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# THE UNITED STATES NAVAL WAR COLLEGE

# **Operations Department**



# SPACE SYSTEMS PIVOTAL TO MODERN WARFARE by General Charles A. Horner, USAF

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By Gen. Charles A. Horner, USAF, Commander in Chief, U.S. Space Command

THE TEMPO of modern, joint military operations and coalition warfare has dramatically increased. Commanders need accurate, near real-time situational awareness and knowledge of enemy intentions more than ever before to operate inside the enemy's decision cycle and ensure success.

Information warfare, or more correctly knowledge warfare, is now central to any military planning. In this regard, space systems play a pivotal part in modern warfare. The global, continuous presence of space systems helps provide war fighters the infrastructure they require. Space is information warfare.

As the commander in chief of the North American Aerospace Defense Command, commander in chief of U.S. Space Command and commander of Air Force Space Command, I operate at a unique level with these distinct but interdependent commands. It is from this level that I can ensure seamless ballistic missile warning and attack assessment to National Command Authorities and unified commands, and optimize space support to regional war-fighting commanders.

Based on a prepared statement to the Senate Armed Services Committee, April 20, 1994



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I address those commands here to the extent needed to offer a complete, coherent picture of where I believe we are and what I assess our priorities should be for the future.

I have two main messages. The first is the abiding utility and the future growth potential of the North American Aerospace Defense Command alliance. The second is to convey the pulse of military space requirements and where national as well as DoD efforts need to be focused to support our troops in conflict.

### **Triple Hatted**

The triple-hatting of my positions has been an efficient way to ensure the responsibilities of all three commands are met without duplication of effort and that we achieve synergism between commands. As North American Aerospace Defense Command commander in chief, I provide warning of attack to the National Command Authorities of Canada and the United States, contribute to the air sovereignty of both countries and provide for the aerospace defense of North America.

Despite the breakup of the Soviet Union, the North American Aerospace Defense Command mission remains an enduring requirement. Furthermore, this binational military relationship is an important aspect of the overall economic and political relationships we share with Canada. A dialogue has already begun with the Canadian and U.S. governments to prepare for renewal of the North American Aerospace Defense Command agreement in 1996.

As U.S. Space Command commander in chief, I am responsible for providing ballistic missile warning or information to the North American Aerospace Defense Command, the National Command Authorities and regional commanders. I am also responsible for ensuring the United States has access to and use of space; for enhancing U.S. land, sea and air operations through space support; and for planning and developing requirements for ballistic missile defenses.

As commander of Air Force Space Command, I am responsible for training, maintaining, and equipping systems and forces that support U.S. Space Command, U.S. Strategic Command and the North American Aerospace Defense Command.

I would like to offer my view of the strategic backdrop against which we assess our space capabilities and requirements. Every day we see how the demise of the Soviet Union has made the world more dynamic — with a complex, volatile and often dangerous geopolitical landscape. Pervasive nationalism, weapons proliferation and increased availability of space systems to developing nations loom on the horizon as potentially destabilizing influences.

I regard the most significant characteristic of our strategic environment to be its unpredictability. I know of no one who forecast the diverse developments and challenges we have faced over the last two years. We must be cautious to prepare and preserve capabilities that could be needed faster than we can build them if we arecaught by surprise. Therefore, we must ensure appropriate technologies and systems are developed and/or fielded to the point where they could be made operational within our strategic warning time for emerging threats.

Weapons of mass destruction and missile technology are a volatile mix and cause me great concern. The relatively low cost and increasing availability of these systems, coupled with a lack of effective or widely deployed defenses, make them attractive to developing nations attempting to establish influence.

The addition of nuclear, chemical or biological warheads provide terror effects, further complicating problems for our commanders. Of still greater concern is the emerging generation of missiles boasting longer ranges and shorter times of flight. Improved accuracy, maneuvering re-entry vehicles and multiple submunition warheads are also possibilities for which we must plan when developing and fielding new defensive systems.

## **Expanding Arsenals**

Despite numerous treaties and agreements such as the Missile Technology Control Regime, we face an expanding proliferation of ballistic missiles and weapons of mass destruction. These agreements do not currently include the countries we are most worried about.

If efforts aimed at halting proliferation prove ineffective, we must counter with improved missile defenses, warning and tracking systems, and the ability to target weapons of mass destruction and ballistic missiles. The Scud and its derivatives are A Theater High Altitude Air Defense interceptor launches against an incoming enemy warhead in this artist's conception. The interceptor, one aspect of a proposed multilayered theater missile defense system, would engage re-entry vehicles in their midcourse or late flight stages.



now in the inventory of approximately 16 countries. North Korea has an indigenous missile production capability and has reverse-engineered the Scud to produce additional missile systems based on this design. It may have also licensed production lines in other countries to include Iran and, before the gulf conflict, Iraq. North Korea also tested at least one new, longer-range ballistic missile system in 1993.

While the ballistic missile threat to North America will remain low for the near term. proliferation will increase the ballistic and cruise missile threat to deployed U.S., allied and coalition forces. The future potential for employment of cruise missiles against North America is also cause for concern. The bulk of Third World missile systems are easily relocated and tough to target, are reloadable and are directed by unsophisticated command and control procedures. These characteristics often preclude any warning of a launch except detection from space-based systems. Detecting, targeting and destroying these missiles remains a problem and a major reason we must field an improved space-based launch detection system.

The number of countries with access to satellites or satellite data obtained on the open market continues to rise. No longer is space the exclusive domain of more advanced countries. Space-based capabilities with inherent military value such as surveillance, navigation, communications and environmental monitoring are commercially available. This space system and data proliferation will transform our current high-ground advantage into a more level playing or war-fighting field in the future.

## **Cost Effective Alliance**

Our experience in Desert Storm was a watershed for space power, but we cannot afford to mark time. It would be unwise to believe potential adversaries have not learned from Iraq's failures. The Global Positioning System receivers that gave us an overwhelming desert navigation advantage are now available through Soldier of Fortune magazine. Several countries have capable weather satellites and earth sensing and imaging are emerging services that go to the highest bidder. Access to commercial satellites is available via international consortia — INTELSAT is a perfect example.

Quite frankly, we're going to be challenged to maintain some of the space capabilities we had in Desert Storm while the rest of the world is catching up. The course



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of the next war will be highly dependent upon space information — a true information war. Given this strategic backdrop, our relationships with allies and coalition partners will be fundamental to our future security, especially as we allocate fewer resources to defense.

There is probably no better example of a cost-effective and mutually beneficial alliance than the one we share with Canada under the North American Aerospace Defense Command agreement. In addition to shared warning and air defense, the United States and Canada share a common interest in maintaining their air sovereignty through effective surveillance and control of North American airspace.

One of the North American Aerospace Defense Command's greatest benefits to both the United States and Canada is the ability to share not only the responsibilities but also the resources for North American air sovereignty. It would be more difficult, as well as more costly, for each nation to develop unilateral plans for missions and functions currently performed jointly through the North American Aerospace Defense Command. The command remains a cornerstone of Canadian and U.S. cooperation and expands traditional political and economic ties into a defense partnership.

In the post-Soviet era, fiscal constraints are making it increasingly important to maintain robust relationships with allies relationships based upon common values, vision and operational economies in the monitoring and control of North American airspace. While North America is no longer seriously threatened by massive air attack, there are elements of the air sovereignty mission that must be sustained. The North American Aerospace Defense Command assists both nations with a fundamental aspect of sovereignty — the right to control access to national airspace.

The North American Aerospace Defense Command remains ready to perform the air sovereignty mission across the spectrum from routine, peacetime operations through crisis to a fully regenerated air defense mission, should it be required. My staff has been re-examining present and future requirements, deleting those no longer applicable in the post-Soviet world, while maintaining the requirement for infrastructure upon which a full-up defense can be regenerated if needed. For example, the

flexible approach toward the air sovereignty mission. Instead of the former concept of continuous, 24-hour aircraft alert at fixed sites, region commanders will vary their alert locations and response postures. *Fiscal Constraints* 

command has recently adopted a more

Integrated Tactical Warning and Attack Assessment is another enduring mission for the North American Aerospace Defense Command. Specific concerns cause me to hold that belief, among them the continued presence of nuclear weapons dispersed throughout the former Soviet Union and the increasing number of nations developing missile and nuclear weapons technology. Capabilities, not intentions, drive our evaluation of potential strategic threats. Still, some economies are being realized in this mission area. The North American Aerospace Defense Command headquarters and U.S. Space Command staffs have reviewed procedures and requirements focusing on missile warning functions. We are working with the Joint Staff on our proposals. In addition, we have already coordinated cost reduction initiatives for the atmospheric warning systems.

Budgetary pressures are forcing us to reexamine every system put in place for the Cold War threat. Our focus is to maintain critical, core capabilities while eliminating unnecessary ones. For those systems on the margin, which we may need if the geopolitical climate or threat changes, we are developing plans to regenerate our air defense systems in less than 24 months. For example, in the case of our northernmost sites, the difficulties of reconstituting systems in the Arctic make it prudent to install and test the radars now, but then place them in a reduced operational status. Other systems, such as the Over The Horizon-Backscatter radar and selected missile warning radars, may be subject to less extreme weather and could be stored in-place, and brought back in the future if needed.

I believe our strategy of backing cost reduction measures with regeneration plans will yield a robust North American Aerospace Defense Command that continues its vital binational security responsibilities in an efficient and effective manner.

I am pleased that Congress and the DoD Bottom-up Review have prioritized our development and fielding of ballistic missile defense systems. We all agree theater missile defense is the top priority.

While the Scud had limited military effectiveness in Desert Storm, I grossly underestimated its impact as a political terror weapon and the resources we would have to expend to counter it. The capability of that antiquated weapon to hamstring modern warfare shocked me. Proliferation of fielded and emerging ballistic missiles with vastly improved capabilities will only exacerbate the problem for future warfighting commanders. There is no greater proponent of theater missile defenses than Chuck Horner.

## **Ballistic Missile Defense**

A U.S. Army Space Command trainer, center, briefs soldiers at Fort Hood, Texas, on the use of a mobile commercial communications terminal. Army Space Command is a service component of the U.S. Space Command. The second ballistic missile defense priority is the protection of the North American theater. Therefore, we must carefully work concepts of operations with a long view toward our future systems acquisition. We must also consider the ability of our acquisition system to respond to rapidly emerging, unpredictable threats or proliferation.

As the theater missile defense requirements advocate appointed by the Joint



Chiefs of Staff, U.S. Space Command is working closely with the war-fighting commanders to refine and meld their concepts of operations and employment requirements. Based on the lessons learned from the gulf war, we have established the need for multilayered ballistic missile defenses. The decisions to pursue the Theater High Altitude Air Defense and Navy Aegis systems provide for terminal and midcourse phase defenses against ballistic missiles. Efficiently integrating these systems into each theater's battle management command. control and communications networks will pose the greatest challenge. The key to this effort is recognizing ballistic and cruise missile defenses must be included in the overall air defense picture. Consistent with this need, we are working with the unified commands, the services and the Joint Staff to tailor concepts of operations based on theater-specific threats, missions and environments.

To optimize our ballistic missile defenses we need to track threats through their entire trajectory. A space and missile tracking system like Brilliant Eyes could track longer-range tactical and strategic ballistic missile warheads to improve the performance of ballistic missile defenses. In addition, we would improve our space surveillance capabilities, reduce the need for overseas optical sensors and radars, and collect midcourse intelligence information to optimize ballistic missile defense systems.

### **Need for Brilliant Eyes**

One component to the solution of the missile defense problem is cooperative effort involving allies and friends. The United States is pursuing opportunities for cooperation in both theater and ballistic missile warning information. Shared warning and, ultimately, shared ballistic missile defenses should slow proliferation and would be a stabilizing influence in the increasingly unstable technical and geopolitical environment we see evolving.

While an ICBM attack is still the most catastrophic threat, one we must not ignore, we should optimize our warning to include the theater ballistic missiles that most concern us. Defense Support Program satellites were designed in the early 1970s to provide strategic warning of large, hotburning ICBM launches, and they do this job well. Over the years the program has under-



gone numerous creative upgrades increasing its capabilities and operational utility. We were fortunate that conditions in the Persian Gulf were optimum for DSP, and we had the residual capability to optimally position our assets. U.S. Space Command was able to warn Central Command forces of Scud launches within minutes.

### Satellite Shortfall

The problem is our DSP system may not be as robust next time. It cannot provide quality warning in every theater, and it cannot give a launcher location accurate enough to target. Despite our best efforts, I'm not certain we located and destroyed a single mobile launcher during the gulf war. We also face a known future shortfall in polar coverage. While options are being explored and sufficient time exists to address this future shortfall, no program is currently in place, and this concerns me.

By the end of this year, the Talon Shield program will become operational as ALERT, or Attack and Launch Early Reporting to Theater. This data fusion system improves our cueing and warning support to theater commanders, reducing warning time to seconds, but it is limited by DSP data. Even with Talon Shield/ALERT, our ability to provide adequate warning to theaters like Korea is limited.

There are limits to how much a 20-yearold design can be upgraded, and we are at those limits. We owe our fighting forces better theater missile detection worldwide, and today's Defense Support Program just cannot provide it. Much of last year the Follow-on Early Warning System was my No. 1 priority as the best system in development to answer the theater missile warning problem. This system fell victim to budgetary pressures, but the need for theater missile warning continues to exist. We have re-examined our need for future warning satellites, will terminate the Defense Support Program line and will compete an improved system we call ALARM - Alert, Locate and Report Missiles. We hope this competition will yield a system that will be win-win for the war fighter and the taxpayer.

Additionally, this approach provides for low-risk, evolutionary improvements to the current Integrated Tactical Warning and Attack Assessment architecture, increased operational responsiveness and decreased cost to orbit by designing the system for medium launch vehicle compatibility. I am convinced this approach is realistic in terms of cost, performance, delivery and launch schedule, and risk. It optimizes competition and allows for creative solutions from industry. Putting capitalism back to work in our acquisitions is the tonic we need to recover from a hangover of burgeoning, over-budget and out-of-control acquisition programs. This is especially true for space launch.

My No. 1 concern as commander of Air Force Space Command is launch. Given our increased reliance on military space systems, we must regard spacelift as strategic lift, and in the same light as airlift and sealift. Whatever the system selected to detect theater ballistic missiles, we must be able to reliably and responsively launch it and other high-priority space systems.

#### **Recognizing the Problem**

Today our largest satellites are our most vital payloads, and as we have seen with Titan IV, heavy lift is our toughest launch problem. It often takes seven to 12 months or even more to launch a Titan IV, and the associated costs are just too high. No matter how exotic the payload, it's worthless to the nation if it is sitting on the launch pad. We build on the pad, we tinker on the pad, and we vote on when to launch from the pad. At costs up to a million dollars a day, I can't think of a more expensive place to do anything.

I am concerned as a citizen that U.S. space launch is not competitive in the world marketplace, and I am concerned as a war fighter that we do not have the spacelift we need to win in modern warfare. Launch is now a national problem — too big for Air Force Space Command, the Air Force, DoD, NASA or anyone to solve alone in today's budgetary environment.

Without decisive action we will continue to see the Europeans, Chinese, Russians and Japanese capture the dwindling U.S. market share of spacelift. I am often asked why we don't just contract our launch to these other folks — take advantage of their subsidies. While we could certainly take that road, I just don't believe that's the vision we should have for America's future space leadership.

The good news is we have wide recognition of the problem, and several efforts are under way on the Hill, in the White House and within DoD to seek solutions for our launch problems. We completed a congressionally directed study in March to develop an integrated, efficient and balanced space launch program. Integrated means addressing the needs of all sectors; efficient means cost effective and operationally capable; and balanced means developing an appropriate mix of infrastructure and sustainment.

#### Study Offers Options

While reaching consensus among the various space sectors has been an elusive challenge in the past, I believe this effort will answer the mail. The study report, which will be released shortly, offers options ranging from the current baseline through evolutionary improvements to expendable launch vehicles to a "clean sheet" approach. Each option includes its own timeline, funding profile and implementation approach so many of the variables that have made the launcher decision a moving target can finally be nailed down. Clearly, the key to capable, responsive, reliable and affordable military access to space is a strong, robust and viable U.S. commercial spacelift sector. I am confident solutions are within our grasp and require only determined effort and teamwork to put the United States back in a world leadership position in this area.

As we work the fixes for theater missile warning, ballistic missile defense and launch, my staffs are aggressively engaged in improving how we do business with the assets we have. We are reforming staff processes, developing innovative spinoffs to existing technologies, and empowering operators and war fighters.

Where able, we are extending the life of the forces we have. For example, we are pursuing efforts to keep the ICBM forces supporting the U.S. Strategic Command effective through 2020. Life extension initiatives for the Minuteman III ICBM system include upgraded command and control, replacing propellant and remanufacturing missile motors, replacing guidance system electronics and downsizing the re-entry system from three vehicles to one in compliance with arms control agreements.

We continue to pursue efforts to reach a posture for our ICBMs consistent with our national desire to collectively relax our fingers from the nuclear trigger. A robust and resilient Triad has given National Command Authorities the confidence to employ bombers and air refueling tankers during regional contingencies while maintaining deterrence. Our ICBM forces are truly integrated in the space and missile team.

Intelligence and communications are other areas where we are striving to make evolutionary improvements to existing products. I want to eliminate stovepiping in intelligence and military satellite communications. My operations and plans staffs are now actively in the loop to refine products, processes and requirements that were once the exclusive purview of the intelligence staff and communicators. In January 1994 we completed studies on space-based intelligence systems and communications systems for the vice chairman of the Joint Chiefs of Staff. The studies were unique in that we focused on support to the war fighter first, then to other customers.

#### Educating Ourselves

We are working hard to educate ourselves and war-fighting commands on all the space-based reconnaissance and surveillance available. Near real-time products immediately applicable to war-fighting systems are an essential part of support to ground, sea, air and space operations.

As commander in chief of U.S. Space Command, I have initiated an integrated priorities list for intelligence systems that will be coordinated with all theater commanders and submitted annually to the Defense Intelligence Agency and Joint Chiefs of Staff. Of course, the theater commanders still have inputs on these systems through normal channels, but U.S. Space Command can collate a combined operational perspective to give all the commanders a greater voice in intelligence investment decisions. In the long run, making intelligence more directly available and useful to field commanders will increase the utility of overhead intelligence, decrease costs and base our support for these systems more broadly.

In the satellite communications study, we looked at both military and commercial systems for capacity to meet requirements. Using planning guidance provided by the secretary of defense, we looked at two major regional conflicts occurring nearly simultaneously and the resultant demands placed upon the systems.



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Comparing capacity to requirements led us to some key findings and recommendations. We found commercial services will be necessary to augment military systems during most future crises and combat operations. We recommend commercial services be planned for and incorporated into existing and future plans.

## Approaches Differ

We do not recommend acquisition of commercial services configured to military standards. This is where the Civil Reserve Air Fleet approach we use with commercial reserve aircraft differs from on-demand commercial satellite surge capability. Those unique military needs that cannot be met commercially should be designed and fielded to support our theater commanders. Regardless of the decisions made on the Milstar program, existing validated requirements from theater commanders for low-probability-of-detection, jam resistant, mobile satellite communications must be met. Today these requirements can be satisfied only on extremely high frequency satellite systems.

We are working hard to eliminate military and civil duplication in our communications, weather, navigation and imagery systems, and we seek civil-military convergence in requirements wherever possible. Where our requirements can be met by the civil sector, we're using that capacity.

In response to a congressionally directed study, DoD, NASA and National Oceanic and Atmospheric Administration have recommended convergence of DoD's Defense Meteorological Satellite Program and NOAA's polar-orbiting operational environmental satellites. This convergence has the potential to realize significant cost savings while meeting environmental support requirements for worldwide military operations.

In navigation, the use of the Global Positioning System grows rapidly in both the civil and military sectors after its utility was decisively proven in Desert Shield/Storm. Soon, all our forces and most of our weapons will be dependent on GPS information. We must protect its availability for military operations while ensuring it can be safely used in commercial and civil activities during peacetime.

We will continue to cooperate with the Transportation Department to provide maximum civil and commercial use at

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requested accuracies. However, we must also protect military use of full Global Positioning System capabilities and prevent adversaries from exploiting the system for their use and from degrading or denying those capabilities for U.S. and coalition forces. To ensure all requirements are met, I recommend U.S. Space Command retain combatant command of the system, continuing to direct the operation and support necessary to accomplish military missions.

## Dependent on Aging Systems

The December 1993 DoD withdrawal from LANDSAT 7, coupled with the LANDSAT 6 failure, leaves the military dependent on the aging LANDSAT 5 and foreign sources, primarily the French SPOT system, to fulfill military multispectral imagery needs. Wide-area coverage and responsive map generation capabilities are major contributors to successful mission planning and rehearsal, counterdrug operations, terrain analysis and treaty monitoring.

LANDSAT has provided key information during Desert Storm, Somalia and Bosnia operations. We continue to have validated requirements for multispectral imagery data and broad area coverage and are working with the Office of the Secretary of Defense to determine how national and A U.S. Army Space Command instructor, right, shows a soldier how to use a compact Global Positioning System receiver. A Defense Meteorological Satellite Program orbiter collects weather data for military operations in this artist's rendering. More than 20 years old, the program receives command and control support from the 50th Space Wing, U.S. Air Force Space Command. The command is a service component of U.S. Space Command.



commercial systems can best meet them.

As we review and implement all these programs, we keep our mission sharply in focus — make all space systems responsive to U.S. war fighters. Unlike air or surface systems, these space systems do not have to deploy to the theater, do not require air superiority and are virtually always onscene. In an era of diminished forward basing space assets increasingly represent our forward presence.

I want to ensure our war-fighting commanders know more about these vital systems than we did going into the gulf war. To assist our war fighters in exploiting space-based capabilities, U.S. Space Command provides unified commanders with theater support teams. In addition, Air Force Space Command provides Air Force component commanders with forward space support teams trained by the Space Warfare Center. These teams are already in the field in theaters, such as Korea, with real-time support from and connectivity to space assets. We are also working with national agencies to provide quality "outreach" programs to train commanders and their staffs on support from national reconnaissance systems.

The Space Warfare Center is the centerpiece of Air Force Space Command efforts to fully integrate space systems into Air Force daily operations. The center is located at the National Test Facility, which Air Force Space Command operates and manages for the Ballistic Missile Defense Organization. Together the center and facility are rapidly building, testing and supplying new tools to our forward support teams. Prototype systems are demonstrating their usefulness in a variety of applications from command and control, mission planning and real-time information to the cockpit to special operations and communications. One key goal of many space applications is to improve situational awareness at all levels of air operations

#### Supporting Bridge and Foxhole

Just as the Space Warfare Center is bringing Air Force space support directly to the cockpit, Army and Navy Space Command are taking space support directly to the foxhole and the bridge of the ship. The effective exploitation of the Global Positioning System was a direct result of Army Space Command's efforts to show, train and convince skeptics that there was a new and better way to fight a war. Recently in the Army's Louisiana maneuvers space support from commercial communications satellites enabled soldiers to link multispectral imagery and weather information to field users with off-the-shelf equipment.

Naval Space Command is also working numerous development and demonstration concepts and programs for sensor to shooter data transfer. Navy and Marine Corps space support teams provide training, products and augmentation to fleet and fleet Marine



force units.

Space exploitation demonstrations performed by the Space Warfare Center and Army and Navy Space commands provide mechanisms to evaluate and field the rapidly evolving DoD, civil and commercial space capabilities. These demonstrations have refined and tailored space support at reasonable cost and help equip theater forces with space-user equipment the services can integrate into weapon systems. Space requirements need to be embedded in service acquisition strategies, incorporated into service warfighting doctrine, fielded through normal service channels and trained with like any other piece of equipment.

### Involving the Services

Because each service is a space consumer, all must be involved in design, acquisition and operations of all U.S. military space systems. This is not to say a lead service concept is unacceptable, but the systems serving ground and naval forces should have those customers involved as they are developed and fielded. The role of each service in organizing, training and equipping has been essential to successful military space operations. Our current U.S. Space Command organization with service components serves us well, but we must remain vigilant to ensure space budgets are protected as space systems and operations grow and assume a greater share of service budgets.

The geographic proximity of the North American Aerospace Defense Command, U.S. Space Command, the Air Force and Army Space commands, the Air Force Space Warfare Center and the Cheyenne Mountain Complex in Colorado Springs, Colo., provides efficiency. Over the years, however, line and staff functions have blurred.

We are continuing a tricommand effort to get staffs out of operations and realize savings by establishing appropriate operational chains of command. For example, in Air Force Space Command the 20th Air Force is in charge of missile operations and the 14th Air Force is the functional component in charge of space operations. Eventually it may be appropriate to have joint force space component commanders on the staffs of all theater commanders to participate in deliberate and crisis action planning and advise commanders on space support in peace, exercise and conflict.

During conflicts U.S. Space Command is assigned the war-fighting responsibility of

space control. Space control operations ensure freedom of action in space for the United States and its allies while denying adversaries such freedom of action. Space control consists of systems and operations designed for protection of our space systems, negation of enemy space systems (including terrestrial elements) and the necessary supporting surveillance. Space control includes a broad spectrum of measures from diplomatic efforts to downlink or ground station denial to destruction of enemy space systems. Our destruction of Iraqi satellite ground communications stations on the first night of Desert Storm was a perfect example of space control. Ultimately space control protects the very lives of our troops on the battlefield. All space control measures are heavily

All space control measures are heavily dependent upon space surveillance, and U.S. Space Command needs a continuing capability to survey and monitor all militarily significant activities in space. Preservation of our current worldwide space surveillance system in a constrained budget environment is one of my top concerns.

Space control and support from space systems are the key factors in winning an information war. Within our lifetimes we may fight a war in which information dominance wins the conflict without a force-on-force battle. We will also need to develop policy to define which aspects of our space systems are critical and must be controlled and which we will share through international cooperation. I believe we will see expanded international cooperation in warning, missile defense and launch as the costs of space systems and access grow beyond the capacity of any one nation to pay.

As we move toward the 21st century our space industry and culture are evolving from a research and development mentality to one of normalizing space operations and space support. We have had a couple of turbulent decades since the end of Apollo, but I strongly believe we have the means and the motivation to move out and meet the challenges.

The potential rewards of success are great for technology, industry and war-fighters, and the risks are even higher if we fail to meet the challenge. We owe our sons and daughters a vision of U.S. space leadership for the future. $\blacksquare$ 



Gen. Charles A. Horner, USAF

Commander of the U.S. and allied air components during the Persian Gulf war, Horner has held his current triple-hatted position since June 30. 1992. An lowa native, he entered active duty in 1958 with an ROTC commission and bachelor's degree from the University of Iowa. Horner, a fighter pilot and Vietnam combat veteran, has commanded a tactical training wing, a fighter wing, two air divisions and a numbered air force in previous assignments. Among his decorations are two awards of the **Distinguished Service** Medal, two of the Silver Star, the Legion of Merit and the Distinguished Flying Cross. Scheduled to retire in June this year, he was extended on active duty pending the arrival of his successor.