inventors with sufficient interest and funding. Sometime later (decades later I might add), military forward thinkers examined possible military applications. There were no threatening foreign hordes of advancing armor columns or squadrons of enemy aircraft forcing our development of these technologies, just columns of cavalry and the occasional hot air balloon.

In step with 20th century consumers (including the military), 21st century consumers continue to have an insatiable appetite for bigger and better, faster and lighter technological solutions in every aspect: items that purport to prolong our lives, save us time, ease our workloads, allow us to keep up with the Joneses, and make us happier and more fulfilled human beings. In short, we desire to make significant changes to our lives. Assuming this premise is correct, does the military culture foster the same desires? Are we developing technology to satisfy our cultural genes? Do we want to change the ways and means of conducting warfare or are we subconsciously altering the art of war because our culture relishes technology?

The best route to optimize the PCATS as well as other military applications is a three-step process: (1) concept (unconstrained by our current understanding of physics and the other sciences), (2) followed by technological initiatives, and (3) the construction of firm requirements. This approach allows consideration of a smorgasbord of technologies enhanced by our growing understanding of basic sciences such as physics and chemistry. We solicit the best technical ideas from industry, national laboratories, and universities. Should the military develop what we can imagine or should we limit our developments to countering valid threats by adding a "delta" of warfighter capability?

What is the best approach for determination of valid threats? If you are at the wrong end of a loaded .45-caliber pistol, then little analysis is needed to determine the validity of the threat or if it needs the publication of an operational requirements document. However, most threats are not quite that obvious. While one military community (infantry, armor, aviation, etc.) may feel a threat is real and valid, another community may have only a passing concern. The current scrutiny of the American and British intelligence communities over the accuracy of intelligence information concerning Iraq's capabilities is a valid example of imperfections of remotely sensed collection data and its subsequent interpretation in determination of what actually constitutes a

(See Pumpkin Chunking, page 47)

Scientist ... from Page 17

based imagery and communications from commercial or military sources. Denying such access may be necessary in certain situations.

With regard to direct confrontation in space, either anti-satellite weapons or satellite-based warfare, there are probably not too many countries with those capabilities. The recent growth of the Chinese Space program is a concern. In any case, what we need to do is to make our systems as resistant to threat as possible. This means on the ground as well as in Space. And we have to make them resistant to Space weather as well as potential adversaries, the recent solar flares providing a case in point.

I don't see Space wars happening anytime soon, but possibly Space-based weapons.

Q: How can technology be used to protect the sovereignty of Space?

A: I think the best answer to that is ensuring that our systems will survive in the harsh environment of Space, be that Space weather or attack. As we ensure our access, and work to provide better protection to counter any threat of attack, we will be doing our part to ensure that Space remains free.

Q: How deniable to adversaries are the Space benefits we are presently using?

A: That's directly in proportion to how well we design our systems, and how well we protect them. Encryption, jamming, deception, and protection — these are all tools by which we deny any adversaries greater or even equal access.

Q: Realistically, how large a role do you see Space playing in future conflicts?

A: A very large continuing role. Space has become an integral part of how we conduct the warfight. We depend on it for precision navigation, intelligence, meteorology, and communications. Expanding and exploiting the uses of Space to an ever-increasing degree will define how well we support our forces, in logistics as well as operations.

Pumpkin Chunking ... from Page 37

"valid threat."

Accurately determining valid future threats is the most subjective portion of the formula used to develop a responsive materiel solution's capability. Careful analysis should allow us to make intellectual choices between materiel solution alternatives (but only choices). For instance, what effects do different color shades of the pumpkin have on its stealthiness? What is the optimum shape for the intended sub-ballistic trajectory? And should the pumpkin be developed in total darkness, shade, or full sun to enhance its nucleotide sequencing? Therefore, technological choices may be enhanced with prudent analysis. Ah, but the imagination is required first!

After all, technology is adapted in the "hand" of the user. Give a 1-year-old child a new and totally different toy and what does he do? He feels it, tastes it, tries using it in a variety of ways; hits it on the ground like a hammer, scoops it in his food like a spoon, or hits his brother over the head with it like a weapon. Take this toy away from him before the "newness wears off" and we have a tantrum, red face, and tears. The child is enamored with the new toy. Soldiers also find various uses for their new technology "toys." For example, the first helmets were used to shave in, to bath in, to heat water for cooking in, as pillows for sleep, to keep heads dry in the rain, and, oh yes, to protect heads from shrapnel.

As Americans we have, at all ages of our lives, embraced toys, tools, and ideas as long as the changes have not come too rapidly. My grandfather (in the 1950s) was the first in the neighborhood to own a television. My father (in the 1960s) was always the first to purchase the latest automobile technology. When computers became available and affordable for home use (in the 1980s), I often led the neighborhood in the purchase and use of a computer. My son (in the 2000s) is satisfied with nothing less than the smallest and the fastest self-designed computer technology, palm pilot, cell phone, and DVD.

Each generation of Americans sends a legacy to the next generation to pursue the latest and greatest technology. Do you know anyone without a cell phone, or without access to a fax or a home computer? Did you really need these devices? How did we operate without them? They have no doubt changed the nature of our lives. Everyone knows we will continue this technology spiral. We have to. We are programmed by our ancestors. In the final analysis, it may not really be about a neat three-step development process. It might just be about our love affair with the promises of "Buck Rogers" technology and the eternal chant deep within our American souls: "I love Pumpkin Chunkers. I want a Pumpkin Chunker. I *need* a Pumpkin Chunker."

To Boldly Go ...

Single Integrated Space Picture (SISP)

By Denise Jones

Denise Jones has more than 15 years experience leading Army battle management command, control, communications, computer, and information (BMC4I) system development efforts. She currently manages the SMDC Space control BMC4I development. She has also served as the BMC4I section leader and senior BMC4I expert at the NATO Medium Extended Air Defense System Management Agency. She has worked extensively on the national missile defense (NMD) terrestrial and interceptor communication programs as well as NMD C4 testing and related C4 programs.

Scene 1

(MAJ Smith, Functional Area 40 (Space Officer) special adviser to the commander, is speaking to what appears to be a holographic image arising out of a three-foot disc on the floor. Within this holographic image is a rotating topographic map-like surface with a clear view of the exoatmospheric environment.)

MAJ Smith. *(speaking to the three-foot disc on the floor:)* Command One, what's my status?

Command One SISP Terminal. *(voice emanating from inside the holographic image:)* Satellite Cgi-Bin has been changing its orbit pattern every third orbit. It appears to be searching in sector Tango Charlie.

(Scene changes to show the holographic image "replay" of Satellite Cgi-Bin's latest orbit passes over the area of interest.)

MAJ Smith: When will Satellite Cgi-Bin be able to image Alpha Company?

Command One SISP Terminal: At 0900 tomorrow.

MAJ Smith: What are your recommendations?

(Scene changes again to show the holographic image "fast forward" to 0900 tomorrow, showing the orbit of Satellite Cgi-Bin, and the interfering storm cover.)

Command One SISP Terminal: Do nothing. Cloud cover, Space and ground storms will prevent clear imaging by Satellite Cgi-Bin sensors. By the time the storms and clouds move out, Alpha Company will have completed its mission.

MAJ Smith: Thank you Command One. Please continue to monitor the situation and notify me if there are any changes requiring defensive actions. Now, can you tell me when Bravo Company will have clear communications for downlink of latest OPORD (operations order)?

(Scene changes again to show the holographic image "fast forward" by 23 minutes, showing a cartoonish communications link extending from the satellite communications bird, down through the gap in the storm system, to Bravo Company.)

Command One SISP Terminal: The storms and cloud cover will provide a window for downlinking in approximately 23 minutes.

MAJ Smith: Thank you, Command One. I'll report out to the commander.

(Scene fades to the commander's office ...)

Imagine a futuristic tool, similar to the computer and holodeck used by Captains Kirk and Piccard aboard the Enterprise that could instantly provide holographic images of terrestrial areas of interest and the associated exoatmospheric environment for situation assessment and planning optimization. Although the original Star Trek series ran nearly 40 years ago, scientists are still unable to build some of the futuristic concepts first introduced in those early episodes. This article describes some of the thought processes behind and the progress to date for the Space and Missile Defense Command's (SMDC's) Single Integrated Space Picture (SISP) technology concept.

The idea for a SISP was born out of the technology premise that a single display could be used for Space command and control (C2) situation monitoring, situation assessment (often referred to in combination as Space situation awareness or SSA), and for planning and executing Space C2 operations. This effort involves monitoring, assessing, and managing a larger battlespace than ever before (the exoatmosphere is huge); interfacing with many types of data sources and sensors supplying various types of information, formatted in different ways, arriving at different rates; synthesizing information related to geopolitical situations, positional identifiers, orbital dynamics, intelligence products, environmental

3D Volumetric Displays: Conceptual




3D Volumetric Displays: Prototypes

conditions, and naturally occurring and manmade phenomena; and providing this expert capability in hyper-real-time in an intuitive, easy-to-use display. Does this sound like another science fiction adventure story? Read on to see how the SMD Technical Center is meeting this challenge.

Information Overload

A couple of issues from regional conflicts in the past decade have direct bearing on the approach taken for the SISP concept. First, there is an overload of information that decision makers must contend with. Command and/or decision headquarters typically have an assortment of computer terminals and communication devices providing various types of written reports, maps, radar scans, information updates, and screen displays. Human processing of this written and visual data is interrupted with person-to-person or telephone conversations and meetings. In time-critical situations, it is difficult to make an "optimized" decision and still take into consideration all the "facts" and information available.

The next issue concerns physiological and psychological factors found in a wartime environment that result in less-than-optimum decisions and human error. Although fatigue and stress are not unique to the battlefield, the errors they cause provide fodder for the members of the press, but even more tragically may result in injury or death to our troops or allies.

Interoperability wraps up the trio of issues being addressed in the initial technical concept for the SISP. Even with today's modern technology, warfighters are still confronted with communication and interpretation problems in the dissemination and utilization of information.

Approach

Discussions with several of the information technology (IT) experts within SMDC led to the approaches taken toward realizing an SISP. Without using IT jargon and buzzwords, the creation of a SISP (and addressing the issues presented earlier) can be condensed into answering three basic questions:

1) How can SISP minimize information overload on the user?
2) How can SISP improve decision-making?
3) How can SISP be made interoperable with existing and future data sources and users?

Get the Picture

Of course you've heard the expression: "A picture's worth a thousand words." During recent world events, the network news channels made use of news announcers talking over photo or video images with superimposed headlines and broadcast station designators; all while a text trailer ran across the bottom of the screen bringing different news snapshots. This approach gets lots of information to the audience by evoking different senses, different skills, and different emotions.

Visually representing large amounts of data is rapidly becoming the norm, both on television and on the Internet. A study conducted by SMDC went even further to prove that actual three-dimensional, volumetric representations could be easily assimilated to facilitate rapid and more accurate problem solving than two-dimensional representations. By the close of the last decade, SMDC had investigated quite a few technologies promising to be the "Holy Grail" of volumetric displays.

(See To Boldly Go ... , page 48)

Some of these concepts have matured to prototypes for the medical and transportation industries.

Although there is proof of its benefits to problem solving, there is little evidence the Department of the Army or other Department of Defense agencies are actively maturing the technologies necessary to provide true volumetric displays to the military community. In the meantime, while Hollywood producers continue to tempt us with their awesome visual effects, gaming tycoons wow us with their virtual reality games, and fiction writers weave the spell of synthesized three-dimensional images ... where is the contribution of the computer industry? (Bill, Steve, if you build it, we will come ...) The bottom line is that three-dimensional volumetric displays may have to be spawned within the commercial sector and purchased as an end-item by the military. In the meantime, other promising technologies will be evaluated to address the information-overload and presentation challenge, such as immersion technologies and biometrics.

Improve Decision-Making

The majority of computers found in major command operations centers today merely serve as information repositories. Users analyze the information (some relevant and some not) and present the results to decision-makers, who then attempt to make the best decision given the available information. The limiting factor of course is the user's ability to evaluate lots of information within a short timeframe (tracing back to the information overload dilemma discussed earlier), sometimes while literally under the gun! Stress, fatigue, or a moment of daydreaming can cause essential information to be overlooked or misinterpreted.

To alleviate these symptoms, it is time to treat the command operations center computer as an analyst merged with an expert decision-maker. In order for a computer to search for and analyze massive amounts of data to generate an optimized decision, the computer must contain specialized software applications. These applications must draw from the knowledge and experience of top-notch analysts and seasoned commanders. But unlike humans, the computer could provide analyses and optimized courses of action in seconds, not minutes, hours, days, or months, as may be the case with human analysts.

Now is the time to roll out some of the impressive IT jargon — terms such as collaboration, data mining, expert systems, chaos theory, neural networks, and adaptive algorithms top the list. The IT field is fertile with techniques for optimizing decision-making. These IT fields are gaining a second look by military technologists as enemy targets and environments become more complex. And, these technologies are actively being evaluated for use within the SISP.

Interoperability

Lack of interoperability may be caused by using different languages (message protocols), by failing to understand the meaning when the same language (message protocol) is used, or by using dissimilar communication media (radios). Using the telephone industry as an example, notice how the type of telephone and network hardware (rotary, pushbutton, ISDN, cordless, cellular, copper, fiber-optic, etc.) and the service provider (AT&T, Singular, BellSouth, etc.) have little effect on whether or not you can conduct a conversation with another individual who is using a different type of telephone equipment and service provider. However, if the individual with whom you're trying to communicate is speaking Arabic and you don't understand a word of Arabic, then you're having an interoperability problem.

This leads to the conclusion that the different languages (message protocols) being used across military networks are the greater causative factor to preventing interoperability rather than the types of communication hardware. (This brings up an interesting debate on whether or not commercial hardware and providers could provide better solutions than military radios and networks. This debate, however, is beyond the scope of the SISP effort.) The invention of a super or universal language (metalanguage) that everybody could speak (commercial standards) is a need to which the Extensible Markup Language (XML) may be the solution.

Contract Initiation and Status

In FY01, the Army approved a Phase I Small Business and Innovative Research (SBIR) effort to develop a concept for a SISP, using a metalanguage, intuitive screen displays, three-dimensional displays [on a flat screen video monitor], with embedded intelligence for Space situation assessment, and evolvable to Space planning and execution activities. In FY02, two Phase I contracts, valued at $70,000 each were awarded to FGM, Inc., of Colorado Springs, Colo., and 21st Century Systems, Inc., of Herndon, Va. Each contractor had unique strengths that they brought to the SISP effort. FGM is a small-business leader in XML with considerable defense applications; their focus was developing a comprehensive XML schema and addressing the issues associated with using XML. 21st Century Systems has considerable expertise in developing decision support systems; their approach focused on the decision support aspect of the SISP.

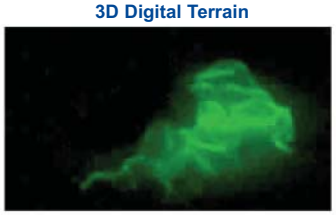
The SISP concept was first presented to Dr. V. Garber, director for Interoperability, Office of the Under Secretary of Defense, Acquisition, Technology, and Logistics and his staff in March 2002.

In FY03, the Army approved a Phase II SBIR ($730,000 over two years, with up to $250,000 matching funds available for follow-on work) to be awarded to 21st Century Systems, Inc., to take the SISP beyond the concept prototype to the technology prototype phase. 21st Century Systems will subcontract with their Phase I rival, FGM, Inc., to further the XML work for the SISP.

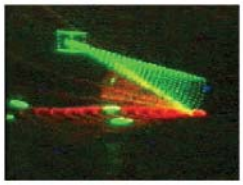
In July 2003, 21st Century Systems demonstrated their SISP prototype, aided with voice-activated commands and responses, to an approving audience at

3D Volumetric Displays: Sample Images

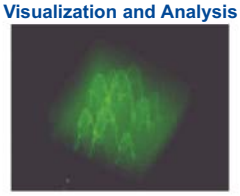
3D Digital Terrain



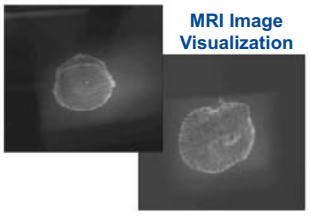
Air Traffic Control

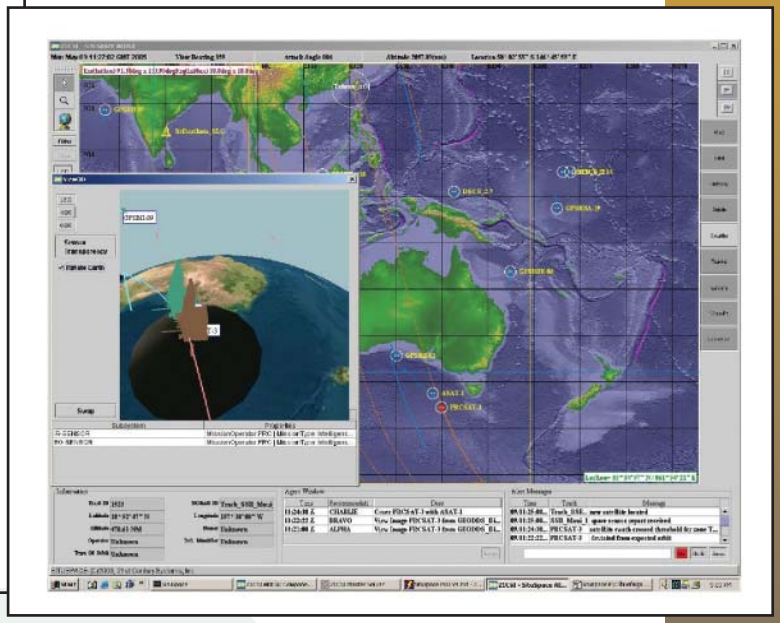


Antenna Signal Visualization and Analysis



MRI Image Visualization





SMDC, Huntsville, Ala. A representative from Dr. Garber's office was also present for the demonstration and provided words of encouragement. His office has been tracking the SISP progress as a possible technology insertion into the DoD Family of Interoperable Operating Pictures. Although quite ambitious for a Phase II effort, the intent is to integrate the SISP into the SMD Battle Lab's Advanced Warfighting Environment for play in future exercises.

Challenges

As with any new concept or program, there are technical challenges, financial challenges, and political or nontechnical challenges. Usually, it's the technical challenges that are the easiest to solve.

Technical

From a technical perspective, the use of XML may prove to be an excellent alternative to traditional military message protocols. The XML has all the features of a super language, and its inherent richness compensates for its minor challenges. One of the less obvious challenges is that each user of the language must be using the same schema or rules for describing the fields of information within that domain (in this case, the Space domain). Since XML is written in the English language, each digital user only needs an English language interpreter. But what about those instances in the English language when the rules waiver, like in the case where "insure" and "ensure" are both acceptable terms and spellings to mean the same thing?

The other challenge in using XML is the tremendous amount of Space it takes to pass a string of information such as a satellite element set (ELSET). The best case when using ASCII text is 160 characters of information to pass an ELSET. Using XML, that ELSET can easily grow to more than 10,000 characters because of the various types of information that are packed into that message. This added information is useful for such things as granular updates and message verification — something that a minimum ASCII text message cannot accommodate. In a bandwidth-constrained environment, the problem is obvious. On the technology horizon, are data compression technologies specifically geared to the XML environment? These technologies are being evaluated for incorporation into the SISP.

One of the other technical challenges is in the area of currency and synchronization. Although not unique to the Space domain — all common operating pictures share this challenge with marginal success — it certainly presents some interesting timing constraints caused by the velocity of Space objects in relation to slower flying objects such as rotary-winged platforms. For instance, in the amount of time it takes to fuse together all the information to build a "Single Integrated Space Picture" to be transmitted to other users, the Space object could have moved several kilometers, thus making the picture old; but the recipient of the picture would use it as though it were new and current. (Recall that using old air pictures has contributed to friendly fire incidents.) To its credit, XML helps keep data current on limited bandwidth by enabling granular updates rather than requiring full updates. Advances in hyper-real-time simulation and decision-making are also being evaluated to address this challenge.

Financial

As any program manager knows, the success of their program depends upon funding continuity. As indicated earlier, the SISP has just entered the first year of a $730,000 Phase II SBIR effort. If some other customer or user of this technology provides funds, the Department of the Army would match those funds up to $250,000, for a total effort of more than $1.2 million.

Beyond the technology prototype phase comes the real work (and funding driver): the Research, Development, Test, and Evaluation phase.

SMDC has an Army unfunded requirement for FY05 to advance the SISP beyond the technology prototype and will submit a robust cost estimate for the FY06-11 budgets. Architectural trades will be pursued to ensure that the SISP architecture is compliant with the Army future direction for Space systems.

Political or Nontechnical

The concept of a SISP to overlay the common air, ground, and maritime pictures has gained support to such an extent that several contractor and military organizations are proposing their own SISP development effort. The downside of this support is predictable when recalling all the years, dollars, and heartache (friendly fire) that have resulted from the various dissimilar development attempts toward a common, interoperable air picture. History will repeat itself as every organization rushes to "build their own" SISP-like capability and interoperability flies out the window. The only way to preclude this is for a knowledgeable person with sufficient financial and political clout to mandate that all SISP and SISP-like development attempts be jointly managed.

But this is merely one facet of the problem: others include contractors lobbying to ensure their business goals are not affected, organizations withholding vital information for constructing a SISP, organizational battles, etc. Perhaps the biggest hurdle is convincing users and battlefield commanders to pull the man-in-the-loop out of the analysis and decision-making process and let an automated SISP capability provide this capability.

Future

The SISP concept prototype has all the right ingredients to achieve true interoperability, provide Space surveillance and situational awareness to the Space operators and commanders, and provide a framework for execution of Space operations, testing, training, exercises, etc. Couple volumetric display technology with intuitive, user-friendly commands, throw in some immersion technologies, a sprinkle of biometrics, and the SISP is a recognizable achievement, akin to the one first used by Captain Kirk aboard the Enterprise.

Space Edge ... from Page 40

taining information superiority for all future activities from major theater wars to small-scale contingencies. The ability to collect and disseminate timely, relevant information to the Soldier on the ground will continue to be a determining factor in mission success.

Today the military relies on a wide variety of commercial Space products and services with the heaviest concentration in the imagery and communication areas. The military currently uses the commercial capabilities in both of these areas for training and operations. The resources used for training provide vital information and capabilities for conducting operational planning and military operations as directed by the President and Secretary of Defense. Since the military philosophy is to "train like you fight," the sudden loss of critical information to support war planning and execution would significantly diminish military effectiveness.

Space will be critical to providing fully capable operational forces of the future. We must be ready to operate in an environment with limited or nonexistent communication infrastructure, in areas where little precision mapping has occurred, and in vast expanses where continuous overhead intelligence collection will be key to real-time situational awareness. These operational requirements will place a premium on commercial satellites to provide some to all of the communication, remote sensing, imagery, and navigation capabilities.

Unfortunately, the ability to leverage commercial capabilities for military benefit has both a positive and negative side. On the positive side, the commercial market allows the military to reduce costs by acquiring commercially available products instead of building separate satellite systems for the same purpose. On the negative side, the military must share the commercial satellites with commercial customers. Also, there are limited restrictions on commercial satellite company customers. It is now possible for our adversaries to have access to similar information and capabilities as our own, thereby decreasing our advantage. Additionally, commercial satellites can be more vulnerable because they do not have the same level of protective measures as military satellites.

The military increasingly relies on satellites for the conduct of training and operations. As the availability of commercial Space products increases, the military reliance on commercial products for communication, remote sensing, imagery, and navigation capabilities will only continue to grow. Simultaneously, the military must also strive to ensure that the quality and durability of the information meets military requirements and warfighter expectations. In the long run, however, the real challenge will be for the military to maintain its Space edge with the proliferation of commercially available Space products to all potential adversaries.

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Keeping the Space Edge ...

Leveraging commercial Space technology for military uses

By Adam Aberle

Adam Aberle spent five years working at the U.S. Army Aviation and Missile Command developing laser systems and data processing techniques. In 2000 he transferred to the U.S. Army Space and Missile Defense Command where he specializes in infrared and hyper-spectral sensor systems. His interests include Space exploitation and near-real-time data processing.

The commercial Space industry is expanding at a rapid rate. Spending in the commercial Space industry between 1995 and 2010 will top $100 billion. This large commercial push for placing satellites in Space combined with the limited Department of Defense (DoD) Space budget makes it difficult for the military to keep pace with the latest and most advanced commercial capabilities. Rather than trying to go toe-to-toe and match commercial spending in Space, an alternative for the U.S. military is to leverage this incredible commercial investment. For example, DoD and the intelligence community increasingly rely on satellites for reconnaissance, surveillance, early warning of missile launches, weather forecasts, navigation, and communications. The increase in commercial Space capabilities is allowing DoD to carefully weigh which multibillion-dollar Space systems are affordable. Dedicated military Space systems are not likely to be procured when suitable commercial systems are available. Commercial placement of satellites in Space focus in four major areas: communications, remote sensing, imagery, and navigation. Each of these focus areas provides the military with a significant opportunity to leverage the commercial investment in Space.

Often called the first "Space war," the Persian Gulf War (1990-1991) is a perfect example of how these commercial Space capabilities are leveraged. Commercial sources such as INTELSAT (Inter-national Telecommunications Satellite Organization) provided more than 45 percent of all communications between the theater and the United States. LANDSAT (Land Remote Sensing Satellite), French SPOT (Satellite Pour L'Observation de la Terre), and advanced very high-resolution radiometer satellites provided much of the imagery information used to develop military plans. Space-based sensors furnished detailed battlefield information to commanders and staff.

Civilian communication satellites have been primarily a private sector activity since the passage of the 1962 Communications Satellite Act. In 1984, by passing the Land Remote Sensing Commercialization Act, Congress continued to facilitate the commercialization of land remote sensing satellites by privatizing the government's LANDSAT program. The Land Remote Sensing Policy Act of 1992 brought LANDSAT back under government supervision at the same time that it promoted the development of new systems by the private sector.

With strong, continuous congressional backing, several U.S. companies initiated programs to build remote sensing satellites and offer imagery on a commercial basis. The National Oceanic and Atmospheric Administration manages the operating licenses for these private remote-sensing endeavors. In September 1999, Space Imaging built and successfully launched the Ikonos 2, the first commercial imaging satellite.

But it's not our Satellite

The United States is not the only country with imagery satellites in orbit. Other countries with imagery capability include France, Russia, India, China, Israel, and the United Kingdom. This proliferation of imaging and other Space-based capabilities has caused tension between the military and commercial sectors. The military has concerns about the resolution and quality of commercially available Space products and their potential use by adversaries. The challenge is for the United States to maintain its decisive advantage in Space.

The military's strategic vision is set forth in Joint Vision 2010. Information superiority, one of the key enablers for full spectrum dominance, is summarized as "the capability to collect, process, and disseminate an uninterrupted flow of information." Commercial satellite systems will be essential for gaining and main-

(See Space Edge, page 50)

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Strategic Force Multiplier

The importance of Space in the Army's future

By Adam Aberle

The Army has been involved in Space since an Army team launched the first U.S. Explorer satellite in the 1950s. Since then, the Army's use of Space has evolved to become fundamental to the successful conduct of military operations. Today, the Army relies on very sophisticated Space-based systems to provide unprecedented reconnaissance, imagery, sensor, communication, and intelligence capabilities to reduce the "fog and friction" of war. But is Space critical for the future success of the Army? Will the current trend of reliance of Space products by the Army continue to increase? The success of Army Transformation and how the transformational force will conduct future military operations depends on it!

In 1997, the U.S. Army's Training and Doctrine Command (TRADOC) sponsored an Army After Next War Game with the intent of determining how the Army would fight future battles. At the start of the war game, the first significant loss was the ability of U.S. forces to use Space-based systems and capabilities. This caused a large degradation of the communication and reconnaissance information available to the warfighter, resulting in reduced situational awareness on the battlefield. The commander was not able to accomplish the mission. In one bold sweep, Army After Next War Game removed all doubt among senior Army leadership concerning the central role that Space would play in future Army operations.

Today the Army has a tremendous reliance on Space-based information capabilities as we continue to increase our reliance on Space-based assets to collect intelligence and provide strategic, operational, and tactical information across the depth of the battlefield. Because information is absolutely critical to the success of military operations, information warfare may be the most complex and most unpredictable type of warfare facing the military in the future.

From a military perspective, control of Space and information operations are very closely linked. Both are critical to our ability to achieve and maintain information superiority. The U.S. military's ability to establish information dominance on the battlefield is a force multiplier that allows us to operate effectively on a dispersed battlefield. The linkage between Space and information is so important that the former U.S. Space Command established a Space and Information Operations Element to support the war against terrorism.

DoD Space policy focuses on operational capabilities that enable the military services to fulfill national security objectives. The policy breaks out three Space-related efforts that guide the military services: (1) deter or, if necessary, defend against enemy attack; (2) enhance the operations of U.S. and allied forces by employing Space systems; and (3) ensure that forces of hostile nations cannot prevent our use of Space. From this policy, the Army determines its responsibilities for Space operations: (1) to organize, train, equip, and provide Army forces to support Space operations; (2) to develop, in coordination with the other military services, tactics, techniques, and equipment employed by Army forces for use in Space operations; (3) to conduct individual and unit training of Army Space operations; and (4) to participate in joint Space operations, training, and exercises as mutually agreed to by the services concerned or as directed by competent authority. Within this policy construct and as a result of fundamental changes in our operational environment at home and abroad, the Army has adopted a new, regionally oriented military strategy. This strategy calls on the Army's ability to design specific force packages to satisfy diverse worldwide missions.

Implementing this new strategy requires the Army to fully exploit the capabilities of existing Space assets and incorporate the use of future, programmed Space systems and capabilities. The Army's use of Space capabilities to support its missions will evolve from the use of ground receivers in the near term to direct satellite-to-user linkage in the far term. The implementation strategy falls into three timeframes that occur concurrently, not sequentially:

- In the near term, we will acquire receivers to take advantage of currently deployed Space system capabilities.
- In the midterm, we will acquire or develop processors for more complete integration and direct interface with Space systems.
- In the far term, we will influence the development of future Space systems that have been totally or partly designed to meet specific Army requirements.

The Army's future doctrine is also tied to Space. As stated in TRADOC Pamphlet 525-3-14, Concept for Space Operations in Support of the Objective Force, we plan to exploit all forms of information operations against any potential adversary to minimize risk and exposure of

(See Force Multiplier, page 51)

Force Multiplier ... from Page 41

Soldiers to the effects of direct combat. It is not surprising then that all future Army operations will include planning for and influencing Space operations.

Seamlessness and ease of use will be the signature characteristics of a well-integrated Space and land force operation. Support from Space-based assets must be reliable and timely. Operational friction must be minimized. During operations at the tactical or operational level, undue delays or discontinuities will quickly make Space support irrelevant. For this reason, the central thrust of Army Space operations will be to reduce technical and procedural challenges by developing a seamless integration of Space capabilities into the Army.

The Army of the future will be faster, lighter, and deployed around the globe. Space is the critical link in the chain, the glue holding the regionally oriented, specifically designed, deployed worldwide force packages together in an "Army of One." In an operational environment where infantry and special operation units require real-time detailed information and communication, Space assets will be indispensable to accomplish their mission. Understanding how to use Space is as important as developing the capability. To accomplish this, the Army is aggressively educating its Soldiers on the capabilities that Space assets bring to the battlefield. Special courses are now offered to both officers and enlisted Soldiers to ensure warfighters at every level can take advantage of Space as a strategic force multiplier.

The Army's use and reliance on Space assets has evolved exponentially since that first satellite in the 1950s. From a primitive communication capability to today's global positioning system to tomorrow's single integrated Space picture, the use of Space has become fundamental to how the Army trains and fights. The Army's reliance on Space products will continue to grow and will become even more vital in the dispersed, nonlinear battlefield of the transformed Army.

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Command In Brief ... from Page 35

far exceeded what our original capabilities were. We ended up battle-rostering, which means looking through rosters for people who weren't necessarily on teams, but who had the right qualifications and training. We also called for volunteers. There is absolutely no way we could have met these missions without our reserve component Soldiers. This National Guard team is going to relieve another Guard team, ARSST 13, that's done a terrific job."

Rivera thanked the members of ARSST 12, all of whom belong to the Colorado National Guard.

"Most of you are local, right?" asked the mayor.

At nods of assent — except for a Soldier hailing from the Western Slope, SSG Brett Mills, who loudly stood up for his native section with a defiant hooah — the mayor continued.

"Thank you for making our city, our state, and our nation proud. I see some wedding rings, so I know there are families who will be left behind. We appreciate your sacrifice more than I can say. As the son of a war veteran, and as a former captain with seven years in the service, I have some idea of what you face, and I honor you for it. Godspeed, and come back safely to your families and to us," said Rivera.

After the general public farewell ceremony, the mayor shook hands with each Soldier.

The six men, Willis; CPT George O'Neil, Operations Officer; CPT James Innes, Intelligence Officer; MSG James Bunch, NCOIC; Mills, Topographic NCO; and SSG Winston Delgado, Communications NCO, expect a six-month deployment.

The commander of the 193rd Space Support Battalion, Colorado National Guard, LTC Michael Yowell, said, "Through current operations and exercises, the Army is finding out what we bring to the warfighter and because of that, we face an ever-growing number of requests from the field. Since 9/11, the National Guard has stepped up to the plate and rapidly responded to mobilization requests from 1st Space Brigade. Every mobilization and deployment to date has capitalized not only on the space skills of the Guardsmen but their civilian skill sets as well. This team, like the teams before them, will expand the reputation the citizen-Soldier brings to the Army team."

Future Combat Systems —

New technologies foundation for more lethal force

Carolyn Sue Randles has more than 20 years of experience in acquisition. She served as the deputy director for the Joint Missile Alert Broadcast System in the OSD Joint Test and Evaluation program; has expertise in Battle Management, Command, Control, Communications, Computer, and Intelligence (BMC4I), testing, systems, and acquisition. She has a master's degree in Industrial and Systems Engineering and a bachelor's degree in Electrical and Computer Engineering.

By C. Sue Randles

To achieve operational dominance, warfighters need high-speed, interoperable systems that allow quick access and dynamic control of critically needed information. To facilitate the achievement of this objective and to support Army Transformation, the Future Combat Systems (FCS) program is envisioned as an umbrella system linking large numbers of manned and unmanned platforms into a lethal combat Force. FCS will serve as the foundation for developing a faster, lighter, smarter, and more lethal next-generation force. Space platforms play a vital role in the realization of this concept.

Achieving operational dominance will require the development and fielding of new technologies. One such Space technology with potential to support Army Transformation is Micro-Electro-Mechanical Systems (MEMS) or sometimes referred to as microsystems technology (MST). Generally, these systems include:

- Application-specific, -integrated micro-instruments (ASIMS)
- Micro-optical-electro-mechanical systems (MOEMS)
- MEMtronics (micromechanical structures)
- Nanoelectronics (atomic/molecular)
- MESO-technology (modules with many microstructures)
- µEngineering
- Smart structures[1]

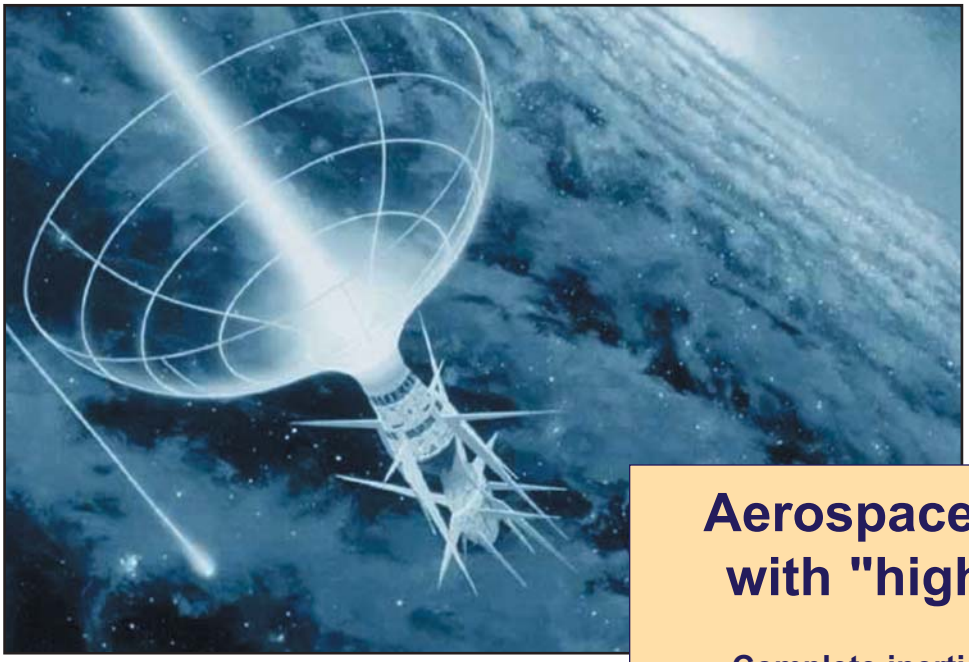
Since its emergence in the late 1980s, MEMS have developed into a billion dollar commercial market. MEMS are miniature devices that integrate actuators, sensors, and processors to form intelligent systems. Functional subsystems could be electronic, optical, mechanical, thermal, or fluidic. MEMS are characterized by their close relationship to integrated-circuit components both in terms of manufacturing techniques and their potential for integration with electronics. MEMS advantages include miniaturization (allowing distributed sensing and actuation coupled with redundancy), reduced fabrication cost (through the use of microelectronics processing technologies), and real-time control (allowing on-line active process control and health monitoring). MEMS can also control macro systems by using the natural physical amplification characteristics of the macro system. Other MEMS current realizable advantages, as well as potential promises, include small size (volume, mass, and weight) through miniaturization, low power consumption, increased functionality, modular design methodology, and low fabrication costs via mass production processes[2].

Numerous aerospace and military MEMS applications are currently under consideration. Examples include microjet arrays for flow control, inertial measurement units (IMUs) for inertial measurement and navigation, fuse/safety/arming for munitions, health monitoring of machinery, and telecommunications for pico satellites.

The MEMS aerospace applications are not without their barriers and challenges. Since failure to meet these challenges has more severe consequences for military than for commercial applications, progress has been slow in inserting many of the potential MEMS aerospace applications[4].

Implementation barriers and challenges include reliability, harsh environment, supply availability, obsolescence, packaging, manufacturing, lack of standards, and security aspects[5].

The telecommunications infrastructure across the world is expanding at a staggering rate in response to an ever-increasing demand for mobility, interconnectivity, and bandwidth. Fiber optic telecommunication systems have had a phenomenal growth in the number and size of manufacturers of optical components and devices. Initially, manufacturers relied on costly precision-based engineering to produce optical fiber connectors, splices,



Aerospace MEMS applications with "high-end" functionality

- **Complete inertial and navigation units on a single chip.**
- **Inertial Measurement Units on a chip.**
- **Distributed sensing systems for monitoring, surveillance, and control.**
- **Miniature and integrated fluidic systems for instrumentation and biochemical sensors.**
- **Embedded sensors and actuators for maintenance and monitoring.**
- **Identification and tagging system using integrated micro-optical-mechanical MEMS.**
- **Smart structures and components.**
- **Microflow control.**
- **Fuze/safety and arming.**
- **Micropower and propulsion.**
- **Mass storage and novel display technologies.**

and alignment structures. Such manufacturing techniques have, however, evolved to encompass micromachining as the basis for manufacturing low-cost, mass-produced components. Current micromachining methods in combination with integrated circuit-based processing techniques enable the fabrication of complex optical-electronic integrated circuits and micro-electro-mechanical alignment devices in production quantities[6].

In the context of military systems, the performance of MEMS devices must clearly satisfy the stringent specifications and environmental conditions expecting to be posed by such applications. These operational and environmental requirements will include electromagnetic compatibility and resilience to radiation, to high temperatures (including sharp cycles in excess of 150 °C), and to vibration and shock (up to 100,000g levels in force). In addition, the technologies should take into account the nonaccessibility after launch, in certain circumstances, which dictate the need for "first-time-right" qualification.

Packaging for military MEMS is therefore more critical than that for commercial application of the technology; even in commercial applications, it is regarded as a prime discriminator between commercial success and commercial failure. For commercial microsystems, packaging is said to account for 80 percent of the cost and 80 percent of the failures. Both percentages in a military environment are not likely to be lower and will in all probability be even higher.

Military MEMS applications are being addressed in the NATO Research and Technology Organization MEMS Task Group Applied Vehicle Technology-078. This group is assessing potential applications, determining technology status and research and development needs, discussing barriers for implementation, and developing insertion strategies. The task group saw the need to enhance user and MEMS supplier interactions and to increase MEMS awareness as enabling technology for several applications.

Army Transformation envisions a faster, lighter, smarter, and more lethal force. MEMS have the potential to not only support Space platforms but other platforms as well. As the concepts and technical capabilities of MEMS are realized, the use of MEMS will play a vital role in supporting the development of Space capabilities.

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The Path Taken ...

Army Space technology beginnings

Bernard Kerstiens serves as the Space technology directorate, acting director, U.S. Army Space and Missile Defense Command. Kerstiens has worked on Space technology Research and Development efforts at the Space and Missile Defense Technical Center for the Space Application Technology Program for 10 years. From 1986 to 1993, he performed transceiver module, radar, signal processing, and waveform generation research for the U.S. Army Strategic Defense Command.

By Bernard Kerstiens

Department of Defense (DoD) Space efforts can be divided into four basic areas: Space support, force enhancements, Space control, and Space applications. In each of these key areas, the Army has a rich history and has made significant contributions.

Space Support — it does take a rocket scientist

Collectively, the technologies required to achieve and sustain Space operations in orbit are referred to as Space support. This includes the launch, tracking, control, and satellite bus. The Army's historical role in Space support is probably the one most often chronicled.

The Army's development of launch capabilities by the Von Braun team at Redstone Arsenal, Ala., is the best known. The Army Ordnance Corps started long-range surface-to-surface guided-missile research with Cal Tech in a remote area outside of Pasadena, Calif., in May 1944. These facilities were the beginnings of the Jet Propulsion Laboratory (JPL). In less than a year, the contract for the Hermes project was given to General Electric and in February 1945, Bell Laboratories received a contract for the Nike project. These two missiles became the progenitors of many of the Army's contributions to the application of "rocket science."

While JPL was at the heart of the Army's research in long-range rockets, the Army's fiscal investments were small, late, and disorganized in comparison to the activities of a group of scientists in Germany. Prior to World War II, the German scientists at Peenemuende had the finances and organization to conduct a rapid succession of experiments to perfect weapons (such as the V-2 rocket) capable of delivering a high explosive payload at distances up to 300 kilometers. These scientists created production and engineering facilities designed to manufacture more than 600 V-2 rockets a month by the end of World War II. This feared weapon of war captured the imagination of the world and inspired rocket research worldwide.

Mr. Rocket comes to America

In an attempt to dismantle the Nazi war machine and to prevent the revival of Nazi war potential by the transfer of its economic and industrial capital, the British and U.S. military collaborated in a plan know as Eclipse. This plan implemented the U.S. State Department's Safehaven project, focusing on the nonproliferation of German nuclear weapon expertise. These efforts spawned Project Paperclip, which sought out strategic centers of German scientific knowledge to provide "proper and permanent control" of them in the best interest of "world security." One of the individuals who supervised Project Paperclip was COL H. N. Toftoy (also know as "Mr. Rocket"). It was his relentless pursuit of rocket expertise that brought the Von Braun team to the United States. By May 1948, Project Paperclip had brought 492 German specialists to the United States: 177 with the Army, 205 with the Air Force, 72 with the Navy, and 38 with the Department of Commerce (under Army custody).

With the delivery of 121 German rocket scientists and 300 freight cars of V-2 components to Fort Bliss, Texas, high-altitude scientific experiments and transfer of German rocket expertise began. The German scientists commented just after World War II that the American capabilities in 1945 were approximately 10 years behind the level of German expertise. Over the next few years, 52 V-2 rockets were fired from White Sands Proving Grounds (WSPG) and the Florida Missile Testing Range, the last one on June 28, 1950.

The Army has been a leader in Space research throughout the 20th century as evidenced by numerous technology firsts and capability demonstrations. The Army is now continuing this heritage in the 21st century in accordance with new DoD guidance and emphasis on Space dominance and operations. Space has evolved from a mission of achieving the "high ground" to one of extending power/might and providing global capabilities to the individual Soldier. It will be imperative to protect and secure these Space capabilities for our future national defense needs.

These series of tests helped facilitate the technology transfer of German "know how."

In February 1949, the Bumper Round 5 Missile, fired at WSPG under Von Braun's direction, was the first penetration of Space by a U.S. missile. Project Bumper was a modified V-2 that accommodated a WAC (without attitude control) Corporal (developed by JPL) to test multistage rocket flight and separation. It also tested second-stage ignition in rarefied air. The Bumper test achieved a 250-mile height to make the Army the first to place an object in Space. The Army, working with the Navy, collaborated on a number of upper atmospheric tests and even launched a V-2 from the deck of an aircraft carrier. The Navy was so interested in the upper atmospheric test that it pursued the Viking missile to continue scientific research when the V-2 stockpile was depleted.

On Oct. 28, 1949, the Army's Ordnance Research and Development (R&D) Division at Fort Bliss was transferred to Redstone Arsenal, Ala. At Redstone, the Von Braun team started work on missile improvements conceived at the end of World War II. Building on the Hermes C-1 rocket, it developed what later became known as the Redstone rocket.

On Feb. 1, 1956, the Army established the Army Ballistic Missile Defense Agency (ABMA), to which the Secretary of Army delegated unparalleled procurement authority. ABMA brought together the unprecedented combination of German creativity and U.S. Army ordnance production capabilities. The Von Braun team's unity of purpose allowed ABMA to remain at the forefront of U.S. rocket R&D.

Redstone Arsenal's initial proposal to manufacture the Redstone missile by using its own R&D shops was denied. Because of delays at the contractor's facilities, the Arsenal ended up building the first 12 Redstone missiles as well as missile numbers 18 through 29. This fabrication experience created a virtual "skunk works" that was fully capable of readily modifying the Redstone missile for various configurations and payloads. The Army joined with the Navy to propose launching a satellite with a Redstone missile under Project Orbiter. But in 1955, the government elected to pursue a less military-related effort under project Vanguard. Vanguard was based on using the Navy's Viking missile to boost an upper atmosphere scientific payload. The Navy's Vanguard project was under contract to the Martin Company and funded by National Science Foundation. The Vanguard project, however, was doomed because Martin received a more lucrative Titan missile contract from the Air Force, causing redirection of limited talent and resources.

The Army began work on a 1,500-mile range intermediate range ballistic missile (Jupiter C missile) to support sea and land requirements on Feb. 1, 1956. To pursue the development of the Jupiter C missile, ABMA became a Class II activity. On Aug. 8, 1957, the nose cone of a Jupiter C missile was successfully recovered. The nose cone success is attributed to German scientist creativity and was accomplished on one-tenth of the budget that the Air Force expended under its nose cone research efforts.

The Oct. 4, 1957, launch of the Russian Sputnik I, followed by Sputnik II on Nov. 3, 1957, unleashed the Army's R&D expertise at Redstone Arsenal to launch the first U.S. satellite (Explorer I). A series of Army "first in Space" events unfolded:

· Explorer I was launched on Jan. 31, 1958, as part of the International Geophysical Year. It was a 30.8-pound satellite that carried a cosmic ray detector, a cosmic dust gauge, thermometers, and microlock and minitrack transmitters. This payload led to the discov-

(See Beginnings, page 52)

ery of the Earth's Van Allen radiation belts.

· Explorer II failed to make orbit on March 5, 1958, because of a fourth-stage failure. The satellite carried a cosmic ray counter, an erosion gauge, a thermometer, and microlock and minitrack instrumentation.

· Explorer III was launched on March 26, 1958, and carried a similar payload to Explorer I. However, it also included a miniature tape recorder to record radiation data between ground stations.

· Explorer IV was launched July 26, 1958, and carried four radiation counters. Explorer V failed to make orbit because of a collision between the first stage and upper stages.

ABMA continued to provided launch service to Advanced Research Projects Agency (ARPA) and the National Advisory Committee on Aeronautics (1915-1958 — forerunner to National Aeronautics and Space Administration (NASA)), including the first two lunar probes.

On Aug. 15, 1958, ARPA Order 14-59 initiated the Army's Juno V booster program. This program started what became known as the Saturn booster.

On July 1, 1960, ABMA and its facilities at Redstone Arsenal and Cape Canaveral, Fla., were turned over to NASA. The Army retained work on the Pershing and Nike missile systems as well as the Army Rocket and Guided Missile Agency that became part of the Army's Aviation and Missile Command.

Another Army installation rich in Space history is Camp Evans (near Fort Monmouth, N.J.). On Jan. 10, 1946, scientists working on Project DIANA were the first to bounce radio signals off the Moon. This experience led the Army's Signal Corps and the Signal Research and Development laboratory (SRDL) team (which also received German scientists through Project Paperclip) to become involved with the operation and maintenance of primary tracking and telemetry ground stations of the Vanguard minitrack network. SRDL later helped calibrate the minitrack system by using its Project Diana radar facilities.

The United States was unprepared to track the Sputnik satellite even though the Russians had previously announced the satellite frequency. Fort Monmouth rapidly found equipment through the recapitalization of military receivers and was credited with having provided the backbone of the entire U.S. tracking and observation efforts for Sputnik. This effort became the Signal Corps AstroObservation Center.

The SRDL tracked solar cell development from its beginnings at Bell Laboratories in 1954 and pressed the Navy to include solar cells on the Vanguard satellite.

Space Force Enhancement

While the Army was very much involved in the development of Space support technology, it was also deeply involved in Space force enhancement. Space force enhancement operations improved the warfighting force via Space capabilities. Traditionally, Space force enhancement includes command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR); position/navigation; and meteorological monitoring.

In June 1958, SRDL at Fort Monmouth initiated fabrication of a 150-pound communication satellite to be completed in 60 days under Project SCORE (signal communication by orbiting relay equipment). The ARPA-sponsored project provided for a launch on an Air Force Atlas intercontinental ballistic missile (ICBM). On Dec. 18, 1958, the SCORE satellite was the first to relay, store, and forward human voice and data. The satellite also broadcasted President Eisenhower's Christmas message to the world.

The work on the SCORE satellite generated another sophisticated 500-pound relay communication SRDL satellite named Courier. The first Courier 1A satellite failed to make orbit (Aug. 18, 1960), but the second Courier 1B satellite was placed in low earth orbit on Oct. 4, 1960. It was the first communication satellite to be powered by nickel cadmium batteries and recharged by solar cells. After completing one orbit, it relayed a message from President Eisenhower to the United Nations, transmitted from Fort Monmouth and relayed to Puerto Rico.

The TIROS (television and infrared observation satellite) was launched on April 1, 1960. TIROS evolved from Major General Medaris' "eye in the sky" concept at ABMA. ABMA and the Signal Corps developed the TIROS I and II satellites and Fort Monmouth provided satellite control and ground stations for the TIROS satellites. NASA directed the overall operational phase after ARPA sponsorship was transferred.

The Army Advent Management Agency had the lead for communication satellite development under ARPA's Project Advent. The Army was the lead in the development of ground stations and payloads, the Navy was lead on shipboard terminals, and the Air Force was responsible for launch. After a year, the Air Force was successfully able to argue that satellites were part of its mission and the Army responsibilities were reduced to ground terminals and ground support. In 1962, the Army established the U.S. Army Satellite Communications Agency.

The Army developed most of the ground stations and payload control for the SYNCOM III satellites. From 1964 to 1969, the U.S. Army Corps of Engineers pioneered the development of a series of very accurate geodetic satellites named SECOR (sequential collation of range), which related local map data to a global grid. Position errors were less than 10 meters and it had similar techniques as today's global positioning system to deal with ionospheric diffraction.

In the early seventies, the Nixon administration revised DoD Directive 5160.32 to allow each Service to conduct Space R&D for "unique battlefield and ocean surveillance navigation, communication, meteorological, mapping, chart-

ing, and geodesy satellites." This allowed the Army and Navy to once again start investigating and exploiting Space capabilities.

During this time, the national strategic Space systems were providing capabilities used by the national decision makers and strategic planners. The tactical user had no, or at best very limited, information from the national Space systems. The Army established the Army Space Program Office (ASPO) in 1973 to rectify this deficiency. ASPO developed means to rapidly exploit national Space information in theater and link this product to tactical users.

The Assistant Secretary of the Army requested that a technology manager of Space R&D programs be established to provide an internal and external focus to the Army. The Army Space Technology and Research Office (ASTRO) was created on Jan. 6, 1988, to fill this role. The ASTRO mission was later transferred to the U.S. Army Space and Missile Defense Command (SMDC) to consolidate Space-related activities in the Army. ASTRO efforts later became the Space Application Technology Program.

The Army Space Institute under the direction of Vice Chief of Staff General Thurman initiated what became the Army Space Exploitation Demonstration Program (ASEDP) to be executed by U.S. Army Space Command (ARSPACE). ASEDP was able to demonstrate multiple Space exploitation capabilities and research opportunities for the Army. ASEDP maintained a close relationship to SATP within SMDC.

Space Control

Space control, defined as ensuring the freedom of action in Space for the United States and its allies while denying the enemy the use of Space, is another area where the Army has a long history of significant contributions. When the Russians threatened the West with an orbital H-bomb on Aug. 9, 1961, all three Services initiated R&D efforts.

The Army's program, codenamed Mudflap, was based upon the Nike missile. The missile's capabilities were extended via antiballistic missile (ABM) research to a Nike Zeus configuration. In May 1962, the U.S. Army fielded the first operational anti-satellite weapon (ASAT) base at the Kwajalein Missile Range (KMR). After an ASAT policy meeting in June 1963, the Army was directed to complete the ASAT facilities at KMR, including storage of the system's nuclear warheads. In 1966 the program was phased out.

In the late 1980s, the Army initiated a new R&D program with a kinetic energy (KE) ASAT system leveraging ongoing ABM development exoatmospheric re-entry-vehicle interceptor system. But by the mid-1990s, with the fall of the iron curtain, the requirement for KE ASAT no longer existed.

The Army conducted a series of data collection exercises in the late 1990s using the mid-infrared advanced chemical laser at the High Energy Laser Test Facility at White Sands Missile Range, N.M., on cooperative Space targets.

The Army is now investigating nondestructive technologies to secure Space superiority for its future forces.

Space Application

Space application is the fourth key area in which the Army has a rich history of making significant contributions. Space application describes the projection of force (i.e., intercontinental ballistic missiles) and defense from, through, and in the Space environment. Accordingly, almost all established Space launch capabilities in the area of Space application trace their beginnings to the nuclear missile arms race.

Besides the missile developments conducted at Redstone Arsenal, reentry-vehicle development was also pursued. The Army flew the successful nose cone test on May 15, 1957, with only one-tenth of the budget of the Air Force. On Aug. 8, 1957, a nose cone was recovered and later displayed by President Eisenhower to demonstrate that Army scientists had successfully solved the problems associated with ballistic missile re-entry.

The work of the Army also led the Services in missile defense. Through the 1960s, the Nike family of missiles evolved with ever-greater capabilities (Nike, Nike Zeus, and Nike X). The Sentinel system had two nuclear-tipped missiles: the Spartan was exoatmospheric and the Sprint was endoatmospheric. Also during the 1960s, the Nixon administration reformulated the ABM mission and renamed it Safeguard. Safeguard was operational less than a year when Congress closed the program in accordance with the ABM Treaty. ABM activities were limited to research by the Army Ballistic Missile Defense Agency. The ABM mission was transferred to the Strategic Defense Initiative Organization (SDIO) in 1985. The Army still actively conducts missile research and its current customer is the Missile Defense Agency, SDIO's successor organization.

Conclusion

The Army has been a leader in Space research throughout the 20th century as evidenced by numerous technology firsts and capability demonstrations. The Army is now continuing this heritage in the 21st century in accordance with new DoD guidance and emphasis on Space dominance and operations. Space has evolved from a mission

of achieving the "high ground" to one of extending power/might and providing global capabilities to the individual Soldier. It will be imperative to protect and secure these Space capabilities for our future national defense needs. The battlefield has already been transformed by Space capabilities such as satellite communications and GPS. The future battlefield will continue to change as new Army-developed technologies are applied to Space and provide capability to both the National Command Authorities and to the warfighter.

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Space Soldiers in Action

l-r, CPT Bob Barrett, SGT Sabrinna Bannister, SSG Greg Singer, and CPT Angela Johnson set up a dish that provided Space support to the 1st Marine Expeditionary Force during Operation Iraqi Freedom.
Photo by MAJ Daniel Cockerham

Seeds of a Soldier

The true story of Edgar Allan Poe — the Sergeant Major

By Michael L. Howard

Author's Note

The catalyst for this article came in a lone picture and caption printed in an NCO history book written by Earnest J. Fisher Jr. There is no mention of Edgar Allan Poe in the book's text, only a reproduced portrait and statement that Poe was a sergeant major.

The thought of Poe walking through his regiment in 1829 while officers and enlisted men said "Good morning Sergeant Major" stirred a boyish interest. Questions: 1) Was Poe's court martial at West Point an accurate and complete indication of his soldiering and leadership abilities? 2) What circumstances led to Poe reaching regimental sergeant major in less than two years? 3) Are there similarities between qualities he possessed then and those required now that tell a story in the development of soldiers, NCOs and sergeants major?

The photo in Fisher's book led to a West Point library publication by J. Thomas Russell that briefly told Poe's military history prior to his becoming a cadet. His bibliography introduced Melvin C. Helfers' 1949 unpublished dissertation at Duke University. Collectively, these sources led to biographies which collectively shed light on Poe's Army life. Helfers' dissertation provided invaluable information and original conclusions on Poe's military career. His work included what appears to be a complete bibliography on the subject and, in many cases, included copies of original handwritten letters and documents for review.

Edgar Allan Poe wore U.S. Army sergeant major stripes. Using the name Edgar A. Perry, Poe enlisted in the U.S. Army on May 26, 1827. Poe climbed from private to regimental sergeant major of the 1st Artillery Regiment, promoted on Jan. 1, 1829. He served nearly two years of a five-year enlistment before the Army discharged Poe April 15, 1829, so that he could begin a yearlong effort to attend the Military Academy at West Point, N.Y. He began his studies at the Military Academy on July 1, 1830. The Academy dismissed him March 6, 1831, after a court martial for neglecting duties and disobeying orders.

But is this failure to ultimately succeed at the Academy an accurate portrayal of Poe's military performance? His later notoriety as a writer makes him a revealing example of an early-day sergeant major and soldier. While many people may disregard Poe's Army experience, letters from his officers he worked for and from Poe himself imply something very different. Even circumstances leading to his dismissal from the Academy indicate deep personal conflict with his foster father — circumstances which had led him to enlisting in the first place — more as the root of his problems than with discipline, academics or military life. In fact, there are indicators that Poe's performance as an enlisted man contains similar traits to those expected of modern day NCOs and Soldiers.

Army documents show that, along with faking his name, Poe claimed to be a 21-year-old clerk from Boston when, in fact, he clerked in Virginia and was 18. Little is known about Poe's enlisted days, but a critical look at his circumstances and actions before and while serving in the Army provide an interesting perspective on the forming of today's modern-day soldier.

The Army assigned Poe to Company H, 1st Artillery Regiment, at Fort Independence, Mass. A malaria outbreak caused the Army to move Poe's unit to Fort Moultrie, S.C., in October 1827 and to Fort Monroe, Va., one year later. Poe's unit was one of 51 artillery companies in four artillery regiments placed at 30 sites along the East Coast during this timeframe. Except for briefly in 1828, Company H and the regimental headquarters were co-located throughout the moves. Colonel James House, the regiment's second commander, was in command of Fort Monroe when he promoted Poe to be the sixth regimental sergeant major since the unit formed in 1821.

Poe's role as sergeant major was probably very similar to that established in William Duane's Handbook of Infantry, which the Army used as its official regulation at the time. In this 1812 handbook, Duane established that the sergeant major owned the responsibility to "conduce ... discipline." He also gave sergeants major "charge of sergeants, corporals, privates and musicians ... ." Most notably, though, Duane established that a sergeant major "should be a complete master of all exercises of the battalion from the first drill to the movements in line of battle." The origin of the sergeant major rank goes to 1775 when General George Washington included the sergeant major position in organization tables of battalion and regimental headquarters.

Poe's reasons for enlisting appear similar to those of soldiers throughout the years. For Poe, he had no money, job, marketable skill, or college diploma, and mostly, a strained relationship with his adoptive father. Gaining favor in the eyes of John and Francis Allan probably provided additional motivation for Poe to ultimately succeed. Poe's biological father disappeared when Edgar was

(See Seeds, page 56)

Recommendations for topics or submissions for the Historical feature segment of the Army Space Journal are welcomed and encouraged. Submission may be sent to the Managing Editor via email to richard.burks@arspace.army.mil

Seeds ... from Page 60

3 years old. The Allans took Poe in under their care after his mother died the following year — this accounts for the "Allan" part of his name. Francis Allan raised Poe as a "Southern Gentleman." This lifestyle led Poe to be financially dependent on his new parents. John Allan, though, appeared reluctant to provide that support when Poe went off to college. Arguments with John Allan eventually led Poe to leave home and join the Army. John Allan was upset with Poe over $2,500 in extra expenses during Poe's brief attendance at the University of Virginia. Poe said the money was needed to maintain the same standard lifestyle as his classmates while the elder claimed the money was needed to pay gambling debts. In any case, Poe came home from college and John Allan put him to work in the family store. They could not settle the dispute, so eventually Poe left home for Boston.

Edgar Allan Poe

Another factor in Poe's enlistment was Poe's interest in literature and initial failure as a writer. Poe possibly took on the name Perry with the Army to hide from the embarrassment of being an enlisted man. Or he simply wanted a new identity and personality. There are indicators that Poe wanted to show his parents that he could succeed without their support or influence. Until his death in 1849, Poe made up and maintained elaborate stories of living in Russia and elsewhere during the timeframe covering his enlistment. The public accepted these until biographers checked with the War Department and discovered the "Perry" connection. Prior to enlisting, Poe used the pseudonym "Henri le Rennet" and published his first book under the byline "A Bostonian." The book, *Tamerlane and Other Poems*, appeared in print around the time he enlisted. The book ultimately failed and, since he invested his own money to publish it, Poe likely entered the Army without money or any other place to go.

Poe's natural military inclination probably combined with these factors to lead him into enlisting. "General" David Poe, Poe's grandfather, served under Washington as a quartermaster officer in the Revolutionary War. As a 15-year-old, the junior Poe showed his interest in the Army by becoming second-in-command as a lieutenant in the Junior Morgan Volunteers. The unit formed in Richmond, Va., to serve as honor guard for General Marquis de Lafayette's October 1824 visit. It appears this interest continued, because he joined the cadet company and volunteered for military drill classes while attending the University of Virginia.

Many Poe biographers portray his military life in degrees of his own dissatisfaction and as a clear mismatch to his actual character. Even the most critical writers describe Poe's performance in terms such as "successful," "prospered," "distinguished himself," "pleased his superiors" and promoted to sergeant major "for merit." Another writer on Poe even gave him a backhanded compliment by saying that Poe's making rank showed that he was not a "dipsomaniac" — alcoholic — at this point in his life. But Poe's own words may be most revealing: "... . My desire is for the present to be freed from the Army — since I have been in it, my character is one that will bear scrutiny and has merited the esteem of my officers — but I have accomplished my own ends — and I wish to be gone." He wrote that to John Allan in a letter dated Dec. 22, 1828.

Poe's achievements show a clear drive for success. Because of the enlisted structure then, it is difficult to establish Poe's actual position in Company H when House selected him from the regiment's nearly 500 authorized enlisted men to become his sergeant major. Artillery regiments did not have first sergeants in those days, so there was no clear career path to sergeant major as there is today. We do know that Poe rose to the rank of "artificer" within his first year, promoted on May 1, 1828. This rank was actually a special ranking reserved for expert artillerymen who prepared and oversaw the company's ammunition supply. This appears to have been a natural progression since Poe had both artillery and quartermaster skills. His promotion to artificer made him at least the 11th ranking enlisted soldier, outranking nearly 400 regimental privates in the unit at the time. Poe's salary as an artificer was $10 a month, one dollar more than what he would get as a sergeant major.

Another aspect of Poe's Army behavior matches positive observations about his performance. As an artificer, Poe apparently established relationships of trust and respect. A sign of this is seen in Poe writing to John Allan on Dec. 1, 1828. This was his first letter written home since enlisting in the Army. The letter indicates that Poe admitted to Lieutenant Joshua Howard, his company commander, that he had falsified his enlistment documents. Poe seemed to be seeking Howard's assistance in gaining a discharge by telling him that arguments with John Allan led to his enlistment. It appears Howard took on a mentoring role as he told Poe to first reconcile with John Allan. Howard introduced Poe to House so they could discuss the discharge and, on Dec. 20, 1828, House reassigned Poe to the regiment's headquarters for duty in the adjutant's office.

Because a commander had complete authority in choosing his sergeant major, it is unknown why House "unexpectedly" chose Poe as sergeant major a short time after meeting him. Poe himself wrote that House knew him only as a soldier in the

regiment before their meeting. Poe reported that he and House had discussed his grandfather. Descriptions of House show he was a student of literature and, from that, may have chosen Poe because they had similar interests. House was probably also familiar with Poe's grandfather. The elder Poe was a popular quartermaster officer who, although he was actually a major, people referred to as "General" because he spent his own money to purchase supplies for his soldiers during the American Revolution.

Traits of Poe's people and leadership skills as a soldier can also be seen during this timeframe as he reunited with his family, came clean with the Army, and worked to find his place in the Army. Poe developed relationships based upon apparent hard work, honesty, trust, and mentorship with his officers. He was able to do that despite entering the Army using false information. If House's intent in promoting Poe was to encourage him to remain in the Army, it is possible the strategy briefly worked. In December 1828, Lieutenant Colonel William J. Worth, (later the famous General Worth for whom Fort Worth, Texas, is named) returned to the regiment from his job at the Military Academy as the commandant of cadets. He had a great deal of influence on Poe.

Needing to show Howard proof that he and John Allan had reconciled, Poe informed his parents that he had spent the last 18 months in the Army. John Allan responded indirectly that Poe should stay in the Army, so Poe eventually shifted by stating he wanted a discharge so that he could apply to West Point. Whether it was the idea of Poe going to West Point or the fact that Francis Allan died in February 1829 and John Allan felt some sympathy for Poe, John Allan requested that the Army grant Poe a discharge.

After Poe left the Army in April 1829, he began a successful yearlong lobbying effort, asking then Secretary of War John Eaton for a class seat. Armed with letters of recommendation from Worth and other officers, John Allan, and Virginia politicians, Poe gained a cadet appointment from President Andrew Jackson. Worth's example of swiftly rising from private to lieutenant in 1813 was probably the genesis of an idea that gave Poe an incorrect view of his upcoming Academy time. Poe believed his enlisted training would help him receive a commission within six months at West Point. He later learned he'd need to attend the entire four years.

Most symbolic of Poe's ability to influence was his final act of shaping both his military and personal futures. Poe excelled as a "model cadet," ranking third in French and 17th in math while recording no disciplinary problems from July 1830 to January 1831. In the end, it was his failed relationship with his father — the same factor that led him to the Army — that caused him to leave the Army. Two critical events made Poe realize he would never retrieve his relationship with John Allan. First, Poe insulted John Allan over some rekindled money issues and, second, John Allan took Poe out of the family inheritance. Poe told John Allan in one of his final letters to his father that he would get out of West Point with or without the elder's permission. Poe then purposely set out to gain a discharge. Poe's last efforts ironically ensured the relationship's end.

That is Poe. And, in Poe, we find seeds of today's soldier and Army.

Allan died in 1834, and is only remembered for his relationship to Poe. And, while the name of Regimental Sergeant Major Edgar A. Perry (Poe) is perhaps familiar only to military history and literature buffs, Poe's successes and failures are intrinsic to the fact that the name Edgar Allen Poe resonates to this day.

Many criticisms exist among Poe biographers. Maybe Poe received a gratuitous promotion to sergeant major to add dignity similar to the way people promoted Poe's grandfather to "general" years earlier. Maybe Poe used whatever means to get out of the Army because he despised it and was bored with it. Motives and exact circumstances are unknown. Comparing Poe as a soldier to a soldier of today is tough. Poe's superiors, though, clearly recognized desired traits. He was intelligent, influential, resourceful, driven for success — an apparent standout. He also mastered basic soldier traits at the time.

One undisputed fact does remain. Poe outranked more than 400 regimental soldiers when the U.S. Army promoted him to its highest enlisted rank nearly 175 years ago. His failures — in his personal life with his father, and at West Point — do not change this fact.

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Space Notes

A new section in the Journal is introduced in this issue. "Space Notes" excerpts professional articles of interest to Space professionals. The section will attempt to present a broad spectrum of newsworthy items, with references to the full article for those who wish to read further. *Suggestions and submissions for this section are solicited, and should be forwarded to the Managing Editor at richard.burks@arspace.army.mil.*

IFF Systems Needed To Complement Blue Force Tracking, Officials Say

By Nick Jonson, Aerospace Daily, October 22, 2003

More Blue Force tracking units will have to be deployed with ground forces for the system to be completely effective, a panel of military leaders told members of Congress Oct. 20. Vehicles equipped with Blue Force tracking systems also need to have a complementary identification friend or foe (IFF) system to guard against friendly fire, the officials said. Testifying before the House Armed Services' subcommittee on Terrorism, Unconventional Threats & Capabilities, Army Lt. Gen. William Wallace said the Blue Force tracking system "performed very well" in Iraq. But due to the number of systems deployed, battle commanders could only "see" the location of units, not individual vehicles, Wallace said. If a system malfunctioned, determining the unit's location and identity could be difficult, he said.

U.S. General Sees Space as Future Battlefield

By Tabassum Zakaria, New Orleans, MSNBC.com, October 16, 2003

Space may become a war zone in the not-too-distant future, a senior U.S. military officer said Wednesday, hours after China became only the third country after the United States and former Soviet Union to put a man in Space. "In my view it will not be long before Space becomes a battleground," Lt. Gen. Edward Anderson, deputy commander of U.S. Northern Command, said in response to a question at a geospatial intelligence conference here. The United States operates spy satellites in Space. Earlier in the day, Rich Haver, former special assistant for intelligence to Defense Secretary Donald Rumsfeld, said he expected battles in Space within the next two decades. "I believe Space is the place we will fight in the next 20 years," said Haver, now vice president for intelligence strategy at Northrop Grumman Mission Systems. "There are executive orders that say we don't want to do that. There's been a long-standing U.S. policy to try to keep Space a peaceful place, but ... we have in Space assets absolutely essential to the conduct of our military operations, absolutely essential to our national security. They have been there for many years," he said. Responding to a question about the implications of China sending a man into Space this week, Haver said: "I think the Chinese are telling us they're there, and I think if we ever wind up in a confrontation again with any one of the major powers who has a Space capability we will find Space is a battleground." Haver added that he was not implying that China was the next great competitor or enemy of the United States.

Plan For Space-Based Radar To Ensure Joint Commanders Have Access

By Anne Plummer, Inside the Army, October 27, 2003

The Pentagon's plan to build a Space-Based Radar system is on track to ensure theater commanders will have access to the future satellite constellation when they need it, defense officials tell Inside the Army. SBR is envisioned as the first Space-based intelligence, surveillance, and reconnaissance (ISR) system that will meet the needs of both theater- and national-level users. On Sept. 29, the Joint Requirements Oversight Council agreed that the constellation of radar satellites should provide a "dynamic tasking capability" that will give priority access to any user whose needs are most urgent at the time. In other words, Defense Department requirements for the system now stipulate that officials must be able to change the path of SBR satellites to accommodate a theater commander or other user who might request specific ISR data. The move is considered a win for the joint commander, according to one defense official.

Next Test Of GMD System Delayed, MDA Says

By Marc Selinger, Aerospace Daily, October 24, 2003

The next test of the Ground-based Midcourse Defense (GMD) system has been delayed, according to the Missile Defense Agency.

The test, the first launch of the Lockheed Martin interceptor booster, already had been postponed from September to October and will now likely take place during the last two weeks of November, MDA spokesman Rick Lehner said Oct. 23.

Lehner attributed the two-month delay in Booster Verification-5 (BV-5) to Lockheed Martin's desire to do more ground testing of components and subcomponents, and to the need to carefully document work done on the booster. GMD program officials are eager to avoid repeating testing problems that occurred with its old booster, which twice failed to separate from the interceptor's exoatmospheric kill vehicle (EKV). MDA is developing two new interceptor boosters for GMD. The Orbital Sciences booster had a successful first launch test, BV-6, in August (DAILY, Aug. 19). Tests involving simulated and actual intercept attempts are expected to occur in 2004. Despite the delay in BV-5, the Defense Department still plans to begin fielding GMD in September 2004.

Weather Intelligence High-fidelity weather-sat sensors will enhance forecasts, improve combat mission planning

By William B. Scott, Denver, Aviation Week & Space Technology, November 10, 2003

Next-generation weather satellites will give military commanders a wealth of "environmental intelligence," significantly improving effectiveness of tactical operations that often hinge on the quality of forecasts. Pentagon planners already are altering their concepts-of-operation and battlefield strategies to maximize the impacts of advanced weather spacecraft now in development. Air, sea, and land forces have always depended on accurate forecasts of cloud cover, storms and winds, but visible-light imagers, infrared sensors and microwave sounders flying on NASA's Terra and Aqua satellites have taken "weather" beyond basic atmospheric phenomena. Operations in Afghanistan and Iraq were highly dependent on weather "knowledge" gleaned from data acquired by NASA's environment-monitoring satellites. And military commanders were quick to recognize the impact of advanced sensor systems on these spacecraft — and take advantage of them. "In the first three months of (the war on terrorism), 15 percent of the targets ... and 30 percent of the weapons were changed as a result of what the weatherman said," Brig. Gen. David L. Johnson, Pentagon's director of weather operations, noted last December. But the next generation of joint civil-military spacecraft will "allow military users to go from coping with weather to exploiting it for tactical and strategic purposes," according to a Northrop Grumman official. To that end, Northrop Grumman and Raytheon are developing the National Polar-orbiting Operational Environmental Satellite System (NPOESS), a constellation of low-Earth satellites and a ground data network that will replace aging civil and military systems.

U.S. Monopoly On Satellites To End

By Anthony Browne, in Brussels, London Times, October 30, 2003

China will today formally join forces with the European Union to put an end to an American monopoly on one of the world's most commercially, strategically and militarily important technologies: satellite navigation. China is investing €200 million (£140 million) and pledging scientific co-operation with the Galileo space project, which rivals America's Global Positioning System (GPS), the technological foundation stone of its global military dominance. China has set up a research center dedicated to help develop Galileo, which should by operational by 2008. Russia, India and Japan are also thought to want to join the Galileo project. Galileo, which will be based on 30 satellites circling the globe, should be more technically advanced than the American system, with greater accuracy. It will allow users such as tankers, tractors, lorries, ambulances and motorists to fix their position to within just one meter, against ten meters for the U.S. system. The U.S. is developing a new version, GPS-M, which will be as advanced as Galileo, but which will not be operational until 2012. It has opposed the establishment of a rival system and its satellite-guided missiles, bombs and jets would be impossible to use without GPS.

Boeing Awarded $147 Million to Build Next Three GPS IIF Satellites First IIF launch planned for mid-2006

By Hampton Stephens, Inside the Air Force, November 7, 2003

The Air Force has awarded a $147 million contract to Boeing to produce three more Global Positioning System IIF satellites, the Defense Department announced last week. The contract, announced Oct. 31, authorizes production of satellites four through six of the 12 planned GPS IIF Space vehicles. The IIF satellites will add new capabilities to the GPS constellation, including new signals for military and civilian use and up to 10 decibels of additional power to specific signals for protection against jamming. The GPS satellites now on orbit are a mixture of blocks I, IIA and IIR spacecraft. Lockheed Martin has built 21 IIR satellites for DoD and 10 of those are now on orbit, according to the company.

(See Space Notes, page 55)

Space Notes ... from Page 59

Troubled SBIRS High Program to Undergo Broad Review, Again GAO warns of further cost overrun risks

By Elizabeth Rees, Inside the Air Force, November 7, 2003

The Pentagon's troubled next-generation Space-based early missile warning program will once again undergo a broad review, the Defense Department says. The statement comes in response to a recent government audit warning that the Space-Based Infrared System High is still at risk of dramatic cost and schedule overruns despite a program restructure just last year. The SBIRS program began in 1996 with the goal of improving long-range ballistic missile detection capabilities over those of the current system now on orbit, the Defense Support System. SBIRS is divided into two architectures indicating the orbiting altitude of the Space-based elements — "High" and "Low." In the fall of 2001, SBIRS Low management was transferred from the Air Force to the Missile Defense Agency, where it has had its fair share of cost overruns and program delays. MDA has renamed the program the Space Tracking and Surveillance System. Meanwhile, SBIRS High has been under intense scrutiny since 2001, when officials disclosed they were about $2 billion over budget. The overrun prompted a two-year delay in the launch of its satellites. SBIRS High was originally slated for fielding in 2004; the constellation will consist of four satellites and the Air Force is procuring a launch-ready spare. The Defense Department convened an independent review team to unearth the budget problems and recommend program reforms. Based on the review, the Air Force restructured the program last year to provide contract incentives and various oversight measures.

Officials Eye Datalink, GPS Capabilities For Future AMRAAM Variant

By Elizabeth Rees, Inside Defense, October 31, 2003

As full operational testing for the latest variant of the Advanced Medium-Range Air-to-Air Missile draws near, the Air Force is crafting plans to integrate datalink and Global Positioning System guidance capabilities for the future version of the AMRAAM, further improving its range and accuracy, according to program officials. Both the Navy and the Air Force use AMRAAM. AMRAAM is currently guided to its target with a seeker and inertial reference unit. Future variants of the missile will house a combined Global Positioning System/inertial measurement unit to replace the baseline AMRAAM inertial reference unit, thus improving accuracy at longer ranges, according to program officials.

Satellite Security Systems Demonstrates Shut Down of Tanker Truck Via Satellite Communications

San Diego, SpatialNews.com Release, November 3, 2003

Satellite Security Systems (S3), a global provider of asset security and logistics control, in cooperation with the California Highway Patrol (CHP) and InterState Oil Company, dramatically demonstrated the first wireless remote shutdown of a fully loaded moving petrochemical tanker truck. From S3's headquarters in San Diego — 530 miles from the demonstration site — satellite communications were used to disable the truck in seconds, proving S3's GlobalGuard(TM) and FleetGuard(TM) a viable solution to the challenge of controlling rogue hazardous waste vehicles that could pose a threat to homeland security. The event, conducted on CHP Academy grounds in Sacramento and administered by the CHP, addresses ongoing concerns about the affordability of effective security technology, stealthiness of such a security device, and how GPS monitoring can be incorporated safely into law enforcement protocol. The need to secure trucks carrying hazardous waste or petrochemical products is of paramount concern to trucking companies, California Independent Oil Marketing Association (CIOMA) members, and State and Federal departments. While the California state government may be voting as early as January on Assembly Bill (AB) 575 (requiring truck disabling devices, global positioning or other "location reporting systems" on hazardous material haulers), the CHP has been tasked with researching various technologies to support these regulatory initiatives.

MDA Delays Next Missile Defense Intercept Test To Spring '04

By Sharon Weinberger, Defense Daily, October 31, 2003

The next full intercept test of the Pentagon's Ground-Based Midcourse Defense (GMD) system will take place in spring of next year, rather than the end of this year as originally planned, according to a spokesman for the Missile Defense Agency (MDA). Integrated Flight Test-14, or IFT-14, will take place "in the spring time," Rick Lehner, spokesman for the MDA told Defense Daily. The change in schedule was made so that MDA could eventually choose between the two boosters under development by Orbital Sciences and Lockheed Martin, which have not been tested yet from Ronald Reagan Flight Test Facility on Kwajalein Atoll in the Pacific. IFT-14 was originally planned as a fully integrated flight test with an intercept set to take place later this year. In that test, the booster, either the one designed by Lockheed Martin or Orbital, would fly out of Kwajalein. In addition, the production kill vehicle, which is built by Raytheon, will be used in that test. MDA may decide to use the Orbital booster "because that is the one furthest along," Lehner said. A final decision on which booster to use will be made by the BMD program office in Huntsville, Ala. IFT-14 will be the first test of the booster — other than the surrogate used in previous flight test — designed specifically for the BMD system. Orbital's GMD boost vehicle is a three-stage system based on hardware that has flown 45 times on missions carried out by the company's Pegasus, Taurus and Minotaur space launch vehicles. The other booster design now being developed by Lockheed Martin for the GMD program is slated to make a similar test launch from Vandenberg in December.


Strategic Wing Tactical Saucer
Atomic Era City Defender: Nike Hercules
Night Firing
Flying Spy: Future Army Jet Drone
Night Reconnaissance
Revolution in Future Flight:
The Tilt-Wing Plane

from the eyes of THE PAST

In 1958, LTC Robert B. Rigg, an Army artist, donated a series of paintings to the Office of the Chief of Military History. In his letter transferring ownership of the artwork, Rigg described his works:

"Eleven paintings of this series represent current Army research and development projects — current history in the making. General James M. Gavin, former Chief of Research and Development, suggested this series and I have painted them in pastels in an effort to lend dramatic character and color to the machines under development for any war of tomorrow."

The original titles and descriptions provide some insight into the artist's thoughts. Riggs did not provide additional comments beyond titling one of the paintings as Night Firing.

ATOMIC FIREPOWER AND AERIAL ASSAULT CRAFT — Concept of aerial and ground vehicles ready to exploit the effects of an atomic blast.

FUTURE ARMOR POWER TO EXPLOIT NUCLEAR FIREPOWER — The Army's T-92 light tank — a prototype vehicle undergoing engineering tests at Aberdeen Proving Ground, 1958.

AERIAL ASSAULT VEHICLE — Concept of a Sky-Cavalry vehicle under combat development in 1958 to provide 3-D means of attach for the Pentomic Army.

FLYING SPY: FUTURE ARMY JET DRONE — A concept of unmanned, remote-controlled drone — a 1958 R&D project to provide drones to accomplish: battlefield surveillance, target spotting, nuclear fallout monitoring, radiation detection, countermeasures control, and tactical reconnaissance.

REVOLUTION IN FUTURE FLIGHT: THE TILT WING PLANE — The first tilt-wing plane, the Vertol 76, is turbine powered. Funded by the Army and developed in cooperation with U.S. Naval Research, it is expected to achieve flight conversion in 1958.

STRATEGIC WING-TACTICAL SAUCER — A 1958 concept of a flying wing to carry tactical flying saucers into combat action a possible substitute for the parachute used by airborne troops.

BREAKING TRADITIONAL TERRAIN BARRIERS — Army R&D is in quest of a flying crane, which can carry payloads of up to 12 tons for distances of 50 miles, and lift small armored vehicles over rivers and other terrain barriers. One 1958 concept is the Hiller duct-fan type crane.

NIGHT RECONNAISSANCE — Air Cavalry's flying jeeps of the future will shoot to obtain information. A ducted-fan aerial jeep of this type undergoing Army development — 1958.

Chief Scientist Speaks of the Future

Interview with Dr. Thomas Killion

Dr. Thomas H. Killion is the Acting Deputy Assistant Secretary for Research and Technology/Chief Scientist, responsible for the Army Science and Technology program. Prior to this designation, Dr. Killion served as the Director for Technology in the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology under the Deputy ASA for Research and Technology. In this position, he was responsible for oversight and coordination for the majority of the Army's Applied Research program and all of its Advanced Development program. He also co-chaired the Warfighter Technical Council and managed the Science and Technology Objective and Advanced Technology Demonstration approval process for the DAS(R&T). These and other outstanding credentials made him an obvious choice for ASJ to interview about the future of Space technology. He spoke by phone from the Pentagon to ASJ's MAJ Laura Kenney on that topic.

Q: From hot air balloons used during the Civil War for aerial surveillance, to satellites providing similar benefits today — Space has been a combat multiplier since its inception. How important a role do you see it playing in current operations?

A: Immense. Bringing technology to bear that we've invested on in the past, we see the results in widely used space technology today. For example, people invested in basic research in the atomic clock 50 years ago that led to high precision timing. The Global Positioning Satellite system that we use to geo-locate vehicles, people, and targets today is based on that research.

As far as current applications, in addition to using GPS for navigation and precision targeting, there is of course the traditional intelligence function, such as imaging, which maps out terrain, infrastructure and forces, allowing us to plan efficiently and effectively in the application of our force capabilities. As usual, that has been critical.

In communications, Space is absolutely essential, allowing us to remain in constant contact, both in theater and back to the U.S., using both military and commercial assets.

Less obvious, but just as important, is how we utilize Space in the field of meteorology. The Army has invested a lot of resources in learning how best to exploit technology under varying weather conditions and to use that knowledge to guide our use of sensors and weapons.

Q: In future operations?

A: I don't see the importance of any of the above diminishing; in fact I only see it increasing.

In communications, limitations we've had in the past have been infrastructure for Space-based comms, such as fairly large tracking antennas. Electronically scanning antennas will enable us to export low profile satellite communications technology down to the much lower levels.

For intelligence — advances in miniaturization of processing, enabling high capacity laptops and even advanced Personal Digital Assistants (PDAs), can literally put imagery and other intelligence information in the hands of the individual soldier. Very Dick Tracy.

Meteorology has seen tremendous advances in the modeling domain. We're already performing pretty well at large scale … I see us in the future getting better at providing high resolution local data… small scale right down to where the soldier is, enabling him to maximize and take advantage of those weather conditions from an operational sense.

Navigation tools will also advance significantly due to miniaturization; we've already got amazing

handheld systems.

Q: In what particular area do you see it as most valuable — communications, intelligence, weaponry? Why?

A: I don't see any single one as the most valuable; rather I see a convergence of functions over time — a synergy of improvements in each area. Imagine a weapon that, in addition to performing as a weapon hitting a target, simultaneously feeds us intelligence on the target area. Communicating back to us intelligence and navigational information on the terrain, target and weather — all this in a single system. Advancements in terms of communications have sped up such concepts as using an artillery shell as an intelligence-gathering device. It expands the envelope of data sources available to the networked force.

Q: What are drawbacks/showstoppers, if any, to integrating and utilizing Space in such ways?

A: I'd use the term challenges rather than drawback or showstopper. The first such challenge is bandwidth, simply put. Our capabilities are expanding faster than the bandwidth available. We're answering that in various ways: being smarter in terms of data distribution (minimizing the load on the network), real-time bandwidth management, dynamically matching information demands to available bandwidth, and using more efficient antennas (such as directional vs. omni-directional systems). So we're working hard to meet that challenge, to ensure the warfighters have access to the information they need.

Another challenge is making sure that the information we receive from these great assets is accurate, that any adversary is not deceiving the system into believing inaccurate info (similar to how meaconing in navigation systems causes location errors). We need to prevent intrusion, deception or disruption and we're also addressing that through techniques that maximize, maintain and improve the integrity of our access to Space assets.

Q: Science fiction writers and artists — notably Jules Verne and Leonardo da Vinci — conceived of ways to exploit Space decades, even centuries, before such usage became reality. Do you believe such exponential development to be still possible, or are there already visible limits set by the laws of physics, etc. Will there be changes as exponential as we've seen this century, in twenty years? In fifty?

A: The short answer is yes — the changes will be exponential. To expound, a noted futurist, Ray Kurzweil, has postulated that advances in scientific knowledge and technology accelerate in an exponential manner. He believes that the explosion we have seen in technology in the last couple of decades is but a harbinger of what is to come.

Kurzweil believes that we will explore Space further, but probably through robots. He believes that there will come a time when, due to the expansion of computer processing, it will rival human intelligence. Nano probes to network and map the human brain could theoretically allow us to download an individual's intelligence. It would then be reasonable to send that intelligence into Space to explore for us, where perhaps our more fragile biological systems could not endure. We could then explore Space virtually. All of this is theoretical or speculation, but I do believe we will see changes as startling and profound in our future as we have seen in our past.

Q: Can you give us an unclassified view of some Space technology under research and/or development currently?

A: The Army's S&T investment in Space focuses on the tools that we use to exploit the communications, navigation and intelligence information available to us from Space systems, rather than on the satellite systems themselves. Again, the rapid advances in miniaturization of technology play a large role in current development. One example of what we're currently working on is shrinking an Inertial Measurement Unit — used in navigation — to a fraction of its current volume. Using micro-electro-mechanical systems (MEMS) technology, the goal is to provide a low cost device for munitions that provides adequate accuracy and much lower volume so it can be used in even very small munitions, greatly increasing their precision. Where Space technology comes in is that we are also looking at integrating GPS into the system to provide real time location updates in-flight, further increasing the accuracy of the weapon.

A couple of other relevant technology efforts are the work on satellite communications antennas for comms-on-the move, mentioned earlier, and techniques for more rapidly exploiting imagery and other Space-based intelligence to aid in maintaining battlespace awareness.

Q: How adversarial do you see Space technology as becoming? Do you foresee actual Space wars, or Space-based weaponry, despite the current treaties forbidding such, in our lifetime?

A: The answers to those questions really depend on the Space capabilities of our potential adversaries. Many people around the world have access to Space-

(See Scientist, page 47)

Scientist ... from Page 17

based imagery and communications from commercial or military sources. Denying such access may be necessary in certain situations.

With regard to direct confrontation in space, either anti-satellite weapons or satellite-based warfare, there are probably not too many countries with those capabilities. The recent growth of the Chinese Space program is a concern. In any case, what we need to do is to make our systems as resistant to threat as possible. This means on the ground as well as in Space. And we have to make them resistant to Space weather as well as potential adversaries, the recent solar flares providing a case in point.

I don't see Space wars happening anytime soon, but possibly Space-based weapons.

Q: How can technology be used to protect the sovereignty of Space?

A: I think the best answer to that is ensuring that our systems will survive in the harsh environment of Space, be that Space weather or attack. As we ensure our access, and work to provide better protection to counter any threat of attack, we will be doing our part to ensure that Space remains free.

Q: How deniable to adversaries are the Space benefits we are presently using?

A: That's directly in proportion to how well we design our systems, and how well we protect them. Encryption, jamming, deception, and protection — these are all tools by which we deny any adversaries greater or even equal access.

Q: Realistically, how large a role do you see Space playing in future conflicts?

A: A very large continuing role. Space has become an integral part of how we conduct the warfight. We depend on it for precision navigation, intelligence, meteorology, and communications. Expanding and exploiting the uses of Space to an ever-increasing degree will define how well we support our forces, in logistics as well as operations.

Pumpkin Chunking ... from Page 37

"valid threat."

Accurately determining valid future threats is the most subjective portion of the formula used to develop a responsive materiel solution's capability. Careful analysis should allow us to make intellectual choices between materiel solution alternatives (but only choices). For instance, what effects do different color shades of the pumpkin have on its stealthiness? What is the optimum shape for the intended sub-ballistic trajectory? And should the pumpkin be developed in total darkness, shade, or full sun to enhance its nucleotide sequencing? Therefore, technological choices may be enhanced with prudent analysis. Ah, but the imagination is required first!

After all, technology is adapted in the "hand" of the user. Give a 1-year-old child a new and totally different toy and what does he do? He feels it, tastes it, tries using it in a variety of ways; hits it on the ground like a hammer, scoops it in his food like a spoon, or hits his brother over the head with it like a weapon. Take this toy away from him before the "newness wears off" and we have a tantrum, red face, and tears. The child is enamored with the new toy. Soldiers also find various uses for their new technology "toys." For example, the first helmets were used to shave in, to bath in, to heat water for cooking in, as pillows for sleep, to keep heads dry in the rain, and, oh yes, to protect heads from shrapnel.

As Americans we have, at all ages of our lives, embraced toys, tools, and ideas as long as the changes have not come too rapidly. My grandfather (in the 1950s) was the first in the neighborhood to own a television. My father (in the 1960s) was always the first to purchase the latest automobile technology. When computers became available and affordable for home use (in the 1980s), I often led the neighborhood in the purchase and use of a computer. My son (in the 2000s) is satisfied with nothing less than the smallest and the fastest self-designed computer technology, palm pilot, cell phone, and DVD.

Each generation of Americans sends a legacy to the next generation to pursue the latest and greatest technology. Do you know anyone without a cell phone, or without access to a fax or a home computer? Did you really need these devices? How did we operate without them? They have no doubt changed the nature of our lives. Everyone knows we will continue this technology spiral. We have to. We are programmed by our ancestors. In the final analysis, it may not really be about a neat three-step development process. It might just be about our love affair with the promises of "Buck Rogers" technology and the eternal chant deep within our American souls: "I love Pumpkin Chunkers. I want a Pumpkin Chunker. I *need* a Pumpkin Chunker."

First Ground-based Midcourse Defense Brigade in nation activated

By MAJ Laura Kenney

PETERSON AIR FORCE BASE, Colo. — A historic moment for the nation's homeland defense strategy took place here Oct. 16, when the U.S. Army Space and Missile Defense Command and the Colorado Army National Guard activated the nation's first Ground-based Midcourse Defense Brigade.

The brigade will operate the first part of the integrated Ballistic Missile Defense System, which, in concert with sister Services, is designed to protect the nation from accidental or intentional limited ballistic missile attacks. It will be manned by Colorado Army National Guard and active component Soldiers.

The brigade will provide expertise to U.S. Northern Command's command and control operations from the Cheyenne Mountain Operations Center.

Another component of the brigade, the Alaska Army National Guard Missile Defense Space Battalion, will be activated in December. It will provide operational control over ground-based interceptors located in Alaska.

LTG Joseph M. Cosumano Jr., commanding general of U.S. Army Space and Missile Defense Command, and Air Force Maj. Gen. Mason C. Whitney, Adjutant General of the Colorado National Guard, hosted the ceremony.

Welcoming the new brigade, Cosumano addressed the crowd of state and local politicians, military service members and their families.

"The missile defense strategy of the 20th century was largely based on the concept that rational countries won't attack each other. We've learned in the 21st century that those theories don't apply anymore. Hostile states, and even non-state hostile groups, now either have or are working on long-range missiles. This activation today of an important part of our homeland defense strategy allows us to defend against that threat," said Cosumano.

"The technology and the organizations have changed dramatically to meet the current threat. The technology has changed from nuclear kill to hit-to-kill. In two wars now, Patriot has proven beyond a shadow of a doubt that we can hit a missile with a missile, despite naysayers of past years. Now we can do it in space.

"As to organizational change — where we're having this ceremony, in front of the U.S. Northern Command building, and close to both the Army and Air Force space buildings, is indicative of the joint nature of this effort to protect our great nation. We'll be depending on Navy Aegis missile cruisers, and on the early warning architecture of the Air Force, as well as the superb skills and training of our own Soldiers.

"And within the GMD Brigade itself, we see the melding of active component service men and women with Colorado National Guardsmen. The Guard is a perfect fit for this mission, with the genesis of their role in national defense dating back to the 1700s. That makes them a natural for this mission, just as Colorado, the hub and nerve center of Space for the nation, is the most logical site for command and control."

Whitney spoke next, expounding on the mission of the Guard.

"We are tremendously proud to be part of this mission. It continues in direct descent the role of the Guardsman in protecting our nation. The only difference between the mission of 200 plus years ago and now is that, with our current technology, we can defend more rapidly and accurately. Even being in Space isn't new; we've been in Space more than ten years now. In all three buildings behind me, you'll find both Air Force and Army National Guardsmen. I congratulate all the members of the new Ground-based Midcourse Defense Brigade, and wish them well as they begin a new tradition of excellence."

GMD is designed to attack and kill any incoming missile in the "middle" phase or "midcourse" of its trajectory, after the boost or launch, and before it reaches re-entry to impact, therefore destroying that missile in Space. Working in concert with the early warning architecture, provided in part by the Air Force and the Navy's Aegis missile cruisers, GMD will launch a booster missile toward a target's predicted location releasing a "kill vehicle" on the path of an incoming target. The kill vehicle uses data from the ground-based radars and its own on-board sensor to collide with the target.

While the GMD Brigade is assigned to SMDC, its operators execute the decision/directive from Northern Command to destroy a ballistic missile threat. The brigade also has responsibilities to both NORTHCOM and U.S. Strategic Command. Command relationships are still being worked out at the four-star level due to the possible trans-regional nature of the threat.

Approximately 90 personnel will be located at the Headquarters. Operators are Air Defense qualified Soldiers and are supported by a Brigade staff (person-

Left, Air Force Maj. Gen. Mason C. Whitney, left, adjutant general of the Colorado National Guard, unfurls the flag of the newly activated Colorado National Guard Missile Defense Brigade, at a ceremony activating the nation's first Ground-based Midcourse Defense Brigade. The "stand-up" took place at Peterson Air Force Base, Colo.

Below, COL Gary Baumann, center left, commander of the newly activated Ground-based Midcourse Defense Brigade, accepts the brigade's flag from LTG Joseph M. Cosumano Jr., commanding general, U.S. Army Space and Missile Defense Command, at a ceremony 'standing up' the nation's first such unit. Framing the two are, left to right, GMD Brigade CSM Daniel Marques and Air Force Maj. Gen. Mason C. Whitney, adjutant general of the Colorado National Guard. The brigade will be manned by both National Guard and active component Soldiers. *Photos by Dennis Plummer*

nel, intelligence, operations, supply and communications.)

The 110 Soldiers who will be located at the battalion include air defense operators, force protection guard force and staff personnel. Actual interceptors will be located at Fort Greely, Alaska. The battalion will have not only the operational mission, but the testbed mission as well, to ensure continuation of development.

Alaska was chosen as a site for interceptors due to requirements of the system. Geometry and the arc of any missile in flight over the globe make Alaska a perfect choice. There will also be interceptors located at Vandenberg Air Force Base in California.

COL Gary Baumann, commander of the newly activated brigade, spoke with conviction about his unit and its mission.

"In the 1970's, we briefly had the capability to defend ourselves against the threat of ballistic missiles. At that point, intelligence indicated that nine countries possessed such capabilities. Today, that number has increased threefold. This unit's activation is a small step towards ensuring the safety of our nation. In December 2002, the President of the United States directed that we push the fielding of this system up from 2006, to 2004. I believe we are on target to meet those goals. Our Soldiers, chosen from the best across the state and nation, are well-trained, excited, and looking forward to the challenge, and have been working tirelessly to be prepared for it."

SMDC sees many changes during Cosumano's time as commander

By Debra Valine

Editor's Note: At a date to be determined, LTG Joseph M. Cosumano Jr. will relinquish command of the U.S. Army Space and Missile Defense Command and Army Strategic Command. Army Space Journal's Debra Valine sat down with LTG Cosumano to get his thoughts. (Some information contained in this article appeared previously in The Eagle.)

When he assumed command in April 2001, Cosumano had a vision. He wanted the command to normalize Space, provide layered force protection for commanders in chief throughout the world, and develop soldiers and civilians with technical and leadership skills to support the Objective Force of the 21st Century.

"Our challenge is to continue providing the expertise, research and work that will move the nation closer to the ability to field a missile defense capable of protecting American citizens and deployed forces against missile attacks," Cosumano said in his column in The Eagle in June 2001.

In just two years, SMDC has made great progress in fulfilling that vision.

"I wanted to make the command more operationally focused," Cosumano said.

"And I wanted to improve the command's team relationship. I wanted the operational and materiel development sides to work more closely together."

SMDC reorganized in mid-2003 from having separate staffs in three locations to a single staff to support the command.

In 2001, the United States did not have a single system that would protect deployed warfighters, allies and coalition partners, and citizens. The Administration made a commitment to missile defense, looking to a multi-layered architecture to counter threats in all phases of their flight: boost, mid-course and terminal. Cosumano predicted at that time that the Army would be responsible for the ground-based portion of the mid-course segment.

Work on a ground-based midcourse defense test bed at Fort Greely, Alaska, started in June 2002. Later, in December 2002, the test bed overview was changed and the command was directed to have an Initial Deployment Operational (IDO) capability in October 2004.

"The deployment of the ground-based midcourse defense is timely," Cosumano said.

"Years ago when we thought about building a system to protect the United States, we had projected an uncertain world. We had the foresight to predict the world we are in today — certainly not to the scale of 9-11, but in the circumstances we are in today. We are threatened by non-nation states such as Al Qaeda and nation states that do not agree with our ideas of democracy and freedom.

"The ground-based midcourse defense program is on schedule with operations and training to become operational in 2004," Cosumano said.

"It is the first step of a global integrated missile defense system that will allow seamless protection from region to homeland. It is a joint system in that the Army is just one of the participants. The Navy will provide early warning and the Air Force will provide satellite- and ground-based early warning."

To help meet the manpower requirement, SMDC stood up the first ever Ground-based Midcourse Defense Brigade, part of the Colorado Army National Guard, Oct. 16.

Work on ground-based midcourse defense is just one area where SMDC has been transforming into a command that can support the modern day warfighter with Space-based products and the Army go-to command for the U.S. Strategic Command.

When SMDC was named the Army Service Component Command for STRATCOM in January 2003, its mission areas grew in scope and depth from three mission areas to five, taking on a global nature. SMDC's mission areas include global strike, Space operations, integrated missile defense, and strategic information operations, with Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) as the enabler.

"The greatest honor the command has been bestowed is being named the Army Service Component Command for STRATCOM," Cosumano said.

"SMDC was selected based upon performance in current and past operations and its ability to not only develop but field and support high-tech equipment. We are appropriately recognized to be the service component command to STRATCOM."

Taking on the increased responsibility meant that technologies needed to be developed and put into the hands of the warfighters, and people needed to be trained to use them.

Many technologies have been transferred from SMDC to the Program Executive Office for Air, Space and Missile Defense. "Hit to kill" technology used in current anti-tactical ballistic missiles was originated in Huntsville's Technical Center to include the Patriot (PAC3), which saw significant action in the war with Iraq. Another capabil-

ity being developed — and used in the Afghanistan theater of operations — is ZEUS, a laser mounted on a HUMVEE that detonates unexploded surface ordnances.

Others include the Tactical High Energy Laser /Mobile Tactical High Energy Laser, the Medium Extended Area Defense System, Theater High Altitude Area Defense, Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System, TES, and Grenadier BRAT, along with the Army Space Program Office.

"Transferring technologies and capabilities to PEO-ASMD allows those technologies to soon be in the hands of the service members to enhance their warfighting ability," Cosumano said.

"Our units are becoming smaller but more agile and lethal through the technologies being developed in Huntsville."

In addition to developing the Space-based technologies and capabilities, SMDC stood up three Space battalions: 1st Space Battalion, 1st Satellite Control Battalion and the 193rd Space Support Battalion, and developed a program to train Space officers. Army Space officers are a key asset to the ground forces. To date, four classes of Space officers have graduated and been assigned to duty supporting combatant commanders worldwide. They support commanders to leverage Space for ground warfighters around the world.

"Ground warfighters must be able to see first, understand first and then finish decisively," Cosumano said.

"Space will enable this by providing near real-time navigation, communication, weather, imagery, missile warning and intelligence.

"The Space operators are being received as members of the combined arms teams to which they are assigned," he said.

"Space operators are deployed with division and corps teams in the areas of operations. They are becoming key members of the teams that are providing key capabilities that enable the current forces. I think Space operators will become more important as the years go on."

Looking back over his tenure as commander of SMDC, Cosumano said he is most proud of the performance by the command's soldiers, civilians and contractors in Operation Enduring Freedom in Afghanistan and Operation Iraqi Freedom in Iraq.

"The team came together to support these operations and made a huge difference in the fight. We deployed and supported every operational element of the command, to include our reserve components," he said.

"The time has just flown by," Cosumano said, not only of his time with SMDC, but of his 35 years in the Army.

"It has been a great opportunity to serve with some of the finest people I have ever met at every assignment along the way," Cosumano said.

"At each assignment, I am sure I have gained more than I gave. Each one has its own special memories for my wife, our children, and me. We are honored to have served for all these years."

SMDC competes at Department of the Army NCO and Soldier of the Year competition

Two members of the Headquarters Company, 1st Satellite Control Battalion proudly represented U.S. Army Space and Missile Defense Command in the second Department of the Army NCO and Soldier of the Year competition. SSG Steven Cato, SMDC NCO of the Year, and SGT Jennifer Swift, SMDC Soldier of the Year, competed against 10 NCOs and Soldiers in their respective categories during the weeklong competition that was conducted at Fort Lee and Arlington, Va., Sept. 12-18.

The event, initiated last year by Sergeant Major of the Army Jack Tilley, brought together once again the "best of the best" in today's Army.

At the end of the competition, SPC Russell A. Burnham, U.S. Army Forces Command, was named the 2003 Soldier of the Year, and SSG James W. Luby, Military District of Washington and National Capital Region, was the 2003 NCO of the Year.

Competitors for the Department of the Army NCO and Soldier of the Year Competition pose for a picture with Sergeant Major of the Army Jack Tilley during a break in competition.
Photo by Sharon L. Hartman

SMDC NCO of the Year battled for DA title while younger brother faces own battles in Iraq

ARLINGTON, Va. — SSG Steven Cato of the Headquarters Company, 1st Satellite Control Battalion, represented U.S. Army Space and Missile Defense Command as he vied for the title of Department of the Army Noncommissioned Officer of the Year during a weeklong competition. The contest, conducted in Fort Lee and Arlington, Va., Sept. 12-18, pitted him against 10 other NCOs representing their major commands as they performed an array of tasks to include a PT test, various common task tests, day and night land navigation, and a mystery event that consisted of a six-mile ruck march, two more CTTs and an M-16 qualification while wearing their protective gas masks. Yet during this time, as often as his mind was focused on the competition and the task at hand, Cato found his thoughts frequently shifting to his brother, John, a truck driver who has been serving in Iraq with a National Guard unit out of Ardmore, Okla., since April of this year. For Cato, the title he was competing for was one, which, in his heart and mind, had already been bestowed upon his brother and every NCO that has served and sacrificed in the fight for freedom.

Cato, a native of Vernon, Texas, joined the Army believing it to be an experience that would send him down a new and challenging path. He knew nothing of what an NCO was or what his role as one would be, but with five and a half years of service behind him, he can now sum up with one word, what it means to be an NCO: Influence.

"NCOs make today's Army. We're molding the Soldiers of the future, and we have an extreme influence on them," said Cato.

"If a Soldier has a poor leader, it reflects directly on that Soldier. That Soldier may not turn out the same way, but even if he or she is a good Soldier, their progression will be much slower. It will hold them back.

"I definitely keep a higher standard for myself, but I also keep a higher standard for other NCOs. A good NCO will give his or her Soldiers guidance and sometimes even a little push to help them reach their potential. That is my goal as an NCO. To embrace that influence and use it to the advantage of the Army."

With this attitude, it was no wonder Cato shone at the company, battalion, and regional boards and was subsequently selected as SMDC's NCO of the Year. Although a competitor at heart, Cato modestly admits that he did not expect to make it as far as he did.

"I have a will to win and always want to do the very

best I can no matter what I'm doing, but the competition I had all the way through the MACOM level was tremendous and I believe, just by pure luck, I came out on top. I never expected to come this far and would have never been upset to be beaten along the way because my competition was that outstanding.

"The competition at the DA level was just another step up," added Cato.

"The Soldiers I work with are satellite controllers like I am. It was interesting and exciting competing against Soldiers from different branches."

The Soldiers he competed against and roomed with for a week, side by side, represented such military branches as Special Forces, Forces Command, Rangers, and the Old Guard to name a few.

"It was a great experience. I was able to learn from these guys and take things from their fields of expertise," added Cato.

"Although there were many differences between the competitors at the DA competition, one thing we all had in common was the drive to live up to that higher standard. We all set standards for ourselves that are so far above the normal standard that we never have trouble meeting the norm, but can have trouble meeting the standards we have set for ourselves. Sometimes this can be a blessing, but other times, an affliction."

When asked what drove him to strive so hard and what prepared him to meet challenges such as this, Cato had another one word answer: Family.

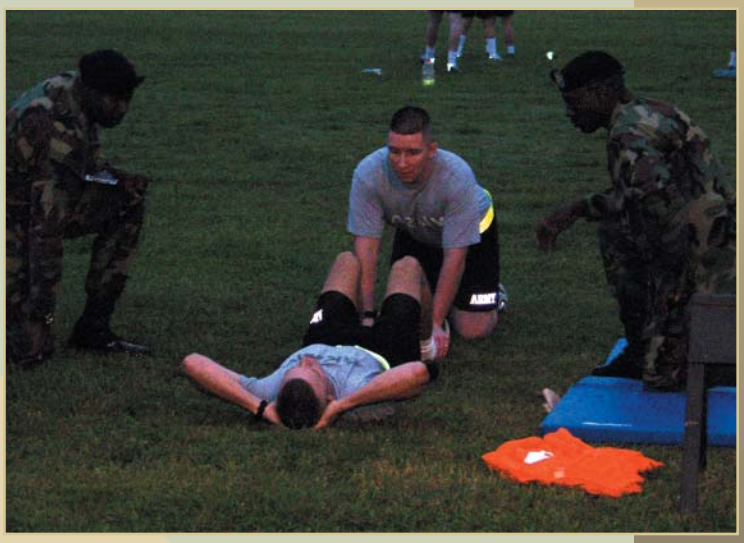
Raised on farms and ranches in Texas and Oklahoma, Cato was placed in a position of responsibility at a very early age. He was responsible for weapons, tractors, making sure he was where he was supposed to be on time, and that his job was accomplished. The standards he had to meet and the safety precautions he had to observe were things he grew up with.

He also credits the love, support, and even discipline from his parents Dena Moss, and Terry and Donita Cato, as well as his siblings, as contributing factors to his successes as an NCO.

"They taught me about sympathy and compassion. They also taught me to listen and understand," said Cato.

"I think the relationship with NCOs is similar to that of your family … especially the relationship with siblings. We are peers and are all on the same team. As long as things are good, there's nothing to say to try to correct each other. However, we all mess up sometimes and when we do, we should expect someone to come and correct us, just like you would your brother or sister. That's how we in the NCO corps and Soldiers are throughout the Army."

Sharon L. Hartman, is a DoD contractor with COLSA Corporation, and has served in the U.S. Army Space and Missile Defense Command Colorado Springs Public Affairs Office for more than three and a half years. She is a computer graphics designer, journalist, and photographer, and is the graphics editor for the Army Space Journal.



Top, SSG Steven Cato performs sit-ups during the physical training portion of the Department of the Army NCO of the Year competition; center, Cato dons his protective gas mask prior to performing a nuclear, biological and chemical task; bottom, a judge, right, weighs Cato's rucksack to standard. *Photos by Sharon L. Hartman*

1st SATCON Soldier hangs tough at DA competition

By Sharon L. Hartman

ARLINGTON, Va. — The Department of the Army Soldier of the Year competition was held this year at Fort Lee and Arlington, Va., Sept. 12-18. Representing U.S. Army Space and Missile Defense Command was Headquarters Company, 1st Satellite Control Battalion, SGT Jennifer Swift — one of four female Soldiers competing "one-on-one" against seven men for the title.

"It was really a tough, good competition, and the people I was up against are the most talented people I've ever met in the Army. They are very good at what they do," said Swift.

A native of Redding, Calif., Swift came into the Army after deciding that the party scene often associated with college life was not for her. Although she didn't consider the military until her brother joined the Marines her sophomore year in high school, the physical aspect of the military and being able to keep in shape was something that definitely appealed to her. An athlete from a very early age, Swift viewed PT tests and ruck marches as an exciting challenge.

"I've been a swimmer pretty much all my life," added Swift.

"I'm a rock climber right now, and go whitewater rafting. I also started dancing when I was five and the flexibility that comes with that has really helped more than you might think it would."

Coming to 1st SATCON's Headquarters Company straight from Advanced Individual Training in early 2002, Swift worked her way up the ranks in good time. Her journey to the Department of the Army Soldier of the Year competition began as a specialist. She competed for Soldier of the month at her company level just hoping to get practice for her E5 board. (Swift appeared before the E5 board and was promoted shortly after being selected as SMDC's Soldier of the Year.)

"I won that, so went up to the quarter board, won that and went to the company Soldier of the Year board, and ... I just kept progressing. I certainly never expected to go all the way to the Department of the Army level," commented Swift.

Once she was there though, she made sure everyone knew she belonged. Especially during the six-mile ruck march that was part of the mystery event. Swift, as did all the competitors, had to carry a 25-pound backpack, but she had to do so on a 5'2" 120-pound frame compared to the larger physiques of the male competitors. Although the other three females were roughly close in size to Swift, what separated her from the other females was the fact that she crossed the finish line ahead of them by quite a margin, and beat several of the males to boot.

"The competition was not quite what I expected. The way they ran the whole thing was very rigid, but it was very, very professional," stated Swift.

"The ruck march was challenging and difficult mentally and physically, especially with my being short. I could not match the strides of the male Soldiers because they have longer legs, so I would jog ahead of them and

Opposite page, SGT Jennifer Swift takes a much needed break from the competition; left, Swift performs a nuclear, biological, and chemical task; bottom left, Swift prepares herself for a grueling day at the Department of the Army Soldier of the Year Competition; below, Swift finishes qualifying with an M16, in her protective gas mask during a portion of the mystery event.
Photos by Sharon L. Hartman

then walk a bit while they caught up, and would jog again for a bit then walk while they caught up again. I just basically kept doing that the entire time."

To make things even more complicated, the competitors had to cross the finish line within an hour and a half from the start to get a score on that portion of the event. Although Swift missed the time limit by a mere minute and a half, she did not let it get her down.

"It was really difficult. Coming that close and missing it was frustrating and you get mad for awhile, but then you have to go on to the next event and move on. You can't be a bad sport. Being competitive does force you to drive yourself a little bit harder to try to do better than the person that is right next to you, but if you've done your best, that's all you can ask of yourself."

Swift has been told she will be traveling a bit over the next year representing SMDC as the Soldier of the Year. When that is complete, it will be close to time for her to head off to her next assignment.

"I would like to go overseas, maybe to Germany, but don't know if I will go to the SATCON Operations Center in Landstuhl or not," added Swift.

Future goals for this young Soldier include an appearance in front of the SGT Audie Murphy board and continuing her education through eArmyU in pursuit of a degree in applied technology.

Chaplain uses experiences in OEF to reach others at prayer breakfast

By DJ Montoya

PETERSON AIR FORCE BASE, Colo. — Terrorism, various personal problems, and a sense of helplessness were the issues covered during a recent prayer breakfast sponsored by the 1st Space Brigade (Provisional) at U.S. Army Space and Missile Defense Command - Colorado Springs.

The guest speaker for the event was Chaplain (MAJ) Andrew C. Meverden, currently assigned to the 2/135th General Support Aviation Battalion of the 89th Troop Command, Colorado Army National Guard. Meverden is one of only two chaplains in the entire COARNG.

Addressing a group of early risers consisting of military and civilians from the command, as well as some curious next-door neighbors hailing from U.S. Air Force Space Command, Meverden's subject was "When you've got problems that can't be solved."

Known to all as "Chaplain Andy," the reverend touched upon recent experiences as chaplain of the 5th Battalion, 19th Special Forces Group (Airborne) Kabul, Afghanistan, August 2002 through July of this year.

"At different times in your life you are going to find yourself in the following kind of a situation," said Meverden.

"You are going to be in the midst of a storm. A storm that you didn't cause. One that you cannot control and you have no choice but to wait out."

"These kinds of problems are the most difficult ones to face because they make us feel so helpless. This current period for those of us in the military being faced with situations — ones we did not cause, or were forced into — sometimes relates to family separations. Other times it relates to hazardous duty. All we can do is wait out the storm."

Meverden added that other issues revolve around money, family, work, and even pets. But the important thing to remember about all such problems is that they are only temporary in nature.

Referring to himself as a wounded healer, Meverden said that he has been through the best and worst of life — witnessing much of both this past year in Afghanistan.

"You can endure anything if it will not last forever. That was the perspective I took when I said goodbye to my family here at Pete Field last year. It was 7,293 miles away. It was hard to leave my wife and children."

He also reminded the audience that the problems don't necessarily have to make one miserable.

"We can live this life with a sense of hope and optimism."

Meverden recounted growing up with a personal fear of the dark and how he dealt with it.

"It was our first night in Afghanistan and there was no electricity in Kabul. We had a little generator powering lights in the mess area. You take your food out about 50 feet away to eat it so the bugs don't get into the kitchen. And here I was standing with wire around us. We had about 800 new Afghan recruits whom we knew could possibly be infiltrators from al Qaeda and the Taliban. And there I was without an assistant — chaplains are non-combatants. I didn't have a weapon. I was standing in pitch-black darkness in Afghanistan. For some strange reason, from that moment on, I lost my fear of the dark. And then … other things happened and I lost other fears."

He then gave an example of how tragedies can be turned into blessings.

Dec. 14 and 16, 2002, are two days Chaplain Andy said he would never forget. He witnessed a live fire exercise between U.S. forces and Afghan friendly forces that led to a horrible tragedy — the accidental death of five local boys.

Despite extensive precautions to clear the area prior to the exercise, 10 boys came over the targeted area on top of the mountain and found themselves in the line of artillery fire.

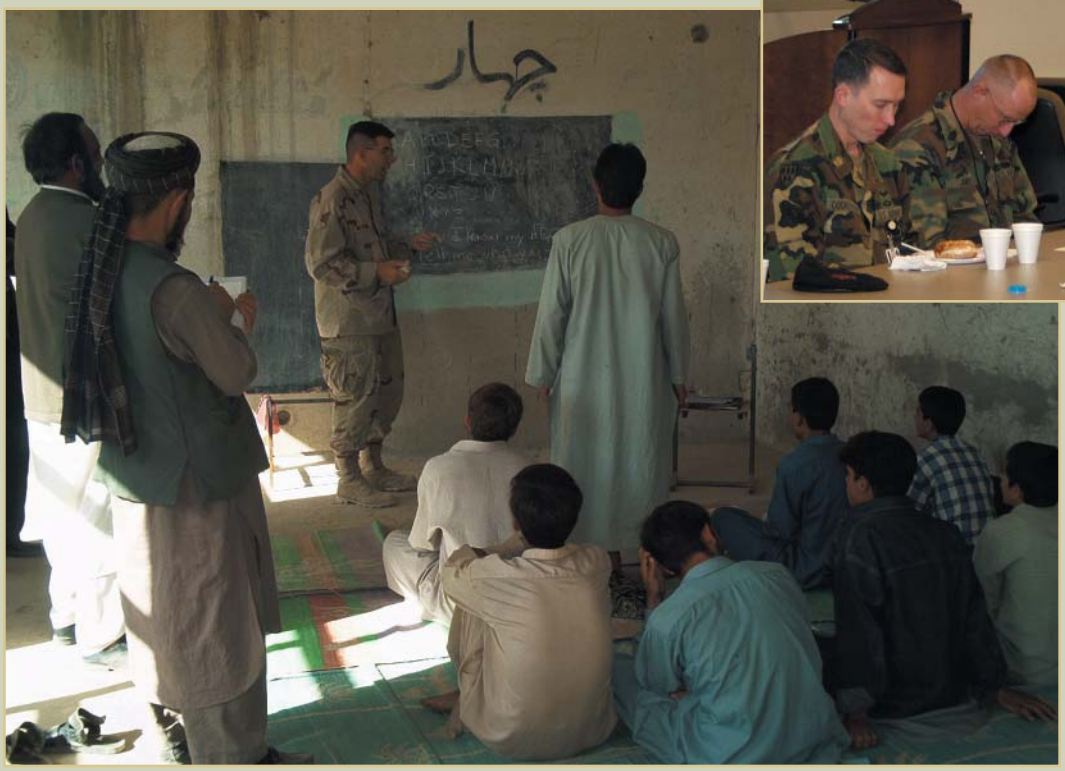
After the first barrage hit, five of them lay dying. When villagers and personnel from the camp realized what had happened and took action, it was too late. One boy died on the mountain. Two died on the stretchers coming down. Another died in the ambulance. A Special Forces medic from camp saved the fifth boy.

"It was a horrible tragedy," said Meverden.

"That night the Soldier who set the tubes — a Special Forces heavy weapons expert who had been in Somalia during Black Hawk Down — sat down with me. He said to me 'Chaplain, when I was in Somalia I had to shoot a 13-year-old boy because he would not put down an AK-47 that was pointed at us. I swore I'd never let myself be put in that situation again. Today I believe I'm responsible for the death of four boys. I did not come here to kill boys. I came here to get rid of terrorists.' And he handed me his weapon, put his head in his hands and cried."

The bodies were autopsied, cleaned up, and placed in body bags.

"I was there when the fathers and uncles came to



Left, Chaplain (MAJ) Andrew C. Meverden, Colorado Army National Guard, teaches English to members of a village in Afghanistan. Meverden spoke recently of his experiences at a prayer breakfast held at SMDC-Colorado Springs. *U.S. Army photo*

Above, members of SMDC bow their heads in a moment of silence at the beginning of the prayer breakfast. *Photo by DJ Montoya*

claim the bodies. I learned to say in their mother tongue 'I'm very sorry.'"

In a situation where understanding and forgiveness between both sides was necessary, it became apparent there was a problem. There was a sense of ignorance of local customs, hurt feelings, and bureaucratic hand tying which gave the wrong perception to the outside world.

Chaplain Andy used his skills and knowledge of the area's customs, in addition to what he considers divine assistance, to help aid the healing process and bring closure to the incident.

Prior to the accident, he had worked teaching English in the local village. One of the boys killed was a student of his. Meverden laid the groundwork through back channels to bring both sides together.

Through little gestures of good faith toward villagers and a simple local custom used when a life is taken or injured, forgiveness was achieved all around. The custom involved the giving of a sheep to the affected families and feasting with the relatives. The Soldiers expressed their sadness for the incident and the Afghans respond in kind by forgiving them.

"I remember what the spokesperson for the Afghans said. That man said 'You didn't have to bring us anything. Just your coming today is more than words can express. The fact that you have come today to mourn and shed tears with us for our boys shows that you see us as people, and not just mere animals. Our country has been at war and many have died, but since your coming last November the war has stopped. For the first time, there is the hope of peace and prosperity in our lifetime."

According to Meverden, the ceremony turned from a solemn occasion into a time of celebration and reconciliation.

"Many of us are caught in storms of our own," said Chaplain Andy.

"How we react to that storm is important. Remember they are only temporary."

Finishing his presentation, the multi-faceted Chaplain Andy took out a guitar and lead the participants in a couple of inspirational songs as the prayer breakfast came to a close.

Attendee LTC Mary Miller, executive officer for the SMD Battle Lab — Space Directorate, was moved by Meverden's address.

"I was intrigued by his experiences from the field," Miller said.

"Rarely does one get to hear or share stories that are of a person-to-person nature. It was also very compelling to see what one person can do or effect. It's like my mother used to say — how many ripples can one stone cast?"

COMMAND IN BRIEF

D Co., 1st SATCON goes Ground Mobile Force with the National Guard

By SPC Glen Jones and SGT Logan Maynard, Unit Reporters

CAMP ROBERTS, Calif. — This summer, the Soldiers of D Company, 1st Satellite Control Battalion Operation Center had the rare opportunity to participate in a Ground Mobile Forces (GMF) satellite communications training exercise with the California Air National Guard.

The training was coordinated by the 149th Combat Communications Squadron (CBCS) out of the 162nd Combat Communications Group and conducted at Camp San Luis Obispo, located in the central coast area of California about a 45-minute drive from D Co. This is one of the few GMF training exercises that are conducted close enough for the Soldiers of D Co. to attend.

Seizing the opportunity to work closely with the GMF terminals that they control, D Co. personnel contacted the 149th CBCS to see if they could send Soldiers to participate in the exercise. Getting the go-ahead, two Soldiers from D Co. were then selected to participate in the two-week exercise. SPC Glen Jones and SPC Jarrod Mantz were chosen because of their strong initiative to learn and their willingness to pass that knowledge on to their fellow Soldiers.

Mantz said, "I enjoyed working with the Air National Guard, they were very helpful and informative, as well as eager to learn."

The focus of the training was to familiarize the Soldiers of D Co. with the daily operations of a GMF mission as well as to refresh their already extensive knowledge of the equipment.

The first week of training was hands-on with the equipment. The Air National Guard had four types of communications terminals. Three types of terminals were satellite based, including two hub terminals; a TSC-85B and a TSC-100A and two spoke terminals — both TSC-94A. The fourth type of terminal was a TRK-170, a line of sight microwave communications terminal. The Soldiers of D Co. had never had the opportunity to work with line of sight communications, but were eager to learn about it.

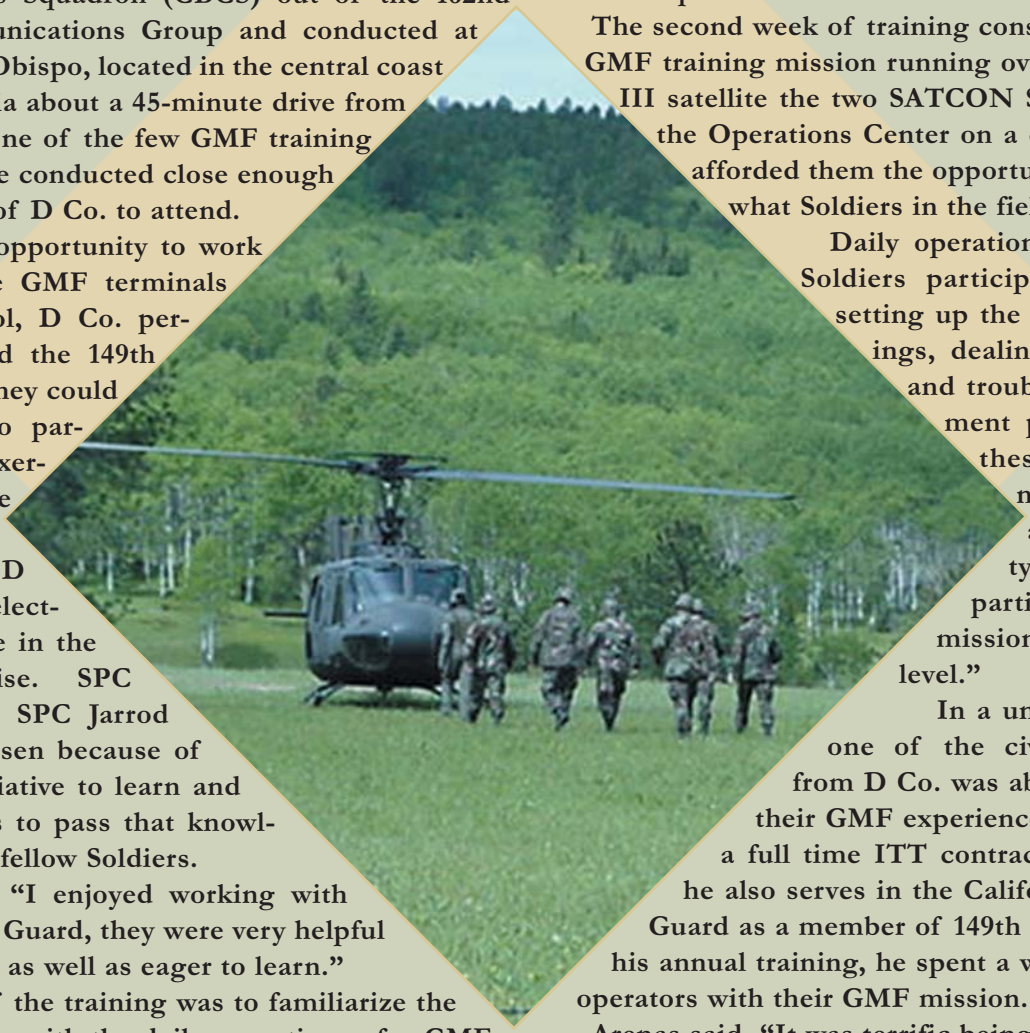
In one instance, Mantz was able to set up and then troubleshoot a line of sight link using the TRK-170. Jones and Mantz were able to help the National Guard Soldiers further their understanding of radio frequency theory as well as how the satellites are controlled and how the Operations Center views their carriers.

The second week of training consisted of an actual GMF training mission running over the same DSCS III satellite the two SATCON Soldiers control at the Operations Center on a daily basis. This afforded them the opportunity to experience what Soldiers in the field go through.

Daily operations that the D Co. Soldiers participated in included setting up the dish, taking readings, dealing with user data, and troubleshooting equipment problems. All of these actions were new to the two, as unit members typically have never participated in a GMF mission on the "ground level."

In a unique coincidence, one of the civilian contractors from D Co. was able to join them in their GMF experience. Mike Arenas is a full time ITT contractor at D Co., but he also serves in the California Air National Guard as a member of 149th CBCS. As part of his annual training, he spent a week as one of the operators with their GMF mission.

Arenas said, "It was terrific being able to work with the Soldiers on a different level and they were a great



Delta Company, 1st SATCON Soldiers recently trained with National guard Soldiers during Ground Mobile Force Exercise, giving the satellite Soldiers a rare opportunity to experience "grunt" life and a helicopter ride. *U.S. Army Photo*

help; I think the people in my unit also learned a lot from them."

The mission was a resounding success because it provided the opportunity to cross-train with another branch of the service and expand the knowledge of all those who attended.

Jones said, "It gives me a much better perspective on how GMF missions work in the field."

The knowledge gained by Jones and Mantz has been a benefit to others as well.

SGT Mike Feddema, Jones' squad leader said, "I'm glad my Soldier got to participate in the training — his new knowledge will be a great help on the (operations) floor."

Air Force members of RSSC CONUS engage in training on the Secure Mobile Anti-jam Reliable Tactical-Terminal, or SMART-T. Senior Airman Amber Duncan and Staff Sgt. Shannon Metcalf are setting up the terminal for operation, while, behind them, Tech. Sgt. Kelven Preston and Senior Airman Candy Knight are going over the theory of operation. *Photo by Wilson Small*

D Co. looks forward to sending more Soldiers to GMF missions and is currently trying to arrange participation in a mission aboard a U.S. Navy ship.

RSSC CONUS gets SMART-T Training

By Air Force Tech Sgt. John Steele, Unit reporter

MACDILL AIR FORCE BASE, Fla. — Members from Regional SATCOM Support Center CONUS Extremely High Frequency section had the rare opportunity in May to do some hands-on training on a particular piece of high-speed equipment. The 280th Combat Communications Squadron made the two-day road trip from their home base in Dothan, Ala., to train RSSC personnel on the Secure Mobile Anti-jam Reliable Tactical-Terminal, or SMART-T.

The training consisted of getting familiar with the terminal, its capabilities, and terminal set-up. Even though the RSSC personnel routinely plan user communication needs regarding the terminal, hands-on experience with it for themselves is rare. The training lasted three days, and six members were able to get up to speed on this new EHF terminal's capabilities. The base is home to U.S. Central Command, and this terminal is widely used to support ongoing operations in Iraq.

The terminal is mounted on the back of a HMMWV, which makes it completely mobile — set-up time taking about 30 minutes. The terminal may use commercial power, the HMMWV itself, or an onboard generator for power. It can support voice and data up to 1.544 Mega bits per second, and has a maximum throughput of 2.24 Mbps, allowing more information to transmit more rapidly and accurately.

The SMART-T can even work under remote operation up to a mile away.

It has the capability of using any EHF capable satellite, but for data rates in excess of 2400 bps, it can only use Medium Data Rates Milstar birds, a more robust satellite.

The training was a special treat to the communications planners stationed at RSSC CONUS, since most of their time is spent allocating resources for others to train. It was their turn this time, and they got to see first-hand how the products that RSSC supplies to the tactical warfighter are implemented.

"SMART-T is the operational terminal of the future, and the training was phenomenal. We greatly appreciated the efforts of the 280th CBCS, in coming all that way to provide the training," said Tech. Sgt. Kelven Preston.

HHC 1ST SATCON steps up and out during national exercise

By PFC Jesse Childress, Unit reporter

COLORADO SPRINGS, Colo. — Dedicated news-hounds might have heard recently about the nationwide terrorist response exercise known as Determined Promise. A less widely publi-

SPC Terry Clough works on satellite terminal equipment under the tutelage of Richard Hamer of ILEX Corporation during the national level terrorism response exercise called Determined Promise.

cized fact is that 1st Satellite Control Battalion's own Headquarters and Headquarters Company played an important role in this national level exercise

Determined Promise 2003 was a Homeland Defense and Northern Command exercise to determine the nation's response capabilities to terrorist attacks in various regions of the United States, as well as other important events, such as natural disasters. A biochemical attack on the city of Las Vegas, raging wildfires in the Northwest or a devastating hurricane in Florida were just a few examples of scenarios that were used to test the strength of our nation's emergency responses in national and state government agencies.

Taking place Aug. 12-28, Determined Promise 2003 was the largest coordinated exercise of terrorism response to date. Involved were 15 federal agencies, several state and local organizations, a number of military units, and the American Red Cross.

That long list of support agencies included a group of HHC, 1st SATCON Soldiers and contractors. These satellite technicians deployed to an undisclosed location, and worked 24-hour shifts providing satellite support functions to keep leaders talking and data flowing. One participant, SGT Robert Smedley, said about the experience "I feel this was a great opportunity for everyone here to learn and 'train as you fight.' It also shows everyone involved what HHC has to offer and proves what we are capable of providing."

Another involved SATCON Soldier, SPC Terry Clough said, "Exercises like this give the Soldiers an opportunity to work in an operational environment that creates stress, which improves crew cohesion and mission focus."

Reflecting on "playing" on such a large stage, HHC 1st SATCON's Commanding Officer CPT Daniel Gager commented, "HHC 1st SATCON's participation in Determined Promise 2003 was a great training opportunity for all involved. The Soldiers adapted to operational and communication challenges without any problems and identified new areas in Space support where they can be useful to the Northern Command staff. It was also a testimonial as to how important contractor support is to the Satellite Control mission. Without the contractor support we had, there would have been a gap in the operation of our more complicated control systems. The teamwork displayed between all of the exercise participants was truly exceptional."

With the experience gained, the Soldiers of HHC 1st SATCON look forward to Determined Promise 2004, as well as other upcoming deployments — opportunities to once again show what they can do.

JTAGS CENTCOM helps warfighters get R & R

By SPC Aaron Evans and CW2 Jeffrey Robinson, Unit Reporters

DOHA, Qatar — Temporarily far from the dust and heat of duty in Iraq or Afghanistan, Soldiers involved in those operations can report to this Persian Gulf-front city for a few days' rest and recuperation. Locally stationed Soldiers from Detachment Echo, 15th Air Defense Joint Tactical Ground Station, Central Command, already an integral part of ongoing operations with their critical mission of providing Theater Ballistic Missile early warning, volunteered to help the incoming weary Soldiers enjoy the R&R opportunity to the fullest.

Army Central Command (ARCENT)-Qatar has the overall responsibility for what is called the Fighter Management Program. The JTAGS Soldiers, along with other local units' members, act as sponsors, and offer vehicles, time, and guide services to those Soldiers lucky enough to make it to this temporary Mecca.

"It feels really good to be able to share something with these Soldiers; to give something back and support them for their efforts. We are lucky to be in a position where we can get them off post and allow them to feel like real people again," said volunteer sponsor Petty Officer Patricia Viviano of Naval Network and Space Operations Command, Detachment Echo.

The mission of the ARCENT-Qatar Fighter

Management Program is to increase the morale and welfare of the Soldiers that support Operation Enduring Freedom and Operation Iraqi Freedom. As of Sept. 7, 2003, about 7,091 Soldiers have participated in the Fighter Management Program. Soldiers are afforded the opportunity to spend five days relaxing and participating in on-post and off-post Morale, Welfare, and Recreation activities. Some of these activities include Dhow cruises, Jet Ski rides, and water skiing.

The time span allotted is a period that participants can enjoy themselves and mentally and physically take themselves out of the battlefield mentality for a few days. While the Soldiers are here, they are afforded the opportunity to swim, visit the malls, and eat some well-deserved meals at restaurants far removed from military chow lines. They also have the opportunity to visit with other Soldiers and share their stories.

Another volunteer, SGT James Smith, of JTAGS Colorado Springs, said, "It's great to reunite with fellow Soldiers from other units and have an opportunity to take some of them out to the restaurants and talk about the good times of the past. It's a good feeling to see their faces glow because they are in a restaurant in the Middle East."

SPC Jorel Santiago of JTAGS Colorado Springs said, "It's nice to meet some of the Soldiers that are putting their lives on the line in the war on terrorism up there in Iraq. This is a great opportunity for them to have some fun, and for us to show them that they are appreciated."

Posing in front of a local tourist attraction along the Persian Gulf city of Doha, Qatar, Soldiers on a brief rest and recuperation respite from duties in Iraq and Afghanistan pal with their guides, Joint Tactical Ground Station - CENTCOM volunteers. The JTAGS Soldiers are, fourth from left, CW2 Jeffrey Robinson, and, last two on right, SGT James Smith and SSG Jeff Patterson. *Photo by SPC David Nussbacher*

While the letters of support from around the world, buttressing speeches made by national leaders, and infrequent phone calls home are equally important for morale, ARCENT-Qatar's Fighter Management Program and JTAGS Detachment CENTCOM do their part and "roll out the red carpet" to allow these heroes critical down time. In the midst of their own important duties, JTAGS Detachment CENTCOM is assisting these service members in truly getting quality R&R, fitting them for the fight they return to.

National Guard ARSST deploys to Iraq, farewelled by Mayor

By MAJ Laura Kenney

PETERSON AIR FORCE BASE, Colo. — The most recent Army Space Support Team to deploy received a special sendoff from the mayor of Colorado Springs.

Lionel Rivera, a former Army captain elected in April as mayor of the city known as "the gateway to the Rockies," met with Team 12, Sept. 24. He spoke with all six members privately just prior to a farewell ceremony, and was briefed on their upcoming mission.

The team, which had recently returned from a mission in Korea, deployed Sept. 29 to support the Coalition Provisional Authority in its mission of rebuilding Iraq.

Team Leader MAJ Michael Willis joked about the quick change in missions exemplified by the color of the uniforms now worn by the team.

"Going from green for Korea, where we were supporting operations (exercise Ulchi Focus Lens) to the tan of Desert Camouflage Uniforms for Iraq, where we'll be assisting people on a humanitarian mission, speaks exactly to the versatility of Space, and to how pervasive the need for it has become," said Willis.

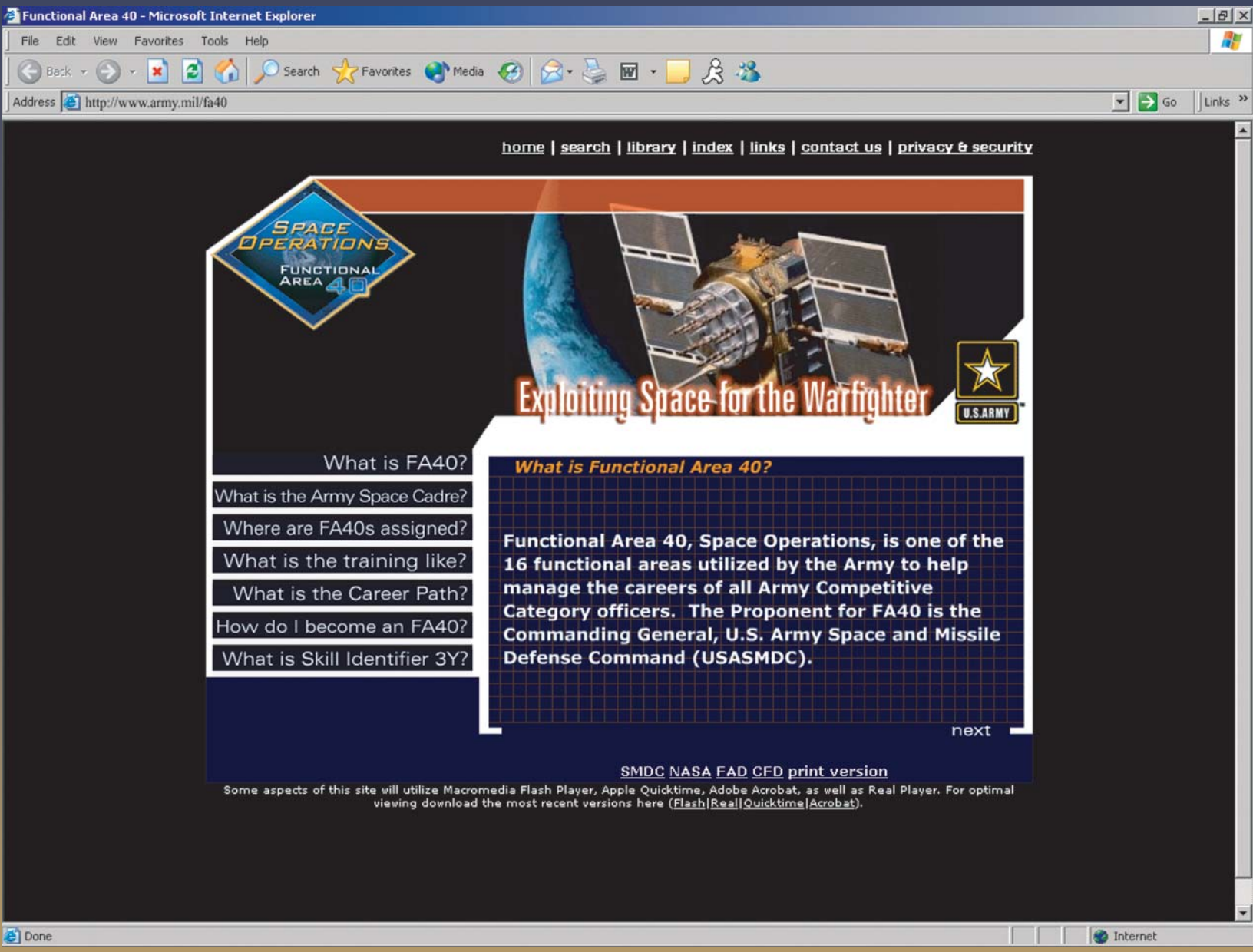
1st Space Brigade commander, COL David Shaffer, commented on the "pervasive need" aspect.

"The demand for Space teams

(See Command In Brief, page 51)

The Army of the future will be faster, lighter, and deployed around the globe. Space is the critical link in the chain, the glue holding the regionally oriented, specifically designed, deployed worldwide force packages together in an "Army of One."

— Adam Aberle



Don't forget, the new Space Operations Web site is up and running!

www.army.mil/fa40

I am continually impressed by the advantage given to our warriors by Space capabilities. Space is still amazingly new years later in the sense that we are not yet fully integrated, but the capabilities we have are truly impressive, as is the professionalism of our military members that are bringing Space to the front.

—The Honorable Donald Rumsfeld
U.S. Secretary of Defense

U.S. Secretary of Defense Donald Rumsfeld responds to a question during a town hall meeting held at Fort Carson, Colo. Oct. 7. More than 40 Soldiers, civilians, and contractors from U.S. Army Space and Missile Defense Command's Colorado Springs office attended the event. *Photo by Sharon L. Hartman*