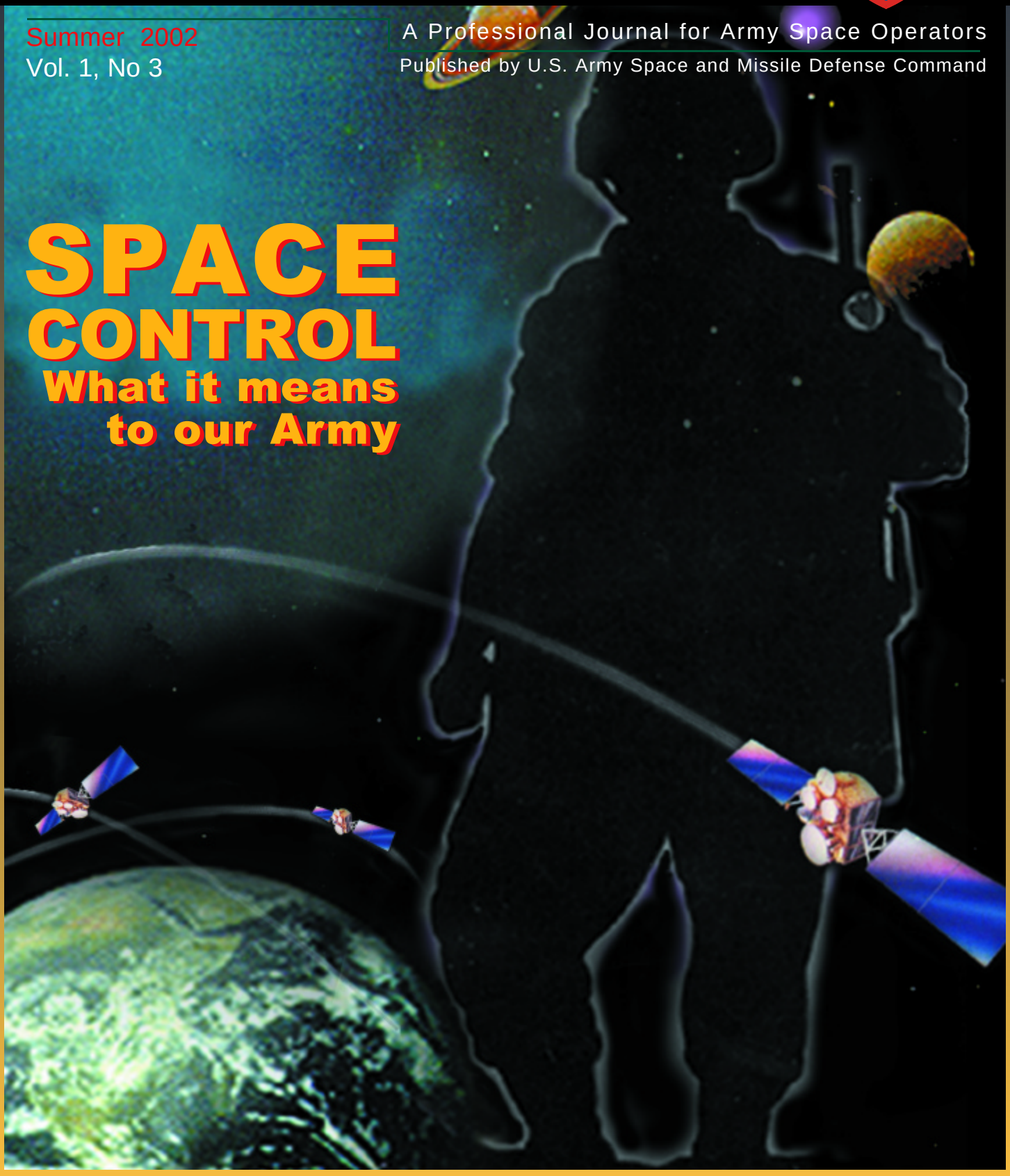
the Army Space Journal

Summer 2002
Vol. 1, No 3

A Professional Journal for Army Space Operators

Published by U.S. Army Space and Missile Defense Command



SPACE CONTROL

What it means to our Army

We want you to know
This Journal's for you

Welcome to the third edition of the Army Space Journal. As you can see, the theme for this Journal is Space control. We've assembled various authors — experts in their particular fields — to explore and define the concept.

A good start to this exploration, however, is the answer to the question of why.

"We know from history that every medium — air, land and sea — has seen conflict" the U.S. Space Commission said in its Jan. 11 report this year. "Reality indicates that Space will be no different. Given this virtual certainty, the United States must develop the means to both deter and to defend against hostile acts in and from Space."

A down to Earth reality of how that matters is found in the Commanding General's column.

"Take a few moments with me now to sit back and think what a day without Space would mean to our nation, and to our military," he writes. We won't steal the thunder, but he goes on to discuss the impact Space has on our everyday personal lives from television to cellular phones to paying for our gas with our credit cards. He goes on to discuss the impact Space has on our weather forecasts, economy and our military.

So, given the realization we rely on Space for just about everything — and it's easily taken for granted — even the layman can see that we need to ensure our continuing dominance of Space. "Our" refers first to us a nation. Equally as important from the point of view expressed in this Journal, it applies to the 'we' as in the Army and in our role in the Space continuum.

A compelling case is made for Space control as an intrinsically Army mission. Other articles explore the close relationship between Information Operations and Space Control, as well as how that relationship plays in Joint operations. Future challenges are discussed, and some solutions are proposed.

New to this edition of the Journal is a category of writing we'll call Tip of the "Sphere." We call it that because no matter what our quarterly theme will be, there will always be some connection to the hard work our soldiers and civilians do in Space operations. We want to showcase the abilities and accomplishments of Army Space Command in real-life, current operations.

For instance, if there wasn't Space control, Army Space would be unsuccessful in providing force enhancement capabilities to the warfighter. A classic example of adjusting these Force Enhancement capabilities to the needs of those in the fight comes in how Army Space assisted in the Western wildfire fighting efforts.

We hope you enjoy the new category, and that the overall theme of this issue and its different methods of presentation prove thought provoking and informative. As always, we welcome and solicit your comments and input.

Our intent is to create a dialogue, a starting point for credible discussion on issues important to our business of Space.

We'll leave you with one final thought on Space, this one coming from the Secretary of Defense.

"From the dawn of time, a key to victory on the battlefield has been to control the high ground. Space is, indeed, the ultimate high ground," he said in his testimony of Feb. 5 to the Senate Armed Services Committee.

Happy reading.

— Managing Editor

Summer Theme — "Space Control"

the Army Space Journal

Summer 2002 Edition

Approval: The Commanding General, U.S. Army Space and Missile Defense Command has determined that the publication of this periodical is necessary in the transaction of the public business as required by law. Use of funds for printing this publication has been approved by the Commanding General, January 2001, in accordance with AR 25-30.

Mission: The Army Space Journal is published quarterly by the U.S. Army Space and Missile Defense Command. The journal provides a forum through which Space operations officers can disseminate professional knowledge and furnish information within the U.S. Army. The purpose is to increase the effectiveness of Space operations through a professional discussion of events and lessons learned. It is also intended to inform the Army warfighter on Army Space initiatives.

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Distribution to Functional Area 40 officers and associated military officers, civilians, and contractors. Changes to addresses and requests for this publication should be made to the FDIC address listed above.

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A Day Without Space

Ensuring It Doesn't Happen

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

By LTG Joseph M. Cosumano Jr.

"The United States is more dependent on Space than any other nation." This single sentence from the January 2001 Report of the Commission to Assess United States National Security Space Management and Organization succinctly states why effective Space Control capabilities (the principal subject of this issue) are so critical to our continued national and economic security. Our growing dependence on Space makes it a vulnerability that must be protected — but that is just one aspect of Space control. The other is having the ability to preclude, when directed, our adversaries from leveraging Space-based assets to our disadvantage.

Take a few moments with me now to sit back and think what a day without Space would mean to our nation, and to our military. First, most pagers, phones, personal data devices, radios and televisions would become silent because in one way or another they rely on satellites for the transmission of the information that flows to and from them. All land, sea and air vehicles leveraging the Global Positioning System for precise location and navigation would have to come up with another means to determine their exact location and navigate from where they are to where they want to go. Weather forecasters would not have access to satellite photos of current weather conditions around the world and in their local areas. Mapmakers wouldn't have current satellite images from which to update their products. And you might actually have to pay the cashier for your gas, instead of paying at the pump with your credit card. A lot of this may be construed as a great inconvenience to the lifestyle to which we have become accustomed, but in many cases it could mean the difference between life and death (e.g., if you cannot contact emergency responders such as the police, fire department and ambulance services in life threatening situations; if you cannot receive warnings of hurricanes, tornados, floods, and forest fires). Additionally, the impact to our nation's economy could be devastating, not only from business losses but also from the chaos resulting from disruption to international monetary transactions.

From a military perspective, a day without Space would mean we would have no effective long-haul communications, thus precluding direct command and control with our joint and coalition partners and ensuring a limited reach-back capability. Without Global Positioning Systems we would have no beyond-line-of-site Blue Force Tracking capability; we would have to manually survey in all our systems; we would have to navigate using maps and lensatic compasses; we would have a limited ability to do precision strikes and we would probably see increased collateral damage as we return to the days of "dumb" and laser-guided bombs. Our intelligence, surveillance and reconnaissance capabilities would be severely limited — impacting our ability to do effective intelligence preparation of the battlespace, select targets and do timely battle damage assessments. Our ability to do weather forecasting and trafficability predictions would also be severely hindered. Early warning of ballistic missile launches would be minimal and tracking of these missiles would be almost non-existent.

BOTTOM LINE: Effective Space control leads to Space superiority which, like air and information superiority, is critical to our success as a military force.

So, what should we be doing to ensure we never experience a day without Space?

First, we have to look at our Space systems and ensure all the various components (e.g., the satellites, our ground stations, the data links between our satellites and our ground stations, and the data links between satellites) are adequately protected. Today, the most vulnerable of these elements are our ground stations. They are susceptible to natural disasters, ground attacks, cruise and ballistic missile attacks, bombs and artillery, and sabotage. Our data links are probably the next most vulnerable to attack. Our satellites are probably the least vulnerable element at this time, but only because our adversaries have not yet devoted sufficient resources to this area of attack. Fact is, most satellites are susceptible to kinetic energy munitions, high-powered microwaves, blocking, dazzling, obscurants, and the electro-magnetic pulse released from the detonation of

BOTTOM LINE:

Effective Space control leads to Space superiority which, like air and information superiority, is critical to our success as a military force.

nuclear weapons. We must devote sufficient resources now to the protection of all components of our Space systems to ensure our continued access to them in the future.

Second, we must consider the other side of Space control — precluding our adversaries from leveraging Space assets to our detriment. This area requires much more attention than it has received in the past. It is paramount we attain accurate, timely "Space situational awareness." This requires the ability to detect, identify and track all man-made objects in Space, understand what they are capable of, and what they are doing at any given point in time. To do this, we must improve our Space surveillance capabilities, which are currently fragmented and sorely out of date in terms of technology. An effective Space surveillance network requires both ground and Space-based assets. Today we only have one Space-based surveillance sensor and our ground-based surveillance assets, such as the Kiernan Reentry Measurement Site located at the Ronald Reagan Ballistic Missile Defense Test Site at Kwajalein Atoll, need to be upgraded to allow U.S. Space Command to continue to effectively keep track of the nearly 9,000 objects orbiting the Earth.

Additionally, we need to design into U.S. and allied commercial satellites the ability to deny an adversary the use of these assets without impacting our ability to continue using them. Today many nations use the same satellites. It is not unusual for the U.S. or an ally to use one set of transponders and a potential adversary to use another set of transponders on the same satellite. After all, commercial satellite consortiums are in the business to make money and they will generally sell their services to anyone with the required capital. In times of increased tension, it is to our advantage that adversaries be precluded from retaining continued access to commercial satellite assets. We would prefer this be done voluntarily by the satellite owners, but, failing that, we may have to take unilateral action against the satellites, the ground stations, or the links between.

This leads to the final set of Space control capabilities we must develop — capabilities that will allow us to preclude an adversary from leveraging Space capabilities (both commercial and their own). We refer to this as "Space negation" and these capabilities range from the permanent and lethal (degrade and destroy) methods to reversible and non-lethal (deny, disrupt, and deceive) ones. Anti-satellite work actually dates back to the early 1950s, before the Soviets launched the first man-made Earth orbiting satellite — Sputnik I. Early programs focused on nuclear interceptors exploding in the proximity of the satellites. However, we learned through testing that the electromagnetic pulse resulting from the explosion of a nuclear device in Space had much more impact than on just the target satellite(s). In 1967, the Outer Space Treaty was signed prohibiting the placing and/or use of nuclear weapons in outer Space. Since then, our anti-satellite efforts have focused on non-nuclear means such as kinetic energy and directed energy. But these methods result in permanent destruction of the satellites and possibly large debris fields posing a potential hazard to other satellites, the International Space Station, and our Space shuttles, and therefore may not be the most desirable course of action to take. Because of this, we have increased our efforts to develop non-lethal means to temporarily preclude access by our adversaries to Space systems.

Space control, like airspace control, is a mission shared with the Air Force and the other services. The ultimate objective is to ensure freedom of action in Space for friendly forces while denying it to the enemy. The Army's role in this function is from the terrestrial perspective, such as attacking satellite control nodes and facilities from the ground, and operating ground-based Space control systems. As part of the joint team, Army Space control capabilities will facilitate freedom of action in the area of operations as well as in Space. The articles in this journal provide tremendous detail on the work that is being accomplished in the area of Space control. I encourage you to study the articles and share this information with those you support.

Secure the High Ground!

Space Control Necessary for Information Operations Enabling Army Transformation

BG Richard V. Geraci, Deputy Commanding General for Operations, United States Army Space & Missile Defense Command/Deputy Commanding General, United States Army Space Command.

By BG Richard V. Geraci

Under Officer Personnel Management System XXI, the Army leadership had the foresight to place Information Operations Officers FA 30 and Space Operations Officers FA 40 in the Information Operation (IO) Career Field. Six years later, these officers are now working together to address Space control and IO issues. Their expertise has gained in importance as the military utility of Space-based capabilities and IO is better understood by commanders and their staffs.

Achieving information dominance, and thus, decision superiority, is the driver for IO. The Army is transforming into an information-centric force — depending on information for real-time collaborative planning, communications and reach-back capability on the move, making decisions quicker than the adversary, and precision lethal engagements. The effectiveness of the Army's Transformation — and the transformation efforts of our sister services — will depend on how successful we are at achieving decision dominance through IO and Space control. Space Operations Officers need to understand Space control and IO to effectively support their commanders.

The emerging definition of Information Operations — *Actions taken to affect, influence, or defend information systems and decision-making* (draft DoD Directive 3600.1) — recognizes the importance of information systems and information, and focuses our efforts on influencing an adversary's decision-making to our advantage. When you read the new draft or current DoD Directive, you will not find Space operations, Space control, or Space force enhancement anywhere in the document. Rather, you will find the implied tasks of controlling space and maximizing Space-based capabilities that must be executed for successful IO.

The Army is, and will remain, the largest user among the services of Space-based capabilities. We must maintain control of Space to ensure access to critical information, much of which is provided by Space-based capabilities. Space control is the ability to ensure freedom of action in space through and within the Space medium and, if necessary, the ability to deny others the use of Space. The Objective Force will need to employ sophisticated Space control capabilities to deny or disrupt an adversary benefit from valuable Space-derived and Space-reliant information. If we lose control of Space, our decision-making capability may be jeopardized. Continuous wargaming sponsored by TRADOC, Joint Forces Command and the Air Force over the past several years, and the most recent Army Transformation Wargame demonstrated that the Army must improve IO, acquire organic Space control capabilities, and effectively utilize Space-based force enhancement capabilities from DOD, civil, commercial and foreign sources. Two of the six critical transformation goals include Space control and IO (highlighted on the next page). The other four depend upon Space and information if the transformation is to succeed. We must get into the habit of addressing these two disciplines together when discussing support to the warfighter. Both Space and IO remain areas where many leaders have yet to fully understand their significance and relationship or their impacts on the warfighter.

Our Army's objective forces will be highly information-centric. They will rely heavily on reach-back capabilities for command and control and to gain critical intelligence, surveillance and reconnaissance information. This space-enabled reach-back will be critical for setting the conditions for success, prior to and during early entry and other "transition" periods in support of mission operations.

As a Space Operations Officer, you are part of the 'IO cell.' You must effectively plan for Space control to support the commander's IO mission.

Critical Operational Goals for Transformation

- Protecting critical bases of operations and defeating chemical biological radiological nuclear explosive weapons and means of delivery.
- Projecting and sustaining U.S. Forces in distant anti-access or area-denial environments and defeating anti-access and area-denial threats.
- Denying enemies sanctuary by providing persistent surveillance, tracking and rapid engagement with high-volume precision strike, through a combination of complementary air and ground capabilities, against critical mobile and fixed targets at various ranges and in all weather and terrain.
- Assuring information systems in the face of attack and conducting effective Information Operations.
- Enhancing the capability and survivability of Space systems and supporting infrastructure.
- Leveraging information technology and innovative concepts to develop an interoperable, joint command, control, communications, computers, intelligence, surveillance and reconnaissance architecture and capability that includes a tailorable joint operational picture.

Source: Army Transformation Roadmap

The Army needs to relook its Space and IO doctrine. Currently FM 3-13 (IO) is out for coordination, but the Combined Arms Center drafted the manual before DoD began reworking its view of IO. The Center did include in the manual a small section identifying some of the IO responsibilities of the Space operations officer.

This summer, the Army staff conducted a full-spectrum IO study to best answer questions concerning command and control, force structure, joint force support, and many other challenging issues. One issue the study did not address is the relationship of IO and Space control. This is an area where we, the Army's Space experts, must take the lead in demonstrating the mutual advantages these two functional areas provide one another.

As a Space Operations Officer, you are part of the "IO cell." You must effectively plan for Space control to support the commander's IO mission. However, before you can do that, you need a good understanding of IO and its associated elements. In fact, this summer we began an instructor exchange program between the FA 30 and FA 40 officer qualification courses to promote that understanding.

Space Operations Officers must understand Electronic Warfare, Psychological Operations, Military Deception, Operations Security, and Computer Network Operations capabilities, all recognized by Joint Doctrine as important component capabilities of IO. As you protect our Space assets, the links and infrastructure, you enable IO. As you advise commanders on the timing of protective measures (effective camouflage, concealment and deception) to deny enemy space operations, you enable IO. In planning to deny an adversary use of Space assets, you must understand the employment of all tools available. You should understand the role, mission and functions of the Space Electronic Warfare Detachment; and work with the IO cell to integrate it into the commander's deliberate and crisis-action planning processes. You must understand the mechanisms and tactics that the enemy could implement in their efforts to asymmetrically use space (and our dependence upon space) against us. The Army Space Command G3 IO Branch and the Space and IO Element can assist you — take advantage of their expertise.

Because IO includes information generated from Space-based capabilities or transported across Space-based infrastructure, he who controls those Space segments (Space platforms, links and ground stations) will have the superior position in controlling information and thus maintain decision superiority. It will take a proactive and IO-savvy Space Operations Officer to plan and execute Space control in support of Information Operations.

The View From (Army) Space …

'Space Control Necessary to Fight and Win in the 21st Century'

By COL Glen C. Collins Jr.

This country has sent men and women off to battle many times, but this time, elements of the U.S. Army Space and Missile Defense Command are involved. Space Operations Officers and others from SMDC are deployed in many locations around the world.

One of our Space Operations Officers was awarded an Air Medal for his actions. Our soldiers and civilians are proving what we have known for a long time — Space control is necessary to both fight and win in the 21st Century. The "genie" is out of the box with Space technology. And this reliance on Space technology brings a new dimension to the battlefield. It also brings new problems for us because the adversary also has this capability.

Sadly, though, many soldiers do not even know that their equipment — or the enemy's — relies on satellites.

That is one reason the FA 40 Space Operations Officers are key members of the team. You have a challenge to bring Space assets and knowledge of how to use Space equipment to the warfighter, and to deny those assets and knowledge to the enemy. You are skilled officers who perform an important role in winning the war.

The article by LTG Cosumano sets the theme of Space control for this edition of the Army Space Journal. He makes many important points for all of us to remember.

First, effective Space control leads to Space superiority that is critical to the success of a military force. Second, without Space technology the military would not have Global Positioning System, precision guided munitions, reach-back communications and intelligence capabilities. Next, Space assets might be the "centers of gravity" of conflicts in this century.

A single ground station could be critical to the war. Commercial Space assets now play a role in warfighting. Finally, don't ever forget that we are part of a Department of Defense team. Other services and non-government agencies all bring new ideas and capabilities together. Cooperation and sharing of data is critical to our team winning the war.

Other articles in the Army Space Journal illustrate the Army's role in Space control. Army Transformation efforts need improved Space capabilities.

Information Operations uses Space. BG Geraci's article highlights the importance of IO in our work. The new definition of IO points out that the actions to influence our enemies' decision-making cycle are necessary to operations. A draft of IO doctrine emphasizes the void that existed in this area to accomplish the mission.

Again, you are a part of this new and exciting change in warfighting.

But these Space capabilities are not just useful for winning wars. Army Space Command provided assistance in fighting forest fires this year with our Space capabilities. Just like our Air Force partners who use organic aircraft equipment (C-130s) to drop slurry on forest fires, Army Space used organic assets to provide pictures taken from Space of the fires to the Forestry

The new U.S. North Command will need you. The new U.S. Strategic Command will need you. Professional Army Space Operations Officers facing and solving those new challenges will make the difference.

— COL Glen C. Collins Jr.

Service headquarters.

The same assets that fight and win wars were used to help our neighbors save their homes and businesses.

New equipment, doctrine and transformation efforts make this an exciting period in our Army. Your mission is to demonstrate to the Army leadership and the country that you are a valuable addition to the future of the Army.

The new U.S. Northern Command will need you.

The new U.S. Strategic Command will need you.

Professional Army Space Operations Officers facing and solving these new challenges will make the difference.

Move Out! There's a war to fight.

On this note, let me add some thoughts about your careers.

On July 16, at 0730 EDT, the Army released its first Officer Personnel Management System XXI Lieutenant Colonel selection list. We FA 40s had one officer picked up-above-the zone, one below- the-zone, and six of 10 officers picked in the primary zone. I had the good fortune to be a member of that board.

First, I will tell you that the board process that the Army has put in place is as fair as it can be. The board is composed of officers equitably distributed in all four of the Army's career fields; two were from the Information Operations Career Field. The files are voted on by career field, so your file competes only against other members of the IO Career Field, and in no way against those of the Operations Career Field. Files are voted the same from one career field to the next, with each voting done distinctly by career field.

If you are promoted, it is because you have done the right jobs, your work has been recognized with strong Officer Evaluation Reports and you have improved yourself with training and education. The selection process is fair.

Second, I'd like to share with you some observations about the board process, and in particular what you should be doing to better your chances of selection. Board members are given files from a given career field in a somewhat random process. Each file is voted distinctly and secretly by all of the board members. No board member can influence the outcome of the votes enough to prevent your promotion. Each file we receive, contains a picture, your Officer Record Brief and your microfiche.

The picture is your first communication to the board member. So long as your picture is current — in the new ¾ color format — it will not make much difference in the outcome of the vote. You should have a professional, confident appearance to ensure the picture does not send the wrong message. Absolutely do not let your file go before the board with either no picture or a picture that is the old style picture. When you do that, you have just sent a message to the board member that you don't care if you are promoted or not. If you believe in yourself and know that promotion is a chance to help more soldiers and assume greater responsibility, then you want

(See View from Space, page 37)

Information Operations and the Joint Force

By Mark Goracke

Space surveillance, negation, prevention, protection, computer network operations, deception, operation security, influence operations — how does it all fit?

These activities are just some of the pieces of the Space ops and Information Operations (IO) puzzle. It has been 11 years since work began to develop joint doctrine for Space Joint Publication 3-14, (Joint Doctrine for Space Operations). When JP 3-14 is formally approved, you will discover it still won't have all the answers, but it does illuminate the operational framework and describe mission areas in language even I can understand. My purpose here is to focus on the Space control mission area articulated in JP 3-14. I'll outline its missions and discuss how it will likely relate to emerging DoD views on IO and joint operations.

In accordance with joint doctrine, Space operations consist of four primary mission areas: Space control, force enhancement, Space support, and force application. Space control operations include surveillance of Space, protection, prevention and negation missions. For our purposes here, I will peel the onion a little and discuss the four Space control missions that are conducted across the range of military operations (peace-time to war).

Surveillance of Space is conducted to detect, identify, assess, and track Space objects and events. Effective Space surveillance is essential for our ability to conduct Space control and achieve situational awareness within a given theater/Joint Operational Area. The information or data produced through surveillance of Space can be used to support terrestrial-based operations, such as missile defense, and avoidance of enemy reconnaissance assets. BOTTOM L LINE: Space surveillance products should be available to a tactical user (Patriot battery in the field) as well as the intelligence analyst stationed in Washington, D.C.

Negation measures are designed to deceive, disrupt, deny, degrade or destroy enemy Space systems and capabilities. They are offensive actions that often target a ground link or Space segment of an enemy Space system. Deception measures are designed to mislead an adversary through manipulation, distortion or falsification. Disruption temporarily impairs enemy systems; denial temporarily removes or eliminates them.

Degradation efforts permanently or partially impair an enemy Space system, usually through physical damage, and include attacking both ground and Space segments of the targeted system. Destruction is the permanent elimination of a given Space system's capability. Examples include attacks on key ground nodes, uplink or downlink and power sources, command and control facilities and even assets in orbit. Destruction can be achieved employing kinetic or non-kinetic means — it could even involve dispatching a person armed with a hammer or a laptop, although that *might* be an over-simplification.

Prevention activities preclude an enemy's use of U.S. or third party Space systems and services. Prevention measures include military as well as political or economic actions. An example of prevention could be our effort to purchase all the available commercial imagery in a given theater of operations. In simple terms, we may not be able to prevent commercial sources from taking pictures but we can buy all the pictures they take and thus prevent the information from falling into the wrong hands.

Protection measures consist of active and passive measures to ensure U.S. and friendly Space systems continue to operate in a hostile environment. In essence, these measures counter an enemy's Space negation efforts or minimize their effects. Space protection measures may also be employed to counter or marginalize the

effects of Space environmental factors. Active and passive protection measures must be prioritized and consistent with overall mission priorities. Examples of protection measures include ground facility defenses, satellite radiation hardening, mobility, concealment, and link encryption.

Now that I have briefly described the doctrinal framework for Space control, I will cover some of the emerging IO policy changes and how they tie into the Space control mission area. On the Office of the Secretary of Defense's initiative, DoD Directive 3600.1, Information Operations policy, is obtaining a face-lift and will trigger a revision of JP 3-13, IO Joint Doctrine. Hopefully, that effort won't require as many restarts as JP 3-14 and there will be something for us to use in 21 months or less. The sixth version of the draft 3600.1 is currently being staffed with the military services and redefines IO as actions taken to influence, affect or defend information, information systems and decision-making. On the surface, the differences between this definition and the old one in JP 3-13 are rather subtle, but in essence it narrows the IO focus. For starters, the new definition indicates that we should look at influencing all foreign perceptions and decision-making. It implies that in peacetime, IO influence ops could mean not only targeting an enemy or adversary, but also neutral foreign parties or potential allies. In crisis short of hostilities, the draft directive states that IO may also be used as a flexible deterrent option to communicate national interests or demonstrate resolve. In conflict it may still be applied in its traditional role to achieve physical and psychological results in support of strategic or operational objectives.

The IO framework outlined in the new 3600.1 revolves around core, supporting and related capabilities. Core capabilities are divided into two parts: psychological operations, military deception, and operations security oriented on influencing adversary decision makers or groups while protecting friendly decision-making; and Computer Network Operations and electronic warfare which are employed to affect and defend the electromagnetic spectrum, IO systems, information weapons and command and control. Supporting capabilities include Counter Intelligence, physical attacks, physical security, information assurance and intelligence. Related capabilities consist of public affairs and civil-military operations.

Now that I have outlined the Space Control and emerging IO frameworks, let's briefly discuss how these missions and capabilities complement one another. To begin, Space surveillance, also categorized as an intelligence activity, is an IO supporting capability. It's not implied here that all Space-based surveillance only supports IO. The point is, Space surveillance is critical to achieving information superiority — the IO objective. Negation activities in Space closely align with the IO core capabilities of deception, operations security, electronic warfare, and Computer Network Operations. An example of mission lash-up would be electronic spoofing measures to deceive an enemy on the true location of our Space surveillance assets.

The take-away point is negation deception measures should be fully coordinated and integrated with overall IO deception planning and execution. U.S. Space Command is the DoD lead for Computer Network Attack and Defenses and therefore, joint Space support teams and other Space experts deployed to a given theater must be involved in theater Computer Network Operations planning and operations. Space Control prevention activities support the IO core capability of operations security and supporting capabilities of counter

(See Joint Force page 40)

Space Control and Information Operations

By Jeff Harley

There exists today a symbiotic relationship between Space Control and Information Operations. Recent events in Operation Enduring Freedom show we are just now beginning to understand the mutual advantages these two communities provide.

The overarching focus of Joint Vision 2020 is full spectrum dominance achieved by the interdependent application of dominant maneuver, precision engagement, focused logistics and full dimensional protection. Information superiority becomes the key enabler to achieving full spectrum dominance — Information Operations (IO) and Space control have become the pillars. Army Space Operations Officers today need to understand the relationship between IO and Space control, and how Space control can support current and future information operations.

IO in a Nutshell

Information Operations do not merely attack computers, satellites, and communications networks. While IO may use these means to influence a decision-maker, IO considers how humans think and make decisions. IO also has to defend friendly information systems, decision-support systems, and decision-making. Ultimately, IO is about will. IO provides the U.S. the ability to influence an adversary's will to fight while protecting our forces and our will.

The Department of Defense Directive 3600.1 will define IO as "actions taken to influence, affect, or defend information, information systems, and decision making." DoD policy employs IO in support of full spectrum dominance by taking advantage of information technology, exploiting the growing worldwide dependence upon automated information systems, and capitalizing on near real-time global dissemination of information to affect an adversary's decision cycle with the goal of achieving information superiority for the United States.

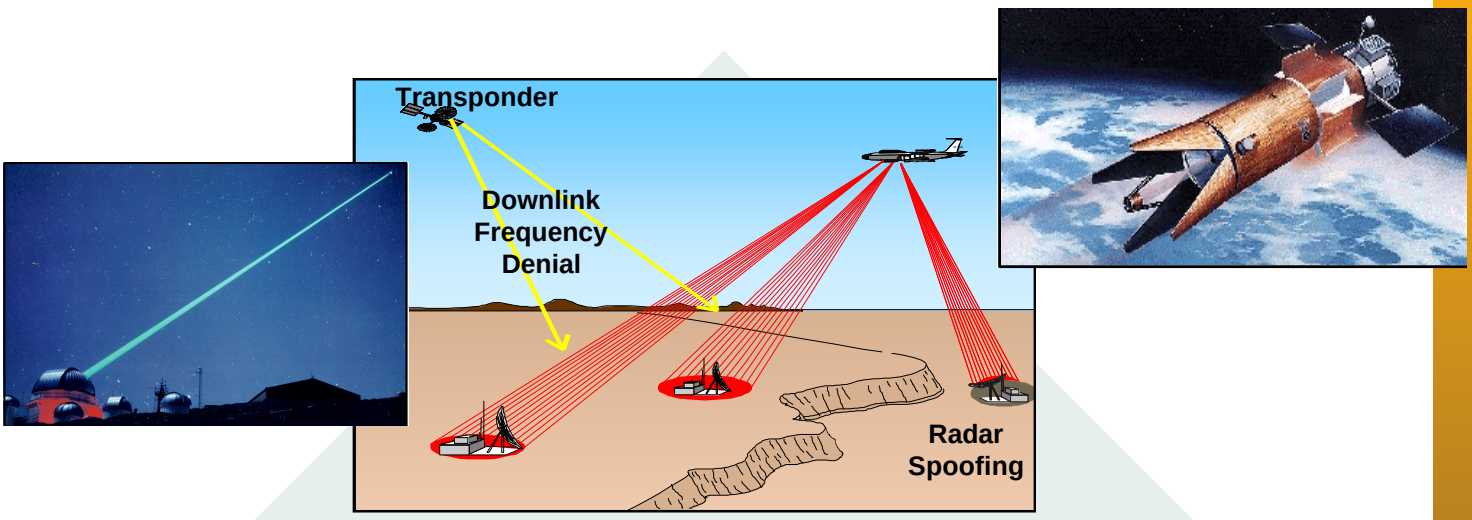
The new directive identifies only five core capabilities for IO. Psychological operations, military deception, and operations security capabilities influence the foreign decision-makers or groups and protect friendly decision-making. Computer Network Operations and Electronic Warfare capabilities affect or defend the electromagnetic spectrum, information systems, and information that support decision-makers, weapon systems, command and control, and automated responses. Computer Network Defense and Computer Network Attack comprise Computer Network Operations.

Counterintelligence, physical (i.e., kinetic) attack, physical security, and information assurance become IO supporting capabilities. These supporting capabilities can influence decision-makers or groups or target information systems, while detecting, safeguarding, and mitigating threats to our own information systems and decision-making processes. Public Affairs and Civil-Military Operations remain related IO capabilities, and help shape the information environment.

A misconception, or "urban myth," seems to have arisen in the last few years. All Space Operations Officers must understand that Space control is not an IO capability. They are two distinct mission areas governed by two separate sets of directives and manned by two unique force structures.

Space Control in a Nutshell

Today our military operations depend on Space capabilities. In the future, new doctrine, technologies, and force transformations will dictate an ever increasing reliance on Space services for command and control, communications, intelligence, navigation, and so forth. The protection of our Space capabilities and denial of an adversary's use of Space is key to information superiority. Lessons learned during the Desert Storm, Kosovo, and Operation Enduring Freedom campaigns underscore and demonstrate the value of operating in Space. Potential adversaries and unfriendly powers have noticed these lessons as well. Adversaries will probe



our Space systems for vulnerabilities. They may gain access to our systems and tamper with or exploit the data and information they carry. The assumption Space capabilities will always be there is wrong — there are no guarantees.

Space control provides "… freedom of action for friendly forces in Space while, when directed, denying it to an enemy," and consists of four operational elements. Space protection employs active and passive defensive measures to ensure U.S. and friendly Space systems operate as planned. Space surveillance monitors, detects, identifies, tracks, assesses, and categorizes objects in Space. Space prevention employs measures to prevent enemies' use of data or services from U.S. or friendly Space assets. Space negation denies freedom of action in Space to enemy forces by disrupting, denying, degrading, deceiving, or destroying enemy Space capabilities.

Space Control Support to IO

The ability to delay or deny information from Space systems, at any level of conflict, provides the basis for information dominance. The Army must seek control over the information or products Space systems provide; recognizing these Space systems are distributed weapon systems, consisting of three segments: an orbital segment, a ground segment, and a link segment. Attacking any of these three segments can provide information superiority and interrupt or affect an enemy's decision-making cycle without necessarily involving the physical destruction of systems or facilities.

Operational centers of gravity in the orbital segment of an enemy's Space system can be the entire satellite or the satellite subsystems critical for mission performance. We do not have to destroy a satellite to prevent it from accomplishing its mission and deny an adversary use of the Space environment. Temporarily damaging or disrupting vital satellite subsystems can prevent satellites from effectively accomplishing their mission. Examples of vital subsystems include satellite attitude control sensors, mission sensors, uplink/downlink antennas, and power generation systems. Directed at an orbiting satellite, high-energy beams projected into Space can dazzle or blind a satellite's sensors or cameras, interrupting or denying the flow of information at critical times.

The center of gravity in the link segment is the communications link, the radio frequency used to pass information to and from the satellite. Since most satellites rely on uplinked command and control information from the ground for station keeping, payload management, and satellite health and status functions, attacking a satellite's uplink during critical commanding periods could seriously degrade mission performance. The effectiveness of electronic jamming, however, is limited because of line of sight restrictions and increased satellite autonomy, therefore, attacking the downlink, rather than the uplink, is usually an easier and more reliable method of disrupting a Space system. Using Computer Network Attack or electronic warfare to attack the link segments provides the military a non-kinetic option to deny information to an adversary.

Since satellite downlink telemetry contains the mission information and health and status information on the Spacecraft and the satellite's sensor, successfully attacking the downlink directly attacks information flow and, therefore, may have a more immediate effect on achieving information dominance. Many countries, including Russia, China, Iraq, North Korea, Iran and Cuba, possess electronic jamming capabilities to disrupt satellite operations. Russia's Aviaconversia marketed a 4-watt Global Positioning System (GPS) jammer weighing about 19 pounds but capable of denying GPS reception for about 125 miles. Disrupting GPS signals can inhibit force-tracking systems, and influence military decision-makers.

The centers of gravity in the ground segment include satellite launch facilities, command and control facilities,

(See Information Operations, page 38)

Information Dominance: Why the Army is Interested in Space Control

By Doug Burdette

The performance capabilities of current micro circuitry technologies and the rapid maturation and proliferation of their fabrication processes have resulted in a virtual worldwide availability of cost effective, highly capable and miniaturized communication products and services to include a plethora of miniaturized communication units (voice and/or data) with multiple spectrum access and multiple high-speed data management modes. In addition, large regional communication support systems have emerged to support these communication products in even the most remote areas around the globe.

For the radio frequency communication links, regional systems facilitate highly reliable communication through repeater/boosting and netted station functions that often incorporate autonomous signal filtering for improved clarity and auto path management (trunking) of data for optimal throughput and speed. In addition, many current systems are emerging with sophisticated interface capabilities into existing hard wire communication architectures to expand reach into earlier generation systems at remote locations and provide the flexibility to handle diverse data formats.

Refinements to existing hardwire communication systems also reflect technology advancements with improved interface speeds and the addition of fiber optic or micro-weave link segments to enhance data transfer volume and speed. Another advancement which plays a significant role in the communication equation is the maturity and diversification of battery technology. Current battery technologies provide relatively high energy density in small rigid or conformal packages that are virtually insensitive to thermal extremes and provide highly repeatable deep cycle energy yield. These factors have greatly contributed to the current availability of a global, readily accessible, non-military communication option for virtually anyone with a modest investment. This global communication capability, though primarily terrestrial based, has logically evolved to a great level of dependence on and utilization of Space-based relay assets. These Space assets, in utilizing the aforementioned maturation of micro circuitry and battery technologies, have been able to achieve levels of performance, automation, and an orbit reliability that make them cost effective ventures in today's highly competitive communication markets.

The ability to accomplish cost effective, multiple platform launches out to desired orbital altitudes by commercial launch consortiums has also greatly contributed to the growing presence of commercial communications in Space. These factors combine to produce a multi-path global communication climate of unprecedented reach that is highly capable, flexible, and available to virtually everyone on a 24-hour basis in any geographic region.

The Future Force

The conceptual evolution of the future Army Force is beginning to reveal a logical need for significantly enhanced flexibility in force structure and functional composition. The mere range of response possibilities and conditions for perceived future conflicts suggest that force flexibility and adaptability will be an up front issue during planning, force constitution, deployment and conflict execution/resolution. The need to establish absolute information dominance is a great consideration during all phases of the conflict. It is worth noting that information dominance in itself is not the end-all goal but rather a key contributor in establishing decision

Gain Information Dominance





superiority at all points in the conflict time line. The early and continued establishment of information dominance is a distinct force effect multiplier for all levels of conflict from surgical micro level special operation forces incursions to full blown theater level conflicts at the corps/joint forces level.

Hostile Space-based military communication and intelligence assets alone present notable challenges for establishing and maintaining information dominance and force security. This urgency and concern is compounded when considering the rapidly evolving, highly capable commercial Space-based surveillance and communication assets that are proliferating outside of traditional military channels and are readily available and accessible through global reach Internet communication links. This ready access to unchecked communication and surveillance sources provides a notable enhancement opportunity for hostile human intelligence threat sources. This concern is exemplified when armed incursions are envisioned into static conflict scenarios such as static peace keeping or in rapid dynamic scenarios involving clandestine surgical special operations where security and stealth are tantamount.

The aggregation of these factors presents a clear and logical conclusion that accomplishing information dominance for the future Army force will depend on how effectively and precisely the Space data links and assets are denied to hostile utilization.

The Way Ahead

Developing key capabilities today for the future Army force requires adhesion to the operational principals and characteristics that are now being developed for that force. Simply put — make it compact, light, lean and mean. Mobility, deployability, supportability, extreme range effectiveness, and surgical precision are guiding principles. Accomplishing information dominance in a precise selective fashion will require techniques and technology applications which afford surgical controlled target responses and encompass a range of selective Space data denial effects from reversible to permanent. Integrating these technology capabilities into the possible vehicle formats of the future Army forces presents engineering challenges that are considered accomplishable within the identified development window.

The investigation of directed energy technologies in this mission area is a logical conclusion when considering the functional physics of the threat itself. Directed energy options open up an appealing set of concept possibilities to explore where Army technology investments and success have shown promise and could be leveraged and focused towards specific technology performance goals. Directed energy applications on the future battlefield will require advanced management and automation measures as well as system level compatibility with the common logistics support picture. The way ahead for accomplishing battlefield information superiority and, ultimately, decision superiority for future Army forces clearly lies in the leveraging and utilization of Army Technology accomplishments.

Doug Burdette serves in the U.S. Army Space and Missile Defense Command Space Technology Directorate. His professional experience includes Underground Nuclear Testing at the Nevada Test Site, development of advanced very large scale integration technologies and advanced concepts for ground-based interceptors and Space systems, and extensive research and development involving Special Programs. He served on advisory panels to the Office of the Under Secretary of Defense on joint service issues and is a certified Strategic Arms Reduction Treaty Inspector under the Defense Intelligence Agency.

Space What? … Space Control

By MAJ Lem Williams

Space control has been an escalating concern for some years now and has recently come to the forefront of Department of Defense concerns and issues. As defined in Joint Publication 3-14, Space control is the ability "to ensure freedom of action in Space for the United States and its allies and, when directed, deny an adversary freedom of action in Space." The U.S. Army is the largest user among the U.S. military services of Space-based capabilities and information — its dependency on these Space resources will only continue to grow with the advent of the Objective Force. The good guys (Blueforce), the enemy (Redforce), and the rest of the world (Greyforce — civil and commercial) are today's Space customers. The product line includes but is not limited to: position and navigation; environmental monitoring; intelligence, surveillance, and reconnaissance; communications; and missile detection and warning. This article illustrates why Space control has emerged as a primary focus in today's three-dimensional tactical arena of modern warfare.

To better understand the interdependencies and relations within Space control, certain categories need to be identified and defined. Space control requires the fluid integration of four interrelated areas:

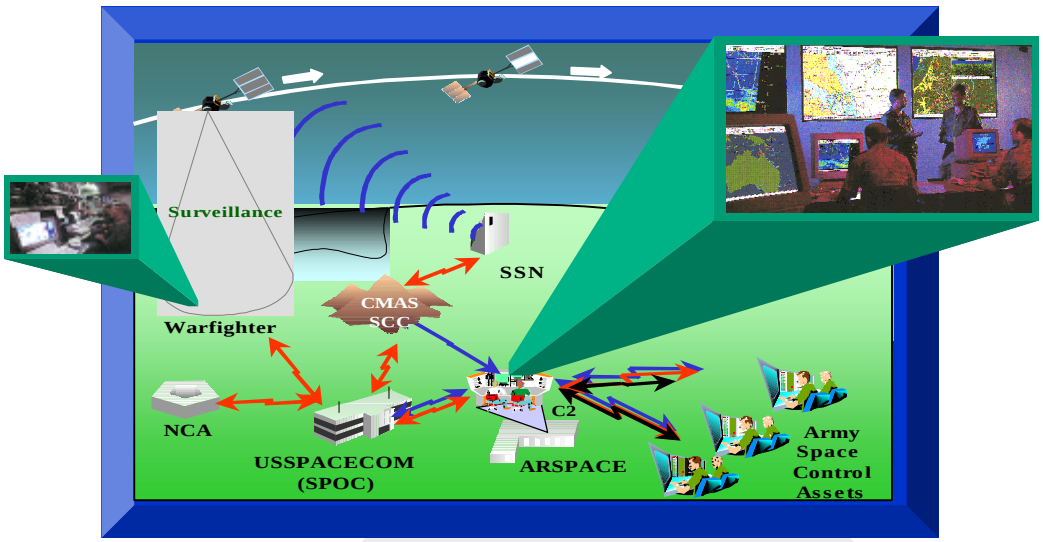
- **Surveil the Space operating environment** (Space, air, and ground), including intelligence-gathering functions, to achieve and maintain Space situational awareness that is the foundation of all Space control efforts.
- **Protect our critical Space systems** from hostile actions and environmental hazards; requires foreknowledge and warning of possible threats, both natural and man-made.
- **Prevent unauthorized access** to and exploitation of U.S., partner, and allied Space systems, when required; is the application of all elements of national power, to deny an adversary from exploiting U.S., partner, and allied or commercial Space capabilities.
- **Negate Space systems** that place U.S., partner, and allied interests at risk. We will act to negate an adversary's Space capability by targeting ground-support sites, ground-to-Space and Space-to-ground links, or Spacecraft.

Through a holistic and unified approach, Army/U.S. forces must integrate a suite of terrestrial- (ground) and extraterrestrial- (Space) based capabilities to facilitate the continued security of national assets and the U.S. dominance in Space. Branches of the armed forces no longer have the luxury of operating autonomously during military/combat operations. Joint situational awareness is imperative to the success of these operations and the mitigation of collateral damage or fratricide.

Of these four pillars of Space control, negation is probably the most critical to the warfighter because it allows him to "squeeze the trigger" in immediate response to enemy threats. While using the other pillars to fortify his position, the warfighter can pick the time and place to engage the enemy without fear of reprisal. Negation is the ability to deny, disrupt, deceive, degrade, or destroy an adversary's Space systems and services. It involves military actions to target ground-support sites and infrastructure, ground-to-Space links, or Spacecraft.

Further defined, these missions are:

- Denial, the temporary elimination of the utility of a Space system, usually without physical damage (total removal).
- Disruption, the temporary impairment of the utility of Space systems, usually without physical damage to the Space system (diminished value or strength).
- Deception, which consists of those measures designed to mislead the enemy by manipulation, distortion, or falsification of evidence to induce the enemy to react in a manner prejudicial to their interests.
- Degradation, the permanent, partial, or total impairment of the utility of Space systems, usually with



physical damage.

· Destruction, the permanent elimination of the utility of Space systems. This last option includes special operations forces interdiction of critical ground nodes; destruction of uplink and downlink facilities, electrical power stations, and telecommunications facilities; and attacks against mobile Space elements and on-orbit Space assets.

In order to accomplish the negation mission, the other three pillars of Space control must be effectively integrated. This vital integration is most apparent in the "key tasks" and "key capabilities" listed below. These capabilities provide the assurances and parameters that the warfighter needs to use these assets with the surgical precision required for modern engagements.

Key Tasks:

· Target identification — know what you are shooting.

· Weaponeering — hit your target.

· Operations cycle — know when to shoot.

· Develop and maintain a force structure — be armed and ready to shoot in short order.

Key Capabilities:

· Flexible effects achieve the range of reversible and permanent negation.

· Precision attack minimizes or eliminates collateral damage so we do not harm or destroy Space services for the United States or our allies.

· Employment on demand protects forces and supports military operations; combatant commanders must be able to negate Space systems immediately (the "trigger").

· Combat assessment includes real-time identification of system users, types of support provided by the Space system, effects of system loss on enemy operations, and alternate sources for support.

In the short term, the Army is preparing itself for the full implementation of Space/Space control as a battlefield operating system in the future by:

· Developing system operational requirements documents for negation and surveillance.

· Establishing a Space control integrated concept team.

· Establishing the FA 40 — Space Operations Officer.

· Executing Space control programs and missions for the warfighter.

· Experimenting and demonstrating new technologies with and for the warfighter

· Integrating Space control in the Objective Force table of organization and equipment.

In the longer term, the Army has the goals of institutionalizing, operationalizing, and normalizing Space and Space-based products/capabilities. These three terms refer to the on-going efforts and desired future goals of the Army to transform this "Holy Grail — Star Trek" vision of Space into a forged tool of war. The mindset of considering Space in all daily operations is being rapidly infused into the formal officer education process and will soon enter the warrant officer and enlisted ranks.

Institutionalize — Space capabilities and knowledge of their limitations must be fully understood throughout the ranks. Officer, warrant officer, enlisted, and Department of the Army Civilian education must cover the spectrum of Space capabilities and Space control.

Operationalize — Embed Space capabilities and the understanding of their limitations into everything the Army does to include planning, operations, wargaming, and exercises. Appropriate models and simulations of tactical Space capabilities must also be incorporated.

Normalize — Ingrain and use Space and its capabilities in day-to-day activities and thought processes. It

(See Space What?, page 39)

Army Space Assists With Western Wildfire Fighting

By MAJ Laura Kenney

When you think about fighting the devastating power of a forest fire, the first images that surface are those of heroic, brawny firefighters — soot and sweat smeared — battling the searing flames literally first hand.

Today's technology, however, has added a new dimension to fighting this particular "enemy." The peculiar ability of wildfires to creep slowly, or leap quicksilver, has hindered man's efforts to subdue them for centuries. Now, it's actually possible to "outsmart" these natural disasters.

Satellites and computers are allowing firefighters to predict the course of a fire, plot hot spots and trigger points, and plan the best ways to outmaneuver these destructive infernos.

Satellites are where Army Space Command comes in. Army Space soldiers and civilians, equipped with the latest in sophisticated technology, joined the firefighting force this summer. By combining Space-based capabilities — satellite imagery and infrared data of the fire area — soldiers and civilians in the Command assisted the forestry service in mapping boundaries, locating hot-spots, and keeping an eagle eye on crucial trigger points.

Two years ago, Army Space was asked to provide a satellite picture of wildfires burning in Idaho, and the Command was able to provide hard-copy images of the fire within 48 hours. This summer, they updated a Web page dedicated to the fires every two hours.

This year, the Colorado wildfires — almost in Army Space's backyard — were the first to come under the "eyes" of the satellites used by Space operators here. The Hayman giant, which in its heyday consumed over 137,000 acres, destroyed 65 homes, killed a forever unknown but massive number of animals, and caused more than 38 million dollars worth of damage, was the first to be 'captured' by satellite.

"We were very eager to help," said LTC Robert King, Army Space Forces executive officer. "I think everyone wanted to pitch in someway, be it through donating comfort articles or those adventurous souls who would have been, if allowed, up there side-by-side with the firefighters.

"As soon as the request came in from the forest service, we jumped on it. We were just one piece of the firefighting puzzle, but if it helped contain it any sooner, or helped someone avoid hazard, then we did a good thing."

Military forces can be called upon only when certain criteria of danger are met, and the forces available to fight fires nation-wide are depleted. That level was reached early on with the Hayman fire. The Air Force responded with slurry planes, Fort Carson, Colo. with engineers and actual firefighters, and then Army Space — with its 'eye in the sky' — became a crucial player.

The images, taken by spectral sensors, provided topographical information. The infrared data offered textual information regarding the intensity of the burn at a given point. The combination of images and data enabled those on the ground to maneuver to the best advantage.

The spectral images were provided by the Spectral Operations Resource Center (SORC) division of Army Space. The Center's mission is to exploit images gleaned from commercial and civil satellites for operational and tactical forces.

The infrared data was supplied by another branch, 1st Space Battalion's Joint Tactical Ground Station (JTAGS), which accesses information from the Defense Support Program satellite constellation, used primarily for missile detection.

"Assisting with the fire, which was something all of us wanted to do, didn't detract from our primary mission. In fact, we were able to incorporate it as training. It's the same process to scan for military targets as it is to assess fire damage, and there was the considerable added satisfaction of doing an immediate good," said SORC Officer in Charge, MAJ Tim Haynie.

The maps were posted on a link to the Army Space Command Web site, available to all, but aimed primarily at the Forestry Service and firefighters.

"Assisting with the fire, which was something all of us wanted to do, didn't detract from our primary mission. In fact, we were able to incorporate it as training. It's the same process to scan for military targets as it is to assess fire damage, and there was the considerable added satisfaction of doing an immediate good."

— SORC Officer in Charge, MAJ Tim Haynie

U.S. Forestry Service representative Melinda McGann said, "We've worked with this level of technology before, and it's invaluable. We took infrared pictures at night, when things were cooler, and, combined with the products we got from Army Space, I think we compiled an extremely clear picture of the fire. And you can always fight so much better when the 'enemy' is clearly seen."

The Hayman fire was the first that Army Space assisted with, but the even deadlier Arizona fires also received keen satellite attention. The Web site link was originally named Colorado Fires, but was changed to Western Fires as Army Space expanded the mission to include other fires in the western part of the nation.

"We had the ability and the desire to help. It's a great thing, what the technology can do, but it's just as important that it was operated by soldiers, airmen and civilians wanting to help their neighbors. And in some cases, it literally was neighbors, or even themselves, as we had quite a few homeowners in the danger zones. So everyone was very upbeat about being able to do something positive," said JTAGS Systems Integration Officer, Chief Warrant Officer Jeff Sprague.

One Army Space contractor who worked with the spectral imagery admitted, "My interest in this was frankly very dual sided. I knew what the technology could do, which was exciting. But I'm also a homeowner whose house was endangered. I'd lost my home to fire before, not a forest fire, but I definitely didn't want to go through it again. This technology can help many in similar situations," said George Wood.

SFC Louis Torrez, a JTAGS analyst who worked on the fire, said he found the mission immensely satisfying. "I found a 'hot spot' registering a '5' and immediately phoned the Forestry Service. When we saw anything of that magnitude, we didn't wait for the two-hour updates, we called right away. They sent out a chopper and confirmed it was a dangerous point, so we simultaneously provided assistance, and validated our system."

Weekly meetings were held between Forestry officials and crews from Army Space working on the fire to provide feedback on how efficiently the system worked. The Forestry Service requested that a liaison be provided to serve at the command post to assist in interpreting data.

As the Hayman fire was largely contained at the time, Army Space officials concentrated on the next burgeoning danger zone, which proved to be the Missionary Ridge fire. A liaison from JTAGS was sent, SFC Marc Van Horn.

"We were still learning, and they were still learning, but I definitely knew that the Forestry Service felt we'd really been able to help. Like any new program, refinements needed to be made, but I saw this as being positive proof of the value of satellites," said Van Horn.

Interest in those abilities was keen. At every weekly meeting, new faces showed.

"I can't overemphasize what a contribution I think your people and your technology can make," said attendee, Bill Mills, Wildland Risk Management Officer for Colorado Springs. "We've been in situations in the past where the only warning we might get is a neighbor running up to our truck when we're out on patrol, telling us the fire jumped a line, or was threatening his house."

"I don't want to sound like Chicken Little — the sky is falling — but, we'd sure like to know if it is, and with you guys providing up-to-date information, we can do our jobs so much more efficiently. And since my primary job is evacuation and the saving of human lives, quick information is the key."

MAJ Laura Kenney is a mobilized reservist currently serving in the Army Space Command Public Affairs Office in support of Operation Enduring Freedom. She served five years Active Duty as an enlisted journalist with Air Defense Command in Germany. As a commissioned Reserve officer, she performed in Public Affairs in the Gulf War theater, and served as Deputy Public Affairs Officer for the American sector in Kosovo in 2001.

Commercial Imagery for the Firefighters

By MAJ Tim Haynie

The introduction of high-resolution commercial imagery and advances in spectral imagery analysis has greatly expanded the military's use of commercial imagery. Although these satellites are under civilian and other government agencies' control, the Army Space Command Spectral Operations Resource Center (SORC) has endeavored to normalize this imagery support by fostering working relationships with the vendors and exploring the utility of new imagery sensors. The recent wild fire imagery support mission was typical of Army Space's role in providing commercial and civil imagery to the warfighters; in this case, firefighters.

Since timeliness of the imagery is critical, the Army Space SORC utilizes existing contracts through the National Imagery and Mapping Agency (NIMA) and coordinates directly with the commercial and civil imagery vendors. This process significantly decreases the time required for electronic dissemination of the raw imagery — from days to hours. This is essential when fighting wildfires, due to the often rapid movement of the fire lines.

Ultimately, the fastest method of receiving data is to control the ground station that takes the information straight from the satellites in orbit. Army Space was receiving data on forest fires from the Defense Satellite Program sensors through the Joint Tactical Ground Station in real time. Had Eagle Vision II, the Army's only direct downlink ground station for commercial imagery, been in proximity of the fires, Army Space could have received satellite imagery over the affected areas in real time as well. Eagle Vision II is able to provide imagery information within two hours of collection.

Since the data is typically unclassified, electronic dissemination over the World Wide Web is the preferred method for getting the imagery from the vendors. For some, this is an automated process programmed for Army Space into the vendors' dissemination architecture. The vendors post the data to a Web site and the SORC pulls the files as needed. At the same time, a copy is also provided to NIMA for posting on the Commercial Satellite Imagery Library for archiving.

However, simply acquiring the imagery is only half the battle, since few are trained to interpret spectral imagery. Few satellite engineers had firefighting in mind when they developed their sensors.

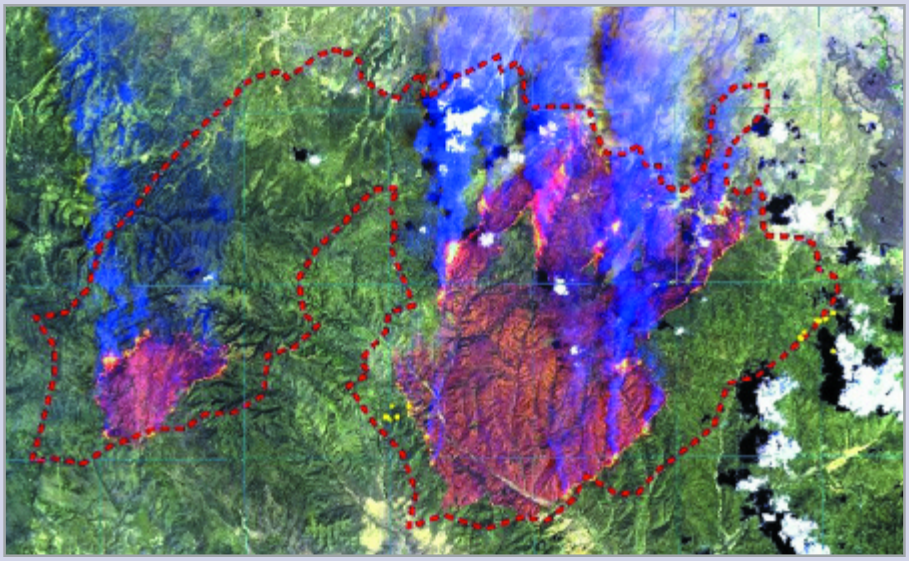
Whether it is identifying charred vegetation on recently burned land, or identifying military equipment parked under camouflaged nets, spectral imagery at the right resolution provides extensive information beyond that of simply locating an object. For fighting fires, spectral imagery analysis can identify different types of vegetation which would enable firefighters to determine speeds at which a fire will consume an area. This assists planners to better identify locations to construct their fire lines. Spectral imagery can also be used for damage assessments and to help the recovery teams prioritize their efforts to protect burned areas from mudslides and to begin the reseeding of other areas.

As the resolution of these sensors increases, so will the tactical utility of the data. Satellite sensors tuned to detect heat or light from the affected areas provide fire data that normally requires extensive planning on behalf of the local agencies, numerous low flying aircraft, and an army of firefighters to monitor the fire lines. The broad area coverage capability of these satellite sensors also enables Army Space to monitor numerous fires simultaneously and report the information.

Supporting the forest firefighters enables Army Space to show how it can provide relevant, timely data to nearly all levels of users. In this case, from the local firefighters who are the first line of defense, the larger government agencies responsible for planning support, to the recovery teams who work to prevent additional damage to the scarred ground.

This is not limited to war fighting and many of the techniques used to support military operations have applications to support relief operations as well. Pivotal to the success of either of these missions is the ability to influence the design and deployment of sensors, unrestricted access to the data, and full integration with the supported organization.

The addition of Army Space Command's information proved a significant Force Enhancer for the firefighting forces, an application directly analogous to the function Army Space's components perform in their support to combatant commands.



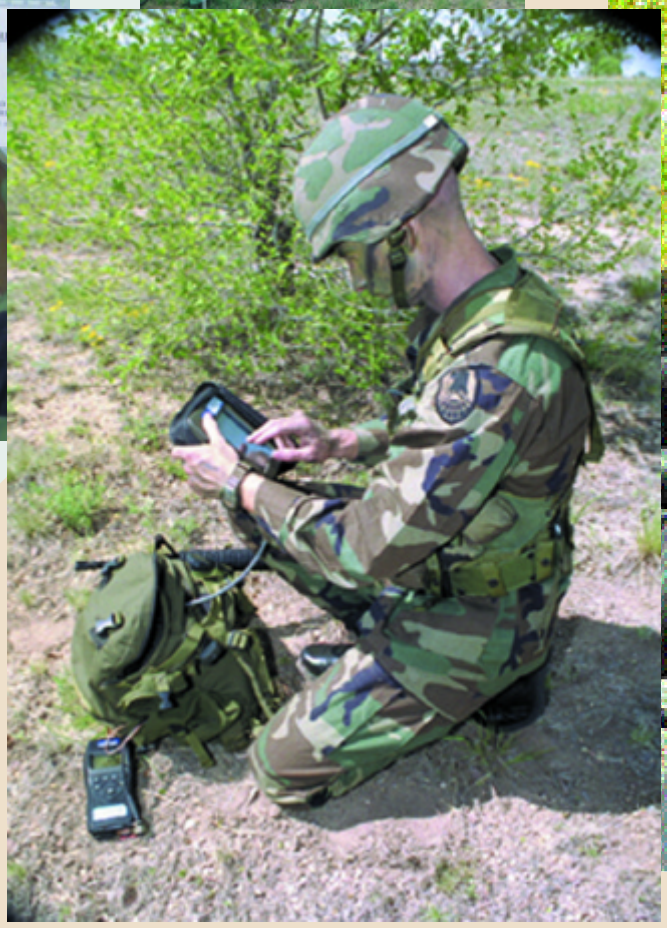
This image of the Chediski-Rodeo Fire in Arizona was taken from a LANSAT 7 Satellite on June 21. The red region is the burned area as of the 21st. The red dotted line shows the additional land the fire had consumed as of June 27.

Above, SGT Brandi Harris from the Spectral Operations Resource Center and SGT Dennis Shay with the 1st Space Battalion's Joint Tactical Ground Station (JTAGs) study maps that were used by fire-fighters and the Forestry Service to battle the western wildfires. Left, a JTAGS shelter.

MAJ Tim Haynie is the Officer in Charge of the Spectral Operations Resource Center, the first to hold that position. An Engineer officer, he previously served as the first OIC of Eagle Vision II, the Army's only commercial imagery direct downlink mobile ground station.

Space Operations Around the Globe

Army Space soldiers from all over the world perform in their unique mission specialties — from Satellite Controllers to Astronauts to Missile Warning Specialists — providing Space assets to the warfighter. Command soldiers cover the globe, from Camp Roberts, Calif., to islands in the Pacific to remote deployments in Southwest Asia to the farthest reaches of explored Space.



Army Space Command Astronaut Trains for Life in Space — Underwater

By Donald Montoya

LTC Jeff Williams, a U.S. Army Space Command astronaut, recently completed a nine-day space flight training mission. The catch is that he and two other astronaut mission specialists from the Johnson Space Center did it 60 feet underwater and 3.5 miles off shore in the Florida Keys National Marine Sanctuary.

The mission is the third of its kind between NASA and the National Oceanic and Atmospheric Administration and is being conducted under the project name NASA Extreme Environment Mission Operations. Basically, NASA astronauts live and work underwater using Aquarius — a laboratory and habitat. Aquarius is the only undersea research platform of its kind and is owned by NOAA and operated by the National Undersea Research Center at the University of North Carolina at Wilmington.

Measuring only 12 by 43 feet, this inner space station provides a similar environment to that found on the International Space Station.

"In planning for the mission, we have come to realize that the challenges associated with going to 'inner space' are very similar to the challenges of going to outer space," Williams wrote in his online journal entries from July 9 through July 22. He made the comments during a week-long training session and time aboard the Aquarius.

"As a result, our experience and lessons learned will apply directly to future space flights on the Space Shuttle and the International Space Station."

The similarities between working underwater and working in space largely center around the stresses of living in an extreme environment in an enclosed space. The lack of minimal comforts such as the ability to go home easily and the separation/isolation from family, friends and the outside world, coupled with challenging workloads, closely mirrors a space environment.

For nine days Williams, along with John Daniel Olivas, crew mission specialist, Gregory Errol Chamitoff, mission specialist candidate, and Jonathan Dory, a space habitability engineer from SPACEHAB, Inc's, Habitability and Environmental Factors Office, lived and worked in "saturation" in and near Aquarius among the coral reefs off the Florida coast.

Typically used by marine scientists to study coral reefs and the coastal ocean, Aquarius allows "aquanauts" to live and work on the seafloor for extended periods using a special technique called saturation diving. The process dramatically increases the time divers can spend working in the ocean depths.

"During this time we were isolated and unable to come to the surface," said Williams who holds the title of NEEMO 3 commander.

Williams, a veteran of Space Shuttle Mission 101, recounted the similarities of the Aquarius to the Space Station and Shuttle in his journal.

"It is amazing how similar the overhead of running Aquarius is like the operation of the Space Station or the Space Shuttle. Air quality is a high priority, of course, in both places.

"The power distribution systems are also an integral part of Aquarius and important to maintain just like space, along with the various means of communications."

One thing Williams found immediately similar to being in space was working on the ocean floor. "Working with tools, line reels and the like in the ocean was like conducting a space walk. You had to work slowly and carefully in order to go fast."

During a journal entry on Mission Day 3 Williams wrote, "Today we are planning on getting started on a

Left: NEEMO Team on conference call with the International Space Station. Far Left, U.S. Army Space Command Astronaut, LTC Jeff Williams.

Below: NEEMO 3 Commander U.S. Army Space Command Astronaut, LTC Jeff Williams with his line reel.

construction project that will help develop methodologies for conducting, controlling and coordinating similar projects on orbit, in the future on Mars or perhaps back on the Moon."

This included long dives taken outside Aquarius, which resembled space walks outside the International Space Station.

During the nine-day mission, several different NASA departments monitored the progress of the astronaut crew from the Johnson Space Center in Houston, Texas, in real-time. Underwater communications equipment and cameras provided interactive capability between the aquanauts and NASA staff.

The crew did a live webcast for educational and outreach organizations, an interview with CNN and even had time for a 10-minute telephone call with their counterparts aboard the International Space Station 250 miles above sea level as the station made its way over the South Atlantic Ocean, or as Williams put it "an inner space to outer space phone call."

This type of experience aboard Aquarius will be used to help build crew and mission control communication techniques and will provide leadership and interpersonal skills training to everyone involved.

On Day 8 of the mission Williams noted, "It's hard to believe that the diving is over. Today will be dedicated to getting our data and personal equipment organized, preparing for and initiating the decompression routine and a little relaxation ... much like deorbit prep on the Space Shuttle."

"Even though I had high expectations of the mission before, the experience has surpassed these and I couldn't be more pleased with the way things went, both personally and for the crew.

"As in all things, what makes the difference is the people. The crewmembers have been great to live and work with. Everybody has done all the right things in regard to what it takes for an expedition to work in an isolated and unforgiving environment, to operate safely and effectively, while maintaining high morale, esprit and camaraderie. Best of all, we have encountered no close calls or safety problems and everybody has had fun ... my two top priorities going in.

"The topside crew, both NASA and the National Undersea Research Center, also have been a pleasure to work with. They have gone above and beyond the call in anticipating the support we needed and responding to requests and contingencies, always in a can-do and enthusiastic way. In expeditions such as this, there is often great potential for a split to form between the deployed crew and the 'base' crew during the course of the mission but nothing of the sort occurred to us."

Williams, a scuba diving enthusiast, is fascinated with exploring the unknown and the challenges of human exploration and considers the challenges of living and working on Aquarius to be analogous to that of space. "We have realized that the mission in Aquarius transcends the experiences we will have. Like space flight, the NEEMO mission is one small page in the history of human exploration."

The public can see a recap of the crew's mission and view images by logging on to www.uncwil.edu/nurc/aquarius/.

Donald Montoya is the deputy for Public Affairs at Army Space Command. Previously, he spent 25 years at White Sands Missile Range, N.M., serving as chief of Command Information. He served as an authority on missile range historical footage providing assistance to various independent production outfits such as PBS, BBC, The History Channel and The Discovery Channel.

Rationale for Space Control as an Army Mission

By Ed Zehner

Terrestrial-based Space control is in the Army domain, it is an Army responsibility and, while it has not been codified as an Army mission, it clearly falls within the Army realm of operations — the Army has a specific interest in using it because it directly supports land operations. There are some who hope it will indeed be codified as an Army mission in the near future. The draft Army Space Control Mission Need Analysis lists the mission: "develop, operate, and maintain ground based Space control capabilities that support assured access to Space enablers, ensure freedom of action of Space systems and, if directed, to deny same to our adversaries."

Space control operations ensure freedom of action in Space for the United States and its allies, and, when directed, deny an adversary freedom of action in Space. Space control involves four interrelated objectives:

- Surveil Space to be aware of the presence of Space assets and to understand real time satellite mission operations.
- Protect our Space systems from hostile actions.
- Prevent unauthorized access to, and exploitation of our Space systems.
- Negate hostile Space systems that place our interests at risk.

Each of these Space control mission areas are detailed in other columns in this issue so doctrinal definitions will not be repeated here. Instead, the purpose of this article is to argue that Space control should be an official Army mission. Not only is Space control directed by the President of the United States as Commander-in-Chief of the Armed Forces, but it is necessary for Army force protection, it is needed to protect the Space force enhancement capabilities the Army is critically dependent upon, it contributes to Information Operations, and it has its own merit as an offensive weapon. This article discusses each of these reasons in more detail, but the starting point for this argument is the opening line: terrestrial-based Space control is in the Army domain. It is not only a natural, but also a necessary, fit.

Space control itself covers a wide range of mission areas, which introduces the need for variety in tools and weapons to execute it. In fact, each of the components of Space control requires at least several different types of systems to be reliably accomplished. The Space Control Capstone Requirements Document — validated by the Joint Requirements Oversight Council — calls for a range of systems to be used to provide robustness through diversity across the spectrum of military operations. The Council followed up with assessments of service satisfaction of negation and protection requirements, and consistently confirmed that a variety of tools, weapons, and methods is needed. While it did not go so far as to assign specific responsibilities to the services, the Council is clearly signaling that Space control is the responsibility of all services.

Practically speaking, tools, weapons, and methods operated from each of the domains — land-sea-air-Space — are needed to properly execute Space control. We can effect Space greatly from the ground and, in so doing, we can effect our land warfighters' environment and battlefield conditions. For example, electronic warfare has long been a part of U.S. warfighting and is recognized as fundamental to modern warfare. Space control executed against ground terminals, the communication link with satellites, or against the Space segment itself is nothing more than traditional electronic warfare.

The Army's interest in electronic warfare used as Space control is two-fold. First, the shooter is in the Army domain. Terrestrial-based Space control negation weapons are battle capabilities executed from the ground, potentially anywhere in or around the theater of operations, among soldiers, and for soldiers. Second, the targets are command and control, navigation and timing, and intelligence assets

which directly effect the adversary capability to fight effectively, especially on the ground.

Attacking such adversary assets is so significant it is recognized as a foundational element of Joint Vision 2020 and Army Vision 2010: information dominance. The upcoming revision of Joint Vision 2020 takes it one step further, calling for establishment of decision superiority by U.S. forces. Decision superiority, like information superiority, is a relative entity. Its value is based on our level of decision-making support capability relative to that of the adversary at any given time and over time. This is a function not only of keeping our information systems effective, but also of fouling adversary information systems. Space control offers a very significant way of both protecting our own and attacking adversary systems. This is as significant in the new realm of information warfare, and the need for information dominance, as guns and bullets. While this is a joint concern overall, on the battlefield it is no more critical to anyone than it is to Army land force operations. It should not be left to any other service. No other service has this fundamental interest in the success of ground operations. The Army clearly should maximize participation in, and contribution to, an effective Space control capability.

With the clear "good fit" of Space control with land force operations, it is hardly necessary to give additional reasons for Army interest in Space control. However, they are abundant and substantial so, for completeness, I will list them.

The most obvious is that national Space policy places a high value on Space control, requires the Department of Defense to develop and maintain Space control capabilities, and does not restrict this direction to any single service. This follows from the National Security Strategy which emphasizes the importance of Space and therefore of controlling Space. The National Space Policy codified in Presidential Decision Directive 49 directs DoD to develop and maintain Space control capabilities. The National Military Strategy directly calls on use of Space and on controlling Space to achieve its objectives. It clearly states the case: "Space control capabilities will ensure freedom of action in Space and, if directed, deny such freedom of action to adversaries." The DoD Space policy (DoD Instruction 3100.10) requires DoD to assure mission capability and access to Space; deter, warn, and if necessary, defend against enemy attack; ensure hostile forces cannot prevent the U.S. use of Space; counter, if necessary, Space systems and services used for hostile purposes.

The Army Space Policy says "… the Department of the Army will conduct Space and Space-related activities that enhance operational support to warfighters and contribute to successful execution of Army missions … . The Army's future is inextricably tied to Space." This is from the 1994 policy which is certain to have even stronger direction for Army participation in Space and Space control when it is updated. The historical approach has never been that satisfying these policies is necessarily an Air Force responsibility. None of the above documents assign specific responsibilities to particular services. The mission is apparently to be accomplished by the service whose domain hosts the operation or the service having sufficient interest in the effect of the operation to ensure it is properly done.

Another reason the Army should accept Space control as its own mission is for force protection. Since the first intelligence, surveillance and reconnaissance satellites were used to gather information about formerly inaccessible land areas, the high vantage point of Space has been recognized as a great military asset. Despite the secrecy of early efforts, the difficulty of eventual proliferation of enabling technologies is now upon us with a number of commercial systems providing militarily useful imagery. It is through Space control that this imagery is controlled before it can be used against our warfighters. Similarly, we

The Army is the premier user of DoD Space force enhancement capabilities. These are Space-based communications; position, navigation and timing; weather; warning; and intelligence, surveillance and reconnaissance. The nature of our land force operations, including the number and dispersion of soldiers, propels us to be the premier user.

might jam Galileo (a European position, navigation, and time constellation being considered for development) or even our own Global Positioning System timing and navigation signals in-theater to prevent adversaries from using them to communicate (the timing signal supports communication) and maneuver against us. In these and any number of other examples, Space control is used for the purpose of protecting the land warfighter.

The Army is the premier user of DoD Space-force enhancement capabilities. These are Space-based communications; position, navigation and timing; weather; warning; and intelligence, surveillance and reconnaissance. The nature of our land force operations — including the number and dispersion of soldiers — propels us to be the premier user. This is the basis for the third reason for Army interest in the Space control mission. One of the components of Space control is protection — protection of our own Space capabilities — and, since Army operations are thoroughly dependent upon Space force enhancement operations, the Army should clearly be interested in protecting them. Space control protection actions range from using encrypted satellite communication links to providing physical security for a satellite ground station to developing robust Space and ground architectures with anti-jam capabilities, spare satellites and user equipment sets, and architectures which provide system-level backups in case primary capabilities are damaged or destroyed. The Army should be especially careful to build protection measures into its user equipment and to diligently guard ground assets, and advocate investment in protection of Space-based assets as well.

Another reason for Army interest in Space control is the contribution Space control makes to Information Operations (IO). Mark Goracke's article in this issue explains the relationship between the two, and makes it clear that Space control functionally comes under the IO umbrella. Each of the components of Space control (surveillance, protection, prevention, and negation) supports Information Operations. Conversely, IO tools can be used to accomplish Space control. Computer network operations could be used to disrupt operations at a satellite control station, or to disrupt electrical power servicing a satellite control station, for example. Or, in the case of electronic warfare, an attack might be classified as Space control and IO simultaneously. This is the case for using electronic warfare to jam satellite receiver ground equipment. As the Army as a whole increasingly embraces IO, the case for doing Space control is also strengthened.

Finally, when exploring Army interest in Space control, we can not miss that Space control is an effective offensive capability, and can directly contribute to winning wars. The most obvious case involves Space control negation. If, consistent with U.S. objectives and the war effort, we destroy an adversary's satellite used for C3I, we unequivocally degrade his ability to coordinate and synchronize forces. These aren't capabilities we now have, but could with modest effort given work that has already been done with such programs as Kinetic Energy Anti-Satellite and the Mid-Infrared Advanced Chemical Laser.

Or, possibly we could jam a satellite communications link, or dazzle a satellite optical sensor so it could not "see," in any case depriving the adversary of significant capabilities. This loss of C3I or of intelligence capabilities could certainly cripple an enemy force, or at the very least cause them to lose confidence in their own capabilities, and therefore effect their resolve to continue. The ability to disrupt enemy command and control on the battlefield through Space control is not only tactically relevant, but potentially just as significant as artillery, for example, in terms of battlefield impact if applied at decisive points and times by a knowledgeable commander seeking information superiority, decision superiority, and a decisive win.

This article does not begin to detail all the ways Space control can effect Army land warfighting operations. Still, the "inextricable tie" between Space, Space control and the soldier is more than clear. Terrestrial-based Space control is executed in the Army domain, it benefits our soldiers more than any other warfighters, it is an Army responsibility, and therefore simply must be an Army mission. Furthermore, the Army should pursue this mission with the same energy and determination, the same forceful character and unabashed focus on victory, on dominance across the full spectrum of conflict, that has left a proud and compelling legacy upon which the Objective Force is being masterfully built. Space control is not some fringe capability better left for someone else. It is an Army mission.

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Space Control and Electronic Warfare Detachment (Force Structure)

By LTC Scott Netherland

Resident within the 1st Space Battalion, Army Space Command, is an organization known as the Space Control and Electronic Warfare Detachment (SEWD). The SEWD is one of the Army's few systems capable of supporting a mission assigned to Army Space Command by the commander of U.S. Space Command's Unified Command Plan — the mission of Space control. Unique to the SEWD organization is the fact that the force structure for mission execution comes primarily from Department of Army civilians and contractors from the command's Big Crow Program Office (BCPO). In addition to the BCPO personnel, 1st Space Battalion has trained soldiers to deploy as part of the SEWD to provide command and control of the system. Army Space is capable today of organizing, training and equipping the SEWD to conduct Space control missions in support of warfighter requirements.

Before delving into the specifics of the organization, it is appropriate to provide some historical background. The Army has long recognized the importance of the Space control mission. Over the years, the Army has developed a variety of Space surveillance and negation systems, such as the Space surveillance radars at Kwajalein Atoll that contribute to the overall Space Surveillance Network, and both Directed Energy and Kinetic Energy Anti-Satellite Programs. The operational capabilities of the SEWD were derived from years of test and evaluation experience as part of the Big Crow Program Office. In late 1998, Army Space Command became interested in the potential Space control capabilities inherent within the BCPO, then assigned to the Army Test and Evaluation Command. The continued interest and increase in warfighter requirements for Space control capabilities resulted in the assignment of the BCPO to Army Space Command in October 2000. Since then, Army Space has worked with the BCPO to operationalize the capability and prepare for missions to provide Space control support to the warfighter.

Today, the SEWD is configured into two principal components: (1) the command and control element, and (2) the Electronic Warfare element. The command and control element is composed of military personnel. A major is the officer in charge and has overall responsibility for the successful mission execution of the detachment. The command and control element is the interface with the supported unit chain of command. They participate in mission planning and facilitate smooth mission execution. The electronic warfare element is composed of civilian personnel who can be a mix of Department of the Army civilians or contractor personnel. This includes a lead electronic warfare engineer and technicians, and a maintenance technician. With this mix of personnel, the detachment can execute 24-hour support to the warfighter.

Since the SEWD capability was derived out of the training and evaluation community and subsequently assigned to Army Space, there is no military force structure in place to conduct sustained combat operations. The military personnel who support the command and control elements are generally members of the 1st Space Battalion who have received specialized training in Space control operations and are subsequently detailed to man the SEWD. Currently, personnel from the battalion staff, an existing Army Space

(See Electronic Warfare, page 38)

Challenges to Future U.S. Space Control

By Terrence Smith

Space Control can be defined as the ability to maintain strategic and tactical military superiority through the continued and uninterrupted use and protection of national Spaced-based assets while denying, degrading, or manipulating the military use of an adversary's Space-based assets. Space control is a mixture of defensive and offensive measures implemented to ensure successful achievement of national objectives and is particularly important during periods of increased international tensions or hostilities. The capabilities required to accomplish the Space control mission are surveillance, protection, prevention, and negation.

The employment of Space-based assets, the utilization of Space asset products or services by the U.S. military since the 1980s has received worldwide attention by friendly, neutral, and hostile nations. Today, a growing number of countries, including third world countries, are accessing Space-based assets. This growth includes terrorist groups who are now utilizing Space assets in their attempts to give them a political (i.e. through direct television broadcast systems) or military advantage in their geopolitical situations (i.e. through the use of telecommunication systems or purchase of satellite imagery for target planning).

History of U.S. Space Control

Until recently, the United States has been able to achieve and maintain its technological superiority in Space through its continued investment in and development of national Space programs accompanied by the fact that there were few competitors or partners in Space. Until recently, Space control for the United States was an issue limited in focus primarily to the assets and capabilities of the former Soviet Union and the Peoples Republic of China, both of which have active military Space programs. Initially, the "Space race" for dominance in Space was limited to the former Soviet Union and the United States. China was added as they acquired intercontinental range ballistic missile capabilities and their associated technologies from the former Soviet Union. Space control was black-and-white at this time, satellites were either "ours" or "theirs" and we knew where our satellites were. With the increase of additional participants in Space, it is no longer an issue of "black" or "white"; now there are a growing number of "grey" systems.

In recent years, the number of Space service providers or users has grown. There are now many countries and commercial consortiums with growing roles in providing services and products from indigenously developed, launched, and controlled Space-borne assets. However, the fact that a country does not have its own launch systems, satellite control facilities, or satellites, does not prohibit their access to Space. Commercial agreements now provide access to Space-based resources to those who are willing to pay. As a result, the significant technological edge that the United States had achieved and maintained up to as recently as the Gulf War may be eroding as the products and services from foreign national and commercial assets achieve capabilities closer to those of the U.S. Space systems, or at least to the point where they now have military significance. The growth of international relationships emerging from cooperative Space agreements will increase the complexity and difficulty of future Space control for the United States.

U.S. DoD Dependence on Satellites

The U.S. military is more dependent on Space-based assets than any other military on earth. The mission of the national Space programs includes launching military satellites designed to: 1) provide worldwide command,

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control, and communications between deployed elements and their respective command structures, 2) provide extremely precise navigational aid to maneuvering military forces and guidance assistance to advanced weapon systems and 3) conduct Reconnaissance, Surveillance, and Target Acquisition (RSTA) of enemy military bases, assets, and deployments. The RSTA element of the national military Space program permitted the collection of various types of intelligence in order to rapidly assess a potential adversary's military current order of battle and capabilities, and to provide insight into their intentions or to provide warning of impending hostile action. As the level of technology and the capability of satellites increases, these assets will continue to be increasingly more important to all aspects of U.S. military operations.

Satellite support is critical to the U.S. military, especially taking into account the fact that the United States could be and often is conducting military operations in several different theaters at any one time. These theaters of operations can be located on opposite sides of the globe from one another. U.S. military satellites provide increased flexibility while increasing overall efficiency and effectiveness of U.S. military forces, operations, and weapon systems.

Increased weapon system accuracy was a direct result of U.S. military satellite integration both through precision location assessments of targets and the use of global positioning system constellation information for weapon system course correction and guidance to the intended target. This capability has been studied in depth by many foreign powers in an effort to increase their own military capabilities. The demands on the limited number of U.S. Space-based assets are growing as their services and products become increasingly integrated into U.S. military operations. The loss of any of the current U.S. Space-based capabilities would have an immediate affect on the U.S. warfighting capabilities and effectiveness.

As dependence and reliance on RSTA satellites has increased, the other more traditional or "lower tech" intelligence disciplines have been neglected. The loss of Space-based RSTA capabilities would have significant impact on U.S. operations and would be difficult to rapidly augment or substitute using strictly terrestrial assets. Protection of U.S. Space-based assets will be of the highest priority for U.S. Space control policy, doctrine, and tactics.

'Commercialization of Space'

Space is becoming increasingly accessible as countries with well developed national Space programs view commercial Space launches and provision of satellite access for countries with less developed or nonexistent Space programs as viable source of income. The revenue opportunities are a direct result of an increase in worldwide demand for access to Space-based services or products. The primary areas of Space commercialization include telecommunications, imagery, weather, and precision satellite-aided navigation.

Telecommunications has shown the greatest growth in the commercial arena and many countries with mature Space launch capabilities are offering their services to countries with less reliable or no Space launch capability to place a satellite into earth orbit for another country or commercial entity. The expenses associated with the development and maintenance of Space capabilities encourage international "partnering." Through these arrangements both can benefit while sharing the cost.

Increase in Dual-Use Satellites

While many current and future Space assets are not

Future satellite trends will probably include the miniaturization of the Space-based platforms or their components which translates into longer life in orbit by permitting more Space on the satellite to be committed to fuel reserves. Eventually there could be "microsatellite" constellations deploying enhanced imagery visit times which could augment intelligence collection during increased tensions.

strictly military in nature, all commercially available Space-based capabilities are cause for concern to U.S. and friendly military forces since they all have inherent dual-use application and therefore relate directly to national security. Designs for commercial and military satellites are increasingly similar and the gap between their respective capabilities is closing. Often, the developers of a nation's Space platforms are also the same developers for commercial platforms. Satellite imagery and telecommunications are two of the most obvious examples of dual-use capabilities for both commercial and military application as the capabilities of commercial satellites like SPOT, IKONOS, and EROS reach militarily significant capabilities (resolutions approaching one meter) and are commercially available through near-real time access. This is an area of growing concern due to possible direct integration of this product into military strike planning.

There are currently no real controls over the end-users of these products other than those imposed by the service or product providers. The increase in worldwide demand will ultimately result in an increase in the number of satellite systems in orbit, the number of product and service providers, and finally, the number of users. All of these have an immediate impact on the U.S. capability to perform Space control simply by increasing the degree of difficulty in accurately identifying product service providers, their satellite systems, and their end-user consumers.

Satellite services and products are becoming increasingly difficult to distinguish between military and commercial. This relationship goes back to the very inception of national Space programs where civilian contractors worked for the government to develop a variety of Space platforms. These contractors often are the same companies that later went on to build Space vehicles for commercial enterprises. In fact today one of the largest customers for the U.S. commercial telecommunication industry is the U.S. Department of Defense. This type of government-commercial provider relationship is spreading throughout the world.

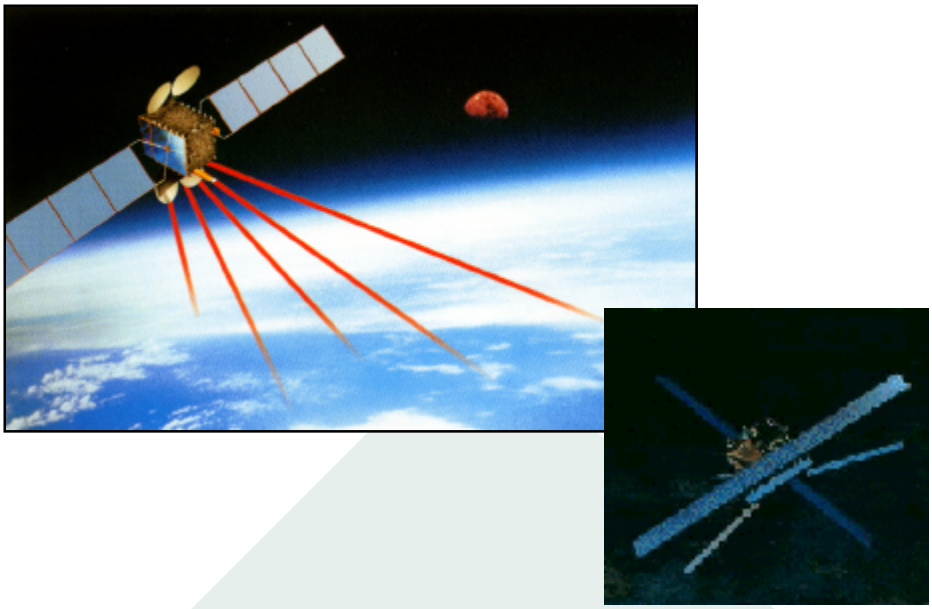
Commercial satellite technologies with dual-use potential are proliferating which will lead to an increase in the number of countries attempting to integrate them into strictly military systems. This will be particularly attractive to countries with a lower technological base and/or limited funds for indigenous research and development efforts.

Emerging Satellite Technology

There are several areas where satellite technology growth will further complicate U.S. Space control efforts. Future satellite trends will probably include the miniaturization of the Space-based platforms or their components which translates into longer life in orbit by permitting more Space on the satellite to be committed to fuel reserves. Eventually, there could be "microsatellite" constellations deploying enhanced imagery visit times which could augment intelligence collection during increased tensions.

Improvements to satellite sensors (i.e., miniaturization of components) will permit placing satellites in orbit which employ multiple sensors on a single platform. Another area where component miniaturization is being used is in reducing the weight and size of telecommunication receivers — which have already made it more difficult to locate the users, and if necessary target them, due to receiver system mobility.

Other satellite improvements will continue in the following areas as a result of ongoing research and development efforts worldwide: propulsion and propellants; electrical power supply; structures and materials; greater satellite autonomy "thinking" satellites; communications, command, and control; antennas; synthetic aperture radars; electro-optical sensors; signal processing; radiation hardening; and ground processing of satellite data.



Conclusions

There are many challenges the United States will face in the near future when it comes to developing an ability to conduct effective Space control. Increasing numbers of Space services providers as the "commercialization of Space" continues will be one of the most challenging issues. These participants will be in addition to the traditional countries capable of conducting Space activities with a primary military mission (Russia, China, France, etc.). A growing number of these providers will be multi-national in nature and may be based in countries friendly, neutral, or hostile to the United States. In fact, a commercial enterprise may be comprised of members from any or all three of the aforementioned country categories. It will become increasingly difficult for the United States to identify who are the services providers and who are the end-users. The increase of objects in earth's orbit will add to the difficulty in tracking, identifying an object or satellite as threat or non-threat, determining its mission, discriminating target satellites from other Space-based vehicles, targeting, and engaging these systems.

The United States will have to develop and maintain indefinitely sufficient assets to constantly track, monitor, or engage all of the Space-borne objects as the numbers continue to increase and at the same time protect its own assets.

Another concern for Space control will be — once a "threat" satellite has been identified — to develop rules of engagement in order to deny, degrade, or deceive the 'threat' system's intended users without affecting satellite assets being used by friendly forces or nations, non-combatants, or neutral entities. The United States will need to develop tactics and methods that can be employed while being consistent with national security directives and policies, and in compliance with international agreements.

Assessments will need to be made to determine an offensive tactic or method that would be the most effective in a given situation for engaging a "threat" platform, its links, or its associated ground stations.

The technology to support offensive Space control operations may have to be developed, and if capabilities exist outside the United States, assessments will have to be conducted to determine who has it, its potential impact on U.S. Space systems, and whether the technology is proliferating.

As more entities (countries and commercial enterprises) become involved in Space activity, the technology associated with Space platforms will likely proliferate and the technological superiority the United States once enjoyed over adversaries may erode. The satellite technologies and systems associated with signal reception are spreading which leads to another area of concern for the United States in controlling the unauthorized use of or access to national Space-borne assets.

The issues presented here show the growing complexity and difficulty the United States will face in trying to develop and maintain Space control in a very dynamic and rapidly changing environment. Both defensive and offensive capabilities have to be taken into consideration in order to protect national assets and if necessary to counter "threat" Space-based systems and capabilities.

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Space Control and the Objective Force

By LTC Tim Coffin

For the past six months I have had the opportunity to work with the Objective Force Task Force in Washington, D.C. The mission of this task force is to impart irreversible momentum to the Army's transformation to the Objective Force and to bring together the various organizations responsible for transformation to achieve synchronization and synergy between their efforts. As the Space Systems Integrator, I had many discussions about the role of Space in the Objective Force. I rapidly found out that when using terms like the "Objective Force" or "Space Control" it was important to ensure we had a common understanding of what we mean by these terms before we moved into the more difficult parts of the topic.

The term "Objective Force" conjures up a different image for each individual who hears it. Part of that problem is that the Objective Force cannot be pinned to a single event or the fielding of a single system. It is an era that we will go through that will start with the first operational unit in 2010 and will continue to evolve gaining more and more capabilities through at least 2030. The Objective Force is not a definitive end state but rather a process by which the Army will continue to transform to meet the ground warfighting demands of the future. For those who are today decisively locked in the close fight of Enduring Freedom combat operations or who are providing support to our corps, divisions and other elements, the Objective Force is a far off dream of futuristic combat systems that sound like a Buck Rogers fantasy. To those at the Department of the Army level doing programming, budgeting, and material development the Objective Force is more like an express train that demands constant attention to keep on track and in control. To those in the science and technology field, the Objective Force represents the opportunity to deploy many technologies we have invested billions of dollars in during decades of development.

While many views of the Objective Force exist, they are rapidly converging as new material programs are established, doctrine is being published and existing systems are identified to equip the first Objective Force units.

Fielding the Objective Force is different from anything else the Army has ever attempted. The closest parallel in military terms would be if the Navy were to redesign the carrier battle group from the submarines below, to the aircraft above the carrier while demanding that the group deploy in one-tenth the time it previously took, with one-third of the tonnage the fleet previously had, having twice the lethality of its former systems while maintaining the same protection afforded by their existing systems. It is a tremendous task and it is the right thing to do. For the Army to accomplish this task in the time allotted it will require the breaking and rebuilding of the way we do system acquisition. Formerly weapons systems followed fairly independent pathways from development to fielding. Major weapons system can take decades from the first proposal to operational fielding of the system. Just this year, the first Army unit took possession of a weapon I first saw at the annual Association of the United States Army Convention more than 20 years ago when I was still a cadet. This must become a part of our history as it has no place with our future. The Objective Force is building on the lessons we learned with digitization and Force XXI to launch capabilities for a fully integrated digital battlefield providing unparalleled information dominance over our opponents. The Objective Force is being designed from the start to go from mud to Space and must be seamless in between.

The Objective Force is about dominant speed of knowledge and precision application of firepower. U.S. and allied Space systems enable the Objective Force to achieve these goals just as our enemies seek to use commercial and national Space systems to nullify our technological advantages. The wide spread use of commercial Space systems has handed the power of Space to all

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our potential adversaries for a relatively low cost. With this in mind the need for Space control becomes more essential for the Objective Force as it cannot rely on its sheer mass to ensure success. To maintain information dominance, the Objective Force must be able to deny observation, communications and precision navigation to its enemies ground, air or Space based capabilities.

Outside the Army, I often hear the argument that Space Control should be an Air Force function. The Air Force certainly should take the lead in conducting air-to-Space and Space-to-Space control functions. However, the Army has a vested interest in denying adversaries the ability to observe, report and communicate or attack its deployed forces. Space control which provides temporary or local effects from ground-to-Space should be conducted by mobile units that can move with the deployed forces. These embedded units must be responsive to the ground commander conducting combat operations. These same units can provide contributing sensors to the Space surveillance network and have the capability to provide real time characterization of Space assets being used against allied forces. This augmentation of the Space surveillance network would provide robustness and global capabilities to the current system. Existing radars developed for missile defense could be purchased to provide a dual capability in-theater. When required these units could then degrade, disrupt or deny the Space system to achieve the desired effects.

The ideal Objective Force Space Control Unit would consist of Space surveillance assets and a variety of engagement capabilities that could degrade or deny Space assets to our adversary. These units will be enabled by the technology developments currently underway in areas like Hybrid Electric Propulsion, Solid State Lasers, Advance Communications Systems and High Energy Microwave Systems. These units would deploy with the Objective Force unit of engagement to ensure information dominance during key portions of ground operations

Key to achieving this type of support to the Objective Force are several steps that must be started now. First we need a clarification of roles and missions in the Space control arena. The Army should be designated as the responsible agent for temporary and reversible ground based Space control effects against Space systems which could be used against Army forces. The basic concept here is that the Army be authorized systems which provide self defense against hostile Space systems. Second, the Army must establish a program of record to develop and build these systems. The Army currently has tremendous capabilities and technology but lacks the focus that a program of record would bring to the material development and fielding of these systems. Third, we must establish the doctrine and manning for these systems. The creation of these units should be the event which also establishes the first Space enlisted MOSs to ensure that the skills and capabilities of these systems continue to grow over time.

Space control is a recognized need for the Objective Force to successfully accomplish the missions it is designed for. In my view, dedicated Army units embedded in the force would provide the highest level of support to deployed units. The decisions on how to accomplish this support have not yet been made but will depend on negotiations between the Army, Air Force and the Joint Staff and the commitment of Army funds to establishing viable Space control units—manned and equipped to accomplish this extremely important mission.

LTC Timothy Coffin is presently attending the Army War College in Carlisle, Pa., after serving as the first commander of the 1st Space Battalion, Army Space Command. Previously, he served with the North American Aerospace Defense (NORAD) Command/U.S. Space Command as a Combined Intelligence Watch Commander inside Cheyenne Mountain, and as the Deputy Director of the NORAD/U.S. Space Command's Combatant Commander's Action Group.

The Security Classification Challenge

By LTC Robert Bruce

Recognizing the challenge of Space Control and its security concerns facing U.S. forces, I offer some information and ideas to generate further discussions and new thinking. Many people speak of Space control in hushed tones afraid to reveal sensitive information. The commanding general, U.S. Army Space and Missile Defense Command, LTG Joseph M. Cosumano, stated "we must normalize Space" shortly after assuming command.[1] In order to normalize Space, you must think, discuss and integrate it while maintaining the security necessary to protect capabilities.

The introduction article to this issue highlights the fact that businesses and civil authorities embrace Space as a way to save time and money and has become an integral part to our way of life. The impact of this Space investment is an enormous advantage in quantity, quality, and applied technologies that have weaved their way into many aspects of our economy. An investment this valuable and integrated into our society must be protected.

The U.S. military shares in this growth, having been unable to ignore the Space enhancement opportunities for military operations. GEN Ralph Eberhart, stated recently that forces involved in Operation Enduring Freedom used many times more the bandwidth than in Operation Desert Storm.[2] And the transformed forces want more. For example, Global Positioning System, although widespread, is becoming more ubiquitous on the battlefield as a method of friendly force tracking, relegating the old methods of navigation to the relics of yesteryear. These are glaring glimpses into the future.

The scientific and engineering communities expend considerable resources to develop new technologies and maintain our technological edge. U.S. businesses and the government apply precious time and resources to gain and maintain a technological advantage over potential competitors. Carelessness at the wrong moment or inadvertent disclosure delivers precious capability at little cost to our potential adversaries.

With businesses, this negates the technological advantage. With national security, this puts Americans at risk.

So, how do you avoid saying something classified? You can say nothing at all, but that keeps Space control operations separated from warfighting operations. A more functional technique would be to use the security classification system. This protects information on U.S. capabilities and intentions while denying the same to potential adversaries. It safeguards information that would permit an adversary to modify any military system or plans in a manner to lessen the effectiveness of U.S. defense systems and/or devalue the U.S. investment in the acquisition of those systems.

A helpful tool in the security classification system is the Security Classification Guide (SCG). The purpose of the SCG is to provide policy, guidance, and procedures for marking and protecting information and activities related to a specific system or area like Space control.[3] Governing the SCG are Executive Order (EO) 12958 (Classified National Security Information), DoD 5200.1-R, (Information Security Program), DoD 5220.22-M (National Industrial Security Program Operating Manual) and AR 380-5 (Department of the Army Information Security Program). Organizations and units classify information, activities, and operations according to these directives.

The SCG consists of several parts. The first part is general information, which builds the framework. It

We must take prudent measures designed to secure our access to Space and we must educate non-Space Operations officers and personnel to Space dynamics, concepts and terminology and the impact of the loss of Space access to operations.

describes the Original Classification Authority (OCA), and general classification instructions. EO 12958 imposes a mandatory ten-year declassification requirement unless the OCA authorizes an exemption. Only an OCA may classify information and he does so only when unauthorized disclosure could reasonably be expected to cause damage to our national security. When deciding what to classify, the OCA must identify one or more categories listed in the executive order as the reason for classification. If you have a question or need clarification, it is best to contact the OCA listed in the front of the SCG.

Before making a classification determination, the OCA identifies each item of information that may require protection. How unauthorized disclosure can adversely affect U.S. national security and interests must be weighed. Weapon system operational capabilities, existing, planned or under development, particularly unique technologies critical to the program must be properly assessed and strict controls over technical and tactical solutions developed and applied.

Another section involves Operations Security (OPSEC). OPSEC details the analyzing of military operations and other activities to identify those observable by Foreign Intelligence Services (FIS). Eliminating disclosures or reducing vulnerabilities provide some defensive measures against FIS exploitation. The OPSEC plan addresses these actions as the methods and means to gain and maintain essential secrecy about critical information. For example, the OPSEC plan may include actions calling for the use of secure communications and couriers, strictly controlling classified and unclassified technical information, monitoring trash dumping, avoiding routine actions that telegraph intentions, ensuring all personnel refrain from engaging in "loose talk" and establishing tighter control measures when warranted.

Often, the SCG includes an overview of the operational aspects of employment such as speed, distance, range and optimal configurations that the OCA determines additional security are warranted. However, this should not to be confused with the tactical employment and used as an excuse for interfering with meeting an operational requirement. The warfighting commander determines operational classification through special categories. The SCG may also include a higher classified annex. Just because something is not listed does not mean that it is unclassified. Use caution and ask the OCA if in doubt.

Space control remains a very sensitive policy area. However, specific Space control issues warrant discussions at the highest levels of the government to determine appropriate responses when, not if, an adversary threatens a U.S. satellite. To prove interference, the United States must have a surveillance system with the fidelity to determine hostile intent by pinpointing positions and tracking changes in attitude, altitude, orbit and location. Our Space-based systems must have the inherent protection to withstand not only the harsh Space environment but the disruptive effect of an adversary's efforts. The military must protect the ground segments from disruption as well. Our signals must be encrypted to prevent enemy data overload from open sources. We must take prudent measures designed to secure our access to Space and we must educate non-Space Operations officers and personnel to Space dynamics, concepts and terminology and the impact of the loss of

(See Security Challenge page 40)

Front row, left to right: LTC Elizabeth G. Kuh, MAJ Saundra R. Yanna, MAJ Chauncy C. Nash, BG Richard V. Geraci, MAJ Andrew Weate, MAJ Katherine P. Thornton, and LTC James E. Lawson II. Middle row, left to right: LTC Jerome E. Thomas, MAJ Robert A. Spuhl, MAJ James E. Rozzi, MAJ Gordon R. Quick, Jr., COL Frank P. Todd, MAJ Dennis W. Brozek, and COL David W. Shaffer. Back row, left to right: MAJ Patrick C. Suggs, LTC Bruce G. Smith, MAJ Don L. Wilkerson, MAJ Daniel D. Cockerham, COL Kurt S. Story, COL Jon P. Smart, and MAJ Stanley K. Russell, USMC.

Third Space Officer Course Graduates 20 New FA 40s

A third Space Operations Officer class graduated August 23. The seven-week course, which began July 8, earned graduates the elite new specialty of Functional Area 40, and equipped them with the tools and knowledge to provide future combatant commanders guidance on conducting Space operations in support of the mission. Graduates can expect assignments to operational staff and Space systems program offices.

At the graduation ceremony held in the Air Force Space Command building on Peterson Air Force Base (the Army Space Command building will be officially opened in October) the graduates were congratulated by guest speaker, LTG Joseph M. Cosumano, Jr., commander of Space and Missile Defense Command and Army Space Command.

"You were selected because you are successful. You will each bring something unique to this new specialty, your own backgrounds, and the knowledge of your basic branches.

"Be adaptive. Change is upon us, and is very significant in our business. Not only are you on the cutting edge — you will be paving the way for many Space operational concepts. Things have changed in the field just since you began this course. As you move into your assignments, you will be the experts on Space, bringing its 'gospel' to the warfighter," said Cosumano.

The 20 officers studied orbitology, satellite communications, Space-based navigation and intelligence gathering to include surveillance and negation of the same to opposing forces. The course is designed and instructed by Space and Missile Defense Command's Force Development and Integration Center - West, located in Colorado Springs, Colo.

The course is divided into three segments beginning with 25 days of classroom instruction. Afterward, a week is devoted to off-site visits to place such as the National Reconnaissance Office, the National Imagery and Mapping Agency in Washington, D. C., the National Security Agency, and Army Space and Missile Defense Command Headquarters.

Included are hands-on training sessions with the Army Space Program Office, which develops Tactical Exploitation of National Capabilities Space support systems in use by Army warfighters. The course also includes a 43-hour command post exercise designed to test each student's proficiency in 24 individual critical tasks.

The Distinguished Graduate, MAJ Daniel D. Cockerham, earned a grade point average of 97.3 in the academically challenging course. Also graduating were the new Army Space Command Chief of Staff, COL Kurt S. Story, and the new Army Space Forces commander, COL David W. Shaffer, who earlier the same day had assumed the command from outgoing commander, COL William J. Partridge. Graduates were awarded the distinguished Air Force Space and Missile Badge for wear on their uniforms. The badge, which retains its distinctive Air Force blue even on the Army

"Be adaptive. Change is upon us, and is very significant in our business. Not only are you on the cutting edge — you will be paving the way for many Space operational concepts."

green Battle Dress Uniform, displays the Earth as viewed from Space, surrounded by stars and orbital paths and features a central figure representing both an upward thrust into Space and the launch vehicles necessary for that movement.

List of Graduates: COL David W. Shaffer, U.S. Army Space Command; COL Jon P. Smart, U.S. Army Space and Missile Defense Command; COL Kurt S. Story, U.S. Army Space Command; COL Frank P. Todd, U.S. Army Space and Missile Defense Command; LTC Elizabeth G. Kuh, U.S. Army Space and Missile Defense Command; LTC James E. Lawson, North American Aerospace Defense Command; LTC Bruce G. Smith, Objective Task Force; LTC Jerome E. Thomas, 3rd U.S. Army; MAJ Dennis W. Brozek, U.S. Army Space and Missile Defense Command; MAJ Daniel D. Cockerham, 1st Space Battalion; MAJ Chauncy C. Nash, 1st Space Battalion; MAJ Gordon R. Quick Jr., XVIII Airborne Corps; MAJ James E. Rozzi, Army Space Program Office; MAJ Stanley K. Russell, USMC, U.S. Space Command; MAJ Robert A. Spuhl, U.S. Space Command; MAJ Patrick C. Suggs, North American Aerospace Defense Command; MAJ Katherine P. Thornton, 8th U.S. Army; MAJ Andrew J. Weate, U.S. Army Space Command; MAJ Don L. Wilkerson, Training with Industry, Denver, Colo.; MAJ Saundra R. Yanna, U.S. Army Space Command.

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to be promoted.

Next, the ORB is your resume. Ensure your duty positions are coded FA 40 and reflect "Space" in your duty title. The board member is looking for branch/functional area qualification and experience. Don't make this difficult for them to determine. The ORB also conveys how you have improved yourself during your career.

As a major prepared for lieutenant colonel, you should have completed your Command and General Staff College and be Mission Essential List 4 (do this early in your time as a major). I strongly recommend that you complete your master's degree, preferably in a Space related field, although this is not currently an Army requirement.

As Space officers, our contribution to the warfighting team is our intellect and knowledge. If you don't want to constantly improve your knowledge and education, then you have no business being one. Our soldiers count on us to be knowledgeable and smart…and to keep them alive while accomplishing the mission.

The ORB also shows your physical status, your additional skill identifiers, awards, and language skills. All of these contribute to an overall picture the board member conjures as to your potential for advancement. Keep yourself healthy, within the weight standards, physically fit, and constantly improving your skills and value to the Army.

Finally, the board member has your OERs/AERs to review. Although all OERs count, the new OER is a very powerful message to the board member about the quality of your work. The old OERs became inflated, so it was difficult to see where an officer really stood in relation to their peers. The new OER doesn't have this problem. If all your new OERs are center of mass , you are in trouble.

It is very difficult, and not necessary, to be all above center of mass. As you have been told, you need to show a "heartbeat" with a mix of center of mass and above center of mass reports. If your last few OERs before the board are above center of mass, it shows support by your chain of command, and that you are getting better as time goes on. That's a good message to send to a board member.

Bottom line, you can only do the best you can and hope that your senior rater has the profile and appreciation of your work to give you a good OER. What is entirely in your ability to control is how your jobs are reflected on your ORB, your education and training, and the skills you bring to the warfighting team. As a Space officer, that's where you should be focused, on…as the

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and processing stations (airborne, sea-based, fixed or mobile land-based). All parts of the ground segment are vulnerable to attack from various means such as clandestine operations, air attack, direct ground attack, and IO.

Space Operations Officers bring their Space control expertise to IO. The latest Army IO field manual, FM 3-13, clearly establishes the Space Operations Officer as a member of the command's IO cell, and identifies some specific duties, such as:

- Including IO requirements in the Space operations appendix of the operations annex.
- Coordinating IO requirements with U.S. Army Space Command.
- Coordinating with IO targeting to include adversary Space system elements in the targeting process.
- Supporting operations security and military deception efforts by maintaining adversary Space order of battle, to include monitoring orbital paths and satellite coverage areas.
- Conducting operational planning analysis and determining how Space operations can meet IO requirements.

It is not a one-way street. As mentioned above, the relationship between Space control and IO is symbiotic — two unlike, yet closely associated mission areas providing each other mutual advantages. Space Operations Officers should also incorporate IO capabilities into their Space planning and operations. Computer Network Defense, physical security, counterintelligence, and information assurance capabilities can become part of Space protection planning. Computer Network Attack, electronic warfare and military deception can become Space negation options.

Integrating Space and Information Operations provides increased operational flexibility by increasing options available at any level of conflict. A Space Operations Officer who understands the basics of IO, and can contribute to the planning efforts, becomes more valuable to a commander than one who does not. These two mission areas will continue to expand and grow in importance, and enable the realization of Joint Vision 2020 - Full Spectrum Dominance.

Jeff Harley supports the U.S. Army Space Command, G-3 Plans, Information Operations Section in Colorado Springs, Colorado. He retired from the Army in 2000 after serving in numerous command and staff positions in the continental United States and Germany; including Department of the Army Inspector General, 104th Military Intelligence Battalion S-3, and Commander, A Company, 204th Military Intelligence Battalion.

Endnotes

1. DOD Directive 3600.1, Information Operations, is in final coordination and the Deputy Secretary of Defense should sign it before the end of Summer 2002.
2. Joint Publication 1-02, Dictionary of Military and Associated Terms, as amended through 15 October 2001.
3. Lt Col Robert H. Zielinski, et al, "Star Tek-Exploiting the Final Frontier: CounterSpace Operations in 2025," A Research Paper Presented to Air Force 2025, August 1996 (http://www.au.af.mil/au/2025/volume3/chap09/v3c9-1.htm#Introduction)
4. Jonathon Broder, "The Threat over the Horizon," MSNBC, undated (http://www.msnbc.com/news/561893.asp)
5. FM 3-13, Information Operations: Doctrine, Tactics, Techniques, and Procedures, is in the final stages of approval, and replaces FM 100-6.

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Support Team, or the Army Space staff are selected for training.

On the equipment side, the SEWD is an electronic warfare ground suite that can be tailored to meet specific mission requirements. Again, with roots in the BCPO, the very nature of the test and evaluation mission is to retain flexibility to meet mission requirements. Today, the ground suite consists of three expando vans (one for mission planning, one for command and control and one for the electronic warfare suite), generators, and the requisite antennas for the mission. The ground suite is deployable by C-17 or C-5.

Army Space is working the Force Design Update process to mature the SEWD into a Modified Table of Organization and Equipment unit. The intent is to gain manning requirements so we can dedicate military personnel to the Space control mission, rather than rob personnel from other missions within Army Space. Additionally, we intend to normalize the ground suite equipment. In this regard, we want to mature the system from a training and evaluation based capability requiring much hands-on involvement from the lead electronic warfare engineer to a more soldier friendly system. The end state will be a system operated and maintained entirely by soldiers from the 1st Space Battalion with limited reliance on contractor technical support for system upgrades. The last item in the force structure maturation of the SEWD is to increase both personnel and equipment from a single-suite detachment to a company with multiple platoons to allow for simultaneous operations in multiple theaters.

The outlook is positive for Army Space to have an increased role in Space support to the warfighter. The increased SEWD force structure will help Army Space to provide relevant Space control capabilities to meet the warfighter demand. Army Space is proud to serve alongside with the Big Crow Program Office in manning and equipping the SEWD to provide improved Space control support to the warfighter! Space Warriors!

LTC Scott Netherland is presently serving as the commander of the 1st Space Battalion, Army Space Command. In 1990, he was assigned to Army Space Command where he worked with the Global Positioning System and Multi-Spectral Imagery Programs. He also served as a Counterspace and Information Operations Action Officer in J32 in U.S. Space Command.

As defined in Joint Publication 3-14, Space control is the ability "to ensure freedom of action in Space for the United States and its allies and, when directed, deny an adversary freedom of action in Space."

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should be common practice for Space to be included in all planning and operations by leaders at all levels.

Traditional paradigms and rules of engagement must now be reshaped with new focuses on joint command and control and planning as cornerstones. Once completed, this transformation will link the "point man" on a patrol with the National Command Authorities, not only in tactical and strategic terms but in thought methodology relevant to the engagement of adversaries. Warfighters will need to assess how an adversary may use many of the same capabilities to gain operational advantages.

The threat in relation to Space/Space control is more pronounced in the easy acquisition of products rather than their widespread application. The capabilities and quantity of both civil and commercial systems with military utility have significantly increased over the past decade and show no sign of slowing down. Potential adversaries now have access to global commercial Space industries. The increasing availability of satellite telecommunications, Space-based imaging, and position and navigation systems significantly degrades the technological edge that the United States has enjoyed in the past. Without Space dominance/Space control, future adversaries could gain advantages they would otherwise not possess. They may well interdict U.S. and allied capabilities on which our recent successes have relied.

Future military operations can assume neither uninterrupted nor sole access to Space products. As more nations gain access to Space capabilities, the need to ensure U.S. access to Space will become a military necessity. Common access to Space capabilities will challenge, perhaps even limit U.S. ability to achieve strategic surprise. As order-to-delivery times decrease, commercial imaging systems will be capable of providing tactically significant products to potential adversaries in near real time.

These capabilities could assist an adversary's implementation of an anti-access strategy and potentially limit U.S. military options, hence our need to deny such capabilities. Space control will be an essential element in ensuring theater access to Space and Space capabilities, and land force information superiority. Future Army operations and equipment will require Information Operations methods that protect our Space capabilities, exploit an adversary's Space capabilities, and protect friendly forces from Space-based observation. These methods will include capabilities for in-theater Space surveillance; protecting vital command control communications/intelligence surveillance and reconnaissance assets; and deceiving, denying, degrading, disrupting and/or destroying an adversary's Space systems when directed. The Army is developing a suite of technologies and Doctrine, Training, Leader Development, Organization, Materiel and Soldier solutions to assure access to required Space capabilities for the Objective Force while denying the same to any adversary.

The Army is, and must continue to be, an active participant in the design and development of Space architectures and capabilities. Military use of Space is inherently joint and increasingly critical to land force operations. Terrestrial systems alone will not enable full-spectrum dominance. Commanders at all levels (strategic, operational and tactical) must have assured, direct access to the full range of Space capabilities, and they must be able to protect that access while denying access to any adversary. The Army equity protected by maintaining Space dominance is nothing less than achieving the Objective Force; enabled by Space and protected by Space control.

MAJ Lem Williams is the Joint Space Control Team Leader with U.S. Army Space and Missile Defense Command's Force Development and Integration Center Space Division. A former enlisted Infantryman, he was commissioned as an Ordnance Officer in 1990. His assignments include 2d Armored Cavalry Regiment, 82d Airborne Division and the 10th Mountain Division.

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Space access to operations.

Space control is too important to this nation to be relegated to whispers. We must plan for it, train to conduct operations, and learn how to debate the finer points while maintaining security. Professional discussions enhance the deterrence value by putting a potential adversary on notice that what seems to be vulnerability may in fact be strength. Remember, Space control does not equal Space negation. It also includes those measures designed for surveillance, prevention, and protection. A system's capability to support Space control in a general context is usually unclassified. When you begin to make further association with specific mission areas and technical capabilities and the technical capabilities tend to lead to classified system specific discussions, then you cross into the gray area where conclusions may be drawn or facts derived that reveal secrets.

Candid open discussions about Space Control should prove healthy and enlightening for all. The military is charged with protecting national security interests. The nation's reliance on Space is too important to be left unprotected. As former Army Chief of Staff General Gordon Sullivan stated once, "Hope is not a method." With people and countries still seeking and finding vulnerabilities to attack, the military must plan for when disaster strikes and all Space assets are vulnerable. We must continue frank professional discussions and take the initiative. Using a security classification guide as a Rosetta Stone, we can proceed without revealing secrets.

LTC Robert Bruce serves as Chief, Space Division, U.S. Army Space and Missile Defense Command for the office of the Deputy Chief of Staff for Operations in Arlington, VA. He served as the Commander of Task Force 1-40th AR and on the Joint Staff and Strategic Command. He graduated from the first Space Operations Officer Qualifications course in Aug 01.

End Notes:

1. "Normalizing the Army's Use of Space with Seamless Integration", Vol 1, September 2001, Lieutenant General Joseph M. Cosumano, Jr., commander, USASMDC
2. "Military Information Technology", Vol 6, Issue 2, February 2002 Interview with General Ralph E. Eberhart, combatant commander NORAD, combatant commander U.S. Space Command, and commander Air Force Space Command by Executive Editor, JoAnn Sperber.
3. Derived from Space and Electronic Warfare Detachment (SEWD) Security Classification Guide, 30 April 2001.

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intelligence, physical security, and information assurance. Examples of merging Space control prevention and IO efforts are: denying enemy access to high-resolution commercial imagery, and the electronic protection element of electronic warfare — disrupting their satellite communications networks by electronic attack. Space protection measures, both active and passive, touch many of the IO core and supporting capabilities. An example of a passive protection measure as it relates to IO operations security is satellite communications link encryption.

From the very basics mentioned, one can understand why it makes good sense to create a joint entity to plan, coordinate, and synchronize IO and Space operations in tandem, or in other words, employ a Space and IO Element (SIOE). The vote is still out as to how well the SIOE functions, but it's pretty clear to me that the SIOE, coupled with reach-back assets at U.S. Space Command, works.

I am also certain we will continue to debate how Space and IO should be coordinated, integrated and synchronized into the joint warfight. In accordance with joint doctrine, the IO function remains embedded in the joint force J-3's range of activities. In addition, Joint Space doctrine will outline that a Joint Force commander has options. The language in JP 3-14 will stipulate that the commander should designate an authority to coordinate, integrate and synchronize Space operations for the theater/joint area of operations. It also states that the Joint Force Commander can retain this authority. In other words, he can use his staff to do the work and designate an officer (Space authority) to direct the effort. The second option is for the commander to delegate the task to a component. Based on lessons learned in Operation Enduring Freedom and the linkages between Space and IO joint doctrine and policy, I would conclude that the joint force is best served by performing both IO and Space coordination/ integration functions at the joint force level. In other words, the J-3 should be the center of activity for both, with the "Space authority" working for the J-3. Certainly joint force components should be authorized to plan and execute their own Space operations and IO, but they should be coordinated, synchronized and integrated with joint activities.

So how do all the pieces and parts fit together? There may not be a clear answer yet, but the current trends are, and future policy and doctrine may direct, that IO and Space operations continue to merge. Given the current direction, joint force IO and Space experts should get used to working together.

Mark Goracke supports the U.S. Army Space and Missile Defense Command and Office of the Deputy Chief of Staff, G-3 , HQDA, and the Strategy, Concepts, and Doctrine Division, in the Pentagon. He is the Army joint and multinational doctrine integrator for Information Operations, Space, and air and missile defense and also is the co-author of JP 3-26, Joint Doctrine for Homeland Security. He retired from the Army in 1998 after serving on the Army Staff as a strategist and policy analyst.

The outlook is positive for Army Space to have an increased role in Space support to the warfighter.

— LTC Scott Netherland
U.S. Army Space Command

The effectiveness of the Army's Transformation forces — and those of our sister services — will depend on how effective we are at achieving decision dominance through Information Operations and Space control.

— BG Richard V. Geraci

Space control, like airspace control, is a mission shared with the Air Force and the other services. The ultimate objective is to ensure freedom of action in Space for friendly forces while denying it to the enemy.

— LTG Joseph M. Cosumano, Jr.

Artist's rendition of U.S. Army Space Command's new home on Peterson Air Force Base. Move in date of October 2002.

UPCOMING JOURNAL THEMES

Fall 2002 — "Space Operations — A Growing Mission Area"
Winter 2002 — "The Role of Space in Army Transformation"
Spring 2003 — "The Army's Future in Space"
Summer 2003 — "Space Technology — Where is it Leading Ground Forces"