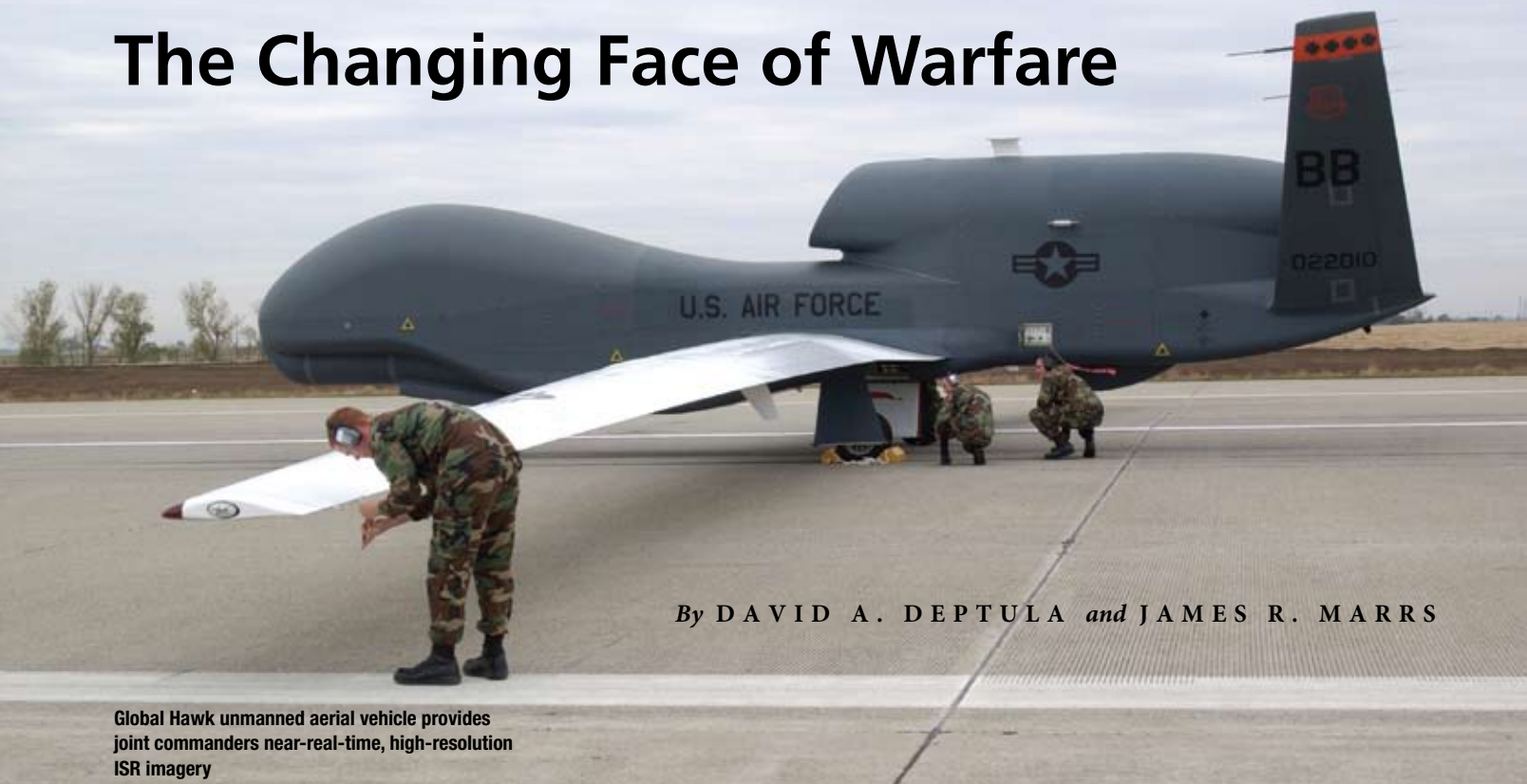# Global Distributed ISR Operations

The Changing Face of Warfare

By DAVID A. DEPTULA *and* JAMES R. MARRS

Global Hawk unmanned aerial vehicle provides joint commanders near-real-time, high-resolution ISR imagery

Over the last decade, our joint team has benefitted greatly from a combination of technology and new operating concepts to better leverage warfighting talent around the globe. Nowhere is this progress as evident as in the rapid evolution of distributed intelligence, surveillance, and reconnaissance (ISR) operations. Joint and allied forces depend daily on these new capabilities—a result of innovations stemming from our longstanding competencies in ISR, unmanned aerial systems, air, space, cyberspace infrastructure, and both the technology and art of distributed operations. This rapidly evolving paradigm, called *distributed ISR operations*, links platforms and sensors, forces forward, and human ISR warfighting expertise around the globe in ways that make networked combat operations routine. The criticality of this amalgam of airborne ISR capability to current operations in Iraq, Afghanistan, the geographic combatant commands, and homeland security is not widely known or

well understood. The intent of this article is to explain and expand awareness of this global network-centric warfighting capability.

Foundations

A discussion of distributed ISR operations can only begin with an understanding of the architecture that makes the concept possible. The key element of the architecture is known as the Distributed Common Ground System (DCGS), which evolved from the high-altitude manned U–2 and national programs. In the mid-1980s, the Air Force deployed mobile ISR vans to forward locations to allow the U–2 to downlink aerial observation data for exploitation. The U–2 and exploitation vans had to be *within* line of sight of each other to work. The Air Force continued to develop technology to enable the U–2 to downlink data *beyond* the line of sight

of the exploitation vans. Leveraging multiple communication assets and space systems, and enhancing collection platforms and sensors, the Air Force built an architecture that allowed U–2, Global Hawk, Predator, and Reaper aircraft to transmit regionally collected data to exploitation locations around the globe. The Air Force DCGS system evolved into a Department of Defense (DOD) DCGS program to create a system of systems for the sharing of intelligence across joint and allied forces. Today, each of the military Services has DCGS elements, based on DOD DCGS standards, and tailored for specific aspects of joint and allied operations.

In 2003, after the success of Air Force DCGS during Operation *Allied Force*, the Service designated the sites and communications architecture of the Air Force DCGS as the AN/GSQ–272 Sentinel weapons system. Each ground station of the system architec-

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ture is designated as a Distributed Ground System (DGS). Five sites, known as DGS 1 through 5, constitute the Active-duty force.[1] Air Force DCGS is an exceptional example of a Total Force team. Currently, the Air National Guard operates four additional DGSs, with two more scheduled for activation this year.[2] DCGS crews also rely on the expertise of partner distributed mission site crews normally collocated at National Security Agency/Central Security Service cryptologic centers.

The integrated global Sentinel team continues to grow with the addition of federated partners—enabled by continued investment in a global Sentinel communications architecture. These partners include significant Army, Air Force, and joint capabilities—such as the 513th Military Intelligence Brigade, Fort Gordon, Georgia; the National Air and Space Intelligence Center at Wright-Patterson Air Force Base, Ohio; DCGS–Army; and the Tactical Exploitation System, Baghdad, Iraq—underscoring the joint collaboration that DOD DCGS standards make possible.

While there are those who characterize technology as not making much difference relative to the human dimension of warfare, the truth is that the appropriate mix of both is what has given U.S. joint forces critical advantages in warfare. The power of this mix can perhaps best be revealed using an example.

The global warfighting partnership in this example begins with an Air National Guard ISR exploitation crew at DGS Arkansas, Little Rock Air Force Base, prebriefing their 12-hour portion of an 18-hour Predator mission over Afghanistan. Essential prebrief background materials were built by the DCGS Analysis and Reporting Team (DART) at DGS–2, Beale Air Force Base, California, whose operational responsibilities include Afghanistan. The prebrief includes operational tasks and supported units for the duration of the mission. The specific lineup associating this Predator to one or more ground units during the airborne mission was decided earlier through a standing process managed by the Joint Information Operations Center–Afghanistan and the regional Combined Air Operations Center (CAOC), while the exploitation crew assignment was tasked by the Wing Operations Center (WOC) at the 480th ISR Wing, Langley Air Force Base, Virginia. In addition, the crew is briefed on major ground

operations in progress, joint force commander priorities, as well as other ISR assets available to prepare for cross-cue opportunities and any likely "audibles" that they anticipate as joint operations continue to unfold over the course of the day.

Once airborne, this Predator's global networked team includes the DGS Arkansas element as well as pilot and sensor operators from the 432d Air Expeditionary Wing, Creech Air Force Base, Nevada, and a joint terminal air controller integrated with the unit that the Predator is operating with, all linked by secure Internet chat capability. At the same time that the Predator is airborne, a Global Hawk images an area nearby. Its DGS–1 crew at Langley identifies potential enemy activity that merits a closer look. An Internet chat discussion takes place among

the DGS–1 Global Hawk exploitation crew, DGS–2 DART, DGS Arkansas Predator crew, CAOC senior intelligence duty officer, and the joint terminal air controller (collocated with the ground forces), resulting in a redirection of the Predator from its current mission to this potential activity.

Once over the area, the DGS Arkansas crew detects and communicates hostile activity and then transitions along with the remainder of the networked team, both the aircraft and sensor operator crew and joint terminal air controller, as the Predator is cleared to engage

the target. Upon successful conclusion of the engagement, the Predator is vectored back to its previous mission—in this case, route clearance for a future convoy mission.

The same advancements that make possible this global collaboration linking a Predator mission to specific joint and allied forces also make possible an unprecedented level of global ISR flexibility. Every day, Air Force global distributed ISR operations teams participate in multiple simultaneous joint and coalition irregular warfare operations, while at the same time providing persistent vigilance in other areas of responsibility to deter major combat operations and to support homeland security events resulting from natural disasters such as hurricanes and wildfires. These simultaneous ISR operations in multiple combatant commands have become routine.

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Reinforcing Success

During the development and maturation of Sentinel, appreciation of the reliance of joint and allied forces on Air Force ISR capabilities was growing throughout the Air Force as a whole. As DGS crew members from the Pacific Air Forces and U.S. Air Forces–Europe began participating daily in Operation *Iraqi Freedom* and Operation *Enduring Freedom* ISR missions, the assumption could no longer be made that the efforts of ISR forces located in one area of responsibility would be limited to just that geographic region.

With these new operational realities in mind, an initiative was proposed that adopted the model of joint

U.S. Air Force (Michael Edmond)

Above: Coauthor Col James Marrs (second from left), commander, 480th ISR Wing, with staff members
Right: Airmen analyze data at imagery workstation within Distributed Common Ground System

U.S. Air Force

command relationships to a Title 10 organization. Administrative control of Sentinel would be aligned under one organization, the 480th ISR Wing, and it would be realigned to the globally focused Air Force ISR Agency (AFISRA) in order to better actualize the global potential of this capability.[3] At the same time, operational control of the individual DGS would be retained by the regional Air Force major commands. The proposal was accepted by the Air Combat Command, Pacific Air Forces, and U.S. Air Forces–Europe commanders and approved by the Air Force chief of staff in January 2008. The significance of this action was to organizationally align Sentinel as a global ISR weapons system, streamline command chains, and maximize joint operational effects across the globe, while still remaining responsive to regional Air Force major command and combatant command concerns. The proposal also realized the major strength of the global network-centric capability of Sentinel: the ability to instantly move ISR access from combatant commander to combatant com-

mander or to provide tailored ISR to multiple combatant commanders simultaneously. Work continues with major command staffs to refine the doctrinal underpinnings of this global construct as we all are experiencing

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the shortcomings of current command relationship terminology in fully capturing the successful operational relationships that exist in this complex system.

The establishment of the AFISRA as the Air Force's Service Cryptologic Component, and the realignment of the 480th ISR Wing to the AFISRA, also enabled the creation of five regional ISR groups that allowed the

integration of both Title 50 and Title 10 ISR functions. The ISR groups are standardized in function and provide a unified force presentation of Air Force ISR capabilities to their respective combatant commands. Each of the five Active-duty DGS organizations forms the operational core of the ISR groups, and each group is operationally aligned with a primary Component Numbered Air Force (C–NAF).

By July 2008, these changes established the foundation for powerful regional ISR teams that live and breathe the operations of their respective C–NAF and combatant commands. The ISR groups and their accompanying Sentinel architecture were created to possess the inherent flexibility to rapidly focus local and global capability on their area of operations while simultaneously shifting elements of ISR capability from one region to another as theater and national priorities require. They truly are the foundation for a new operational paradigm that executes regionally focused, globally networked joint and allied ISR operations.

By establishing an Air Force–wide enterprise solution, we are providing more

480th ISR Wing integrated USS *Harry S. Truman* Carrier Strike Group into DCGS operations, establishing successful ISR partnership

U.S. Navy (Justin Lee Losack)

ISR access to the major commands, combatant commands, and national Intelligence Community than ever before. Optimizing the capabilities that ISR brings to the fight requires streamlined command chains and a single focal point of leadership. DCGS is a perfect example; it is a network-centric weapons system relied upon by joint forces everywhere. Through the new organizational construct, the Air Force has brought responsibility for managing its globally distributed capabilities under one roof to ensure consistent, smart oversight. This centralized oversight allows the synchronization of complex operations across the globe and adjustment of tasking to optimize all the capabilities of the system as operational situations dictate, while decentralized execution ensures end users are provided the ISR they specifically require.

Beyond Reachback

Not long ago, the term *reachback* was used to describe the relationship between forward deployed and in-garrison, geographically separated units. The forward site received the task and then passed back a portion of the ISR requirement to a second (usually based in the continental United States) site to assist in exploitation and dissemination. Specifically, this arrangement allowed forward-deployed forces to converse directly with centers of operational or analytical expertise wherever they existed. This construct also promised to reduce the size of a forward footprint that presented increasing logistical and force protection concerns.

While the current joint definition of reachback is fairly broad in scope, the term has also developed a negative connotation in some operational circles—where it has become synonymous with "not having the same sense of urgency" as the operational units forward (and therefore less likely to be trusted by forward commanders). Even though these views are in most cases without merit, detractors used the perceived faults of reachback to build a wall between them and any organization not located within the confines of their physical operational space. To them, if it was not organic or they did not control it, it did not matter.

The notion of reachback operations has been important to the evolution of modern combat operations. Yet its faults and limitations, whether perceived or actual, argue strongly for the adoption of distributed operations as a term of art—certainly in the

world of ISR—because it better reflects the multinode network-centric relationships that execute ISR today.

Key Elements

Collaboration in combat operations does not just happen. Successful large-scale distributed ISR operations require a combination of specialization and standardization within the global enterprise to make this kind of partnering possible. The six elements that follow form the major building blocks of this global capability.

Presence at Key Joint and Coalition Operational Hubs. To facilitate joint operations, Air Force ISR liaison officers and expeditionary signals intelligence liaison officers are assigned to multinational divisions in Iraq and to regional commands in Afghanistan, as well as to more specialized units including special operations forces and key brigade combat teams. The result of this presence, especially with ground forces, is better understanding and results for the collection requirements of ground commanders; improved partnering between ground force intelligence staffs, CAOC ISR division analysts, and DGS DART analysts to work time-sensitive analytical questions pertaining to current operations; and exceptional situational awareness for ISR crews regarding the details of current operations in which they will participate. In addition, DCGS liaison officers are assigned to CAOCs (and Multi-National Corps–Iraq) conducting major ISR operations, and serve as the 480th ISR Wing and DCGS representatives to the combined forces air component commander (and Multi-National Corps–Iraq collection management) to best integrate and synchronize DCGS capability into theater operations.

Constant Focus on the End User. Joint and allied warfighter end users are the reasons distributed ISR capability exists. Making our capability user-friendly requires a layered strategy that is search- and contact-friendly (from ensuring our analytical products are globally accessible to creating Web sites on a variety of networks that make answering operational questions easy). We spend significant time hosting intelligence staffs

from ground forces preparing to deploy, so they fully understand the depth and breadth of capability that will be part of their operations—and are increasing our investment in postdeployment hot washes. We participate in a web of daily conversations with joint and allied forces; some are focused on specific ISR missions, others on work solutions to broader intelligence challenges. Improvements result from a continuous evolution of tactics, techniques, and procedures to keep pace with and in some cases *drive* changes to operational art. Among our most successful recent improvements are advancements in information-sharing (for example, continuing the installation across multiple DGSs of coalition-friendly terminals for better support of operations); innovative software to ensure that users have real-time access to the status of their intelligence requirement; and access to large volumes of imagery even in bandwidth-constrained environments (through the Air Force's Web-based Imagery Access Solutions capability).

DCGS Crews. Perhaps the most enduring aspect of Sentinel, our exploitation crews around the globe turn what is collected from a variety of airborne platforms (U–2, RQ–4, MQ–1, and MQ–9) into usable intelligence. Even here a great degree of specialization takes place. Tailored crews are assembled based on the type of platform and the nature

the Air Force has brought responsibility for managing its globally distributed capabilities under one roof to ensure consistent, smart oversight

of the mission. Within each crew, a command and control element ensures accomplishment of mission tasks, while an analytical team works through individual exploitation assignments.

DGS Analysis and Reporting Team. A relatively new addition to the Sentinel team, the DART is a key innovation that anchors the global DCGS team geographically. DARTs assigned to each Active-duty DGS specialize in one or more geographic regions. Every DART exists for two primary purposes: to provide external customers with tailored, correlated, higher confidence reporting based on both DCGS analysis and other sources; and to provide DCGS crews with situational awareness on the targets, operations, and requirements that they will execute during the course of their mission.

The DARTs provide detailed, precise analysis that fully leverages multisource intelligence to provide unprecedented insight into theater insurgent activities and aids in shaping the battlespace to our advantage. While we seek to have DGS crews cover targets in their ISR group's area of operation for target continuity, it is not uncommon to have the DART working issues for its respective area while their collocated crews execute missions for one or more areas.

Wing Operations Center. The 480th WOC coordinates and manages worldwide Air Force processing, exploitation, and dissemination (PED) operations. The WOC mission is both simple and daunting: to

ability of our global ISR team, the WOC produces a daily product called the PED tasking order, a sliding 3-day schedule assigning DGS crews around the globe to planned ISR missions. While the tasking order serves as the foundation for mission accomplishment, it is WOC agility that makes it such a powerful element in distributed operations. As crises materialize anywhere on the globe, the WOC is able to react instantly to related combatant command and C–NAF operational responses requiring Sentinel personnel and to reassign crews as appropriate. In addition, WOC expertise in managing the global Air Force DCGS communications architecture enables extraordinary agility

platforms—teaming as an integrated crew regardless of physical location.

Making a Difference

While descriptions of the global network-centric ISR enterprise architecture may assist in its understanding, examples and results of how it operates are perhaps more useful in conveying the value of the system to the conduct of modern joint operations. In one particular instance, the DGS–4 DART, in communication with a forward-deployed analytical team that was collocated with an allied partner, received a tip from coalition collection that a terrorist cell was preparing to take action against blue forces. The DART knew their DGS crews would be executing missions in that area later that day and also knew a fellow Air National Guard DGS site was presently operating there. Via chat and other communications means, the DART analyst pushed the intelligence tip to the respective DGS crews as well as the CAOC that was tasking these missions. The Predator was subsequently redirected to the suspected terrorist assembly area where unusual activity was observed. As this was reported back to the ground elements, planning was under way to conduct operations against the terrorists. After operations were completed, the CAOC passed ad hoc requests to the DGS–4 crew to get U–2 battle damage assessment imagery. DGS–4 imagery analysts were able to provide an immediate assessment and confirmation that the strikes were successful.

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ensure our global Air Force DCGS weapons system is synchronized to meet warfighting requirements around the globe. This team understands the joint operational requirements for DCGS as well as the status of Sentinel crews on a global scale—all the while controlling a worldwide communications architecture that makes our operations possible.

With a sound understanding of joint force commander requirements and the

if any portion of the enterprise suffers an outage.

Global ISR Platforms. A complex team and architecture in its own right, the primary platforms that we operate with every day cover a range of capabilities and configurations, from the high-altitude manned U–2 Dragon Lady and the unmanned RQ–4 Global Hawk, to the multirole, medium-altitude MQ–1 Predator and MQ–9 Reaper. We enjoy a close partnership with the teams that fly these

Another example of the effectiveness of distributed operations occurred early one morning when enemy forces attacked an American base in northern Iraq with mortar fire. Within moments of the attack, Air Force expeditionary signals intelligence liaison officers embedded with force protection elements at the base alerted their Fort Gordon–based counterparts and the ISR mission commander (MC) at DGS–1 to the indirect fire. The Langley-based ISR MC then coordinated Global Hawk collection of both the indirect fire point of origin and impact points while coordinating for Joint Surveillance and Target Attack Radar System Ground Moving Target Indicator data for forensic backtracking. Through constant communication with American-based signals intelligence elements and their forward-based liaison officers, the ISR MC learned a high-value individual, likely related to the indirect fire attack, had been

U–2 Dragon Lady takes off from air base in Southwest Asia

U.S. Air Force (Brian J. Ellis)

active within 3 nautical miles of the indirect fire point of origin. This global distributed ISR team leveraged a variety of national, joint, and theater capabilities to map out this individual's web—his operating locations and insurgent network—and identified his likely residence for the ISR MC to pursue. The ISR MC then directed DGS–1 imagery analysts to pull national reference imagery of the area surrounding the house and passed the analyzed imagery to direct action elements on scene in Iraq. He began coordinating with both the CAOC and DGS–5, located at Hickam Air Force Base, Hawaii, to get a Predator on scene, and further cross-cued the Global Hawk flying nearby to the individual's residence. The ISR MC also tasked his DCGS DART to research known and probable safe houses the individual could run to. Within minutes, the Global Hawk imagery was beamed to DGS–1, analyzed, and forwarded to direct action elements down range, which were already en route to capture the individual. Three minutes later, an Air Force Predator—piloted by a crew at Creech Air Force Base outside Las Vegas, Nevada, and exploited by Airmen from DGS–5—assumed watch duties. Twenty-five minutes later, direct action forces entered the house and captured the individual. Three hours and 16 minutes—little more than a quarter of the night shift—had elapsed from the time the ISR MC was notified of the indirect fire attack to the arrest—all as a direct result of distributed ISR operations conducted by vigilant Airmen halfway around the world.

The Way Ahead

The operational success we have enjoyed through distributed ISR operations comes from our significant investment in both human capital and technology in a fashion that constitutes a truly leading edge ISR processing, exploitation, and dissemination capability. The pace of change in the modern battlespace mandates that we combine technology with human innovation to enhance joint interoperability and rapidly optimize combat operations. One of the benefits of distributed operations is the groundswell of innovative ideas gained from partnering every day with forward-deployed engaged forces. Tapping these insights, we are moving toward a future approach in our acquisition and sustainment community that can more rapidly spiral these improvements into our global ISR architecture.

The focus of spiral improvements to DCGS remains on the joint and allied user. With that in mind, we are implementing a three-part improved ISR end-to-end strategy that optimizes direct connectivity from sensor to user, stores and makes the entire sensor output of our collection assets globally accessible across the network, and constantly evolves the products that skilled ISR Airmen create every day for joint/allied operations.

Taking the above course correction that embraces spiral development and implements an improved ISR strategy is critical to joint and allied forces conducting a diverse array of operations and missions. Rapidly improving exploitation and analysis is at the core of delivering DOD DCGS capability. Collaborative, distributed network-centric ISR operations also require the integration of Service DCGS elements to meet the timelines for warfighting information needs. Our goal is to accelerate the partnering among Service DCGS systems to better federate and enhance intelligence exploitation and reporting for joint and allied operations. A critical element of that process is the recent fielding of the DCGS Integration Backbone that enables data-level interoperability and facilitates integration of all Service DCGS elements to increase situational awareness of the battlespace, make ISR information available across the Services, and improve operational effectiveness. Today, we are just scratching the surface on leveraging the DCGS Integration Backbone capability. Future efforts must seek to better integrate ISR operations across the Services, combatant commands, allied partners, and the entire Intelligence Community.

As our coalition partners continue to develop their ISR capabilities, we must be active participants with them in developing a network-centric allied environment to integrate with the DOD DCGS enterprise. This is also the time to imagine the future of distributed ISR operations—one whose capability is an order of magnitude greater than the one we operate today. In addition, it is long past time to rename the DCGS using terms that describe its function. Words matter, and the arcane acronym *DCGS* hinders understanding—and therefore exploitation—of this ISR fusion system. We must rename this system with a term that better captures the depth and breadth of this global ISR warfighting capability.

Sustained commitment to DCGS has enabled a transition from reachback to true distributed ISR operations, creating in the process the first DOD global network-centric weapons system. DCGS is the leading model for executing distributed operations on a global scale as an integral element of ongoing combat missions: hundreds of ISR personnel, working thousands of miles from Afghanistan and Iraq, are delivering actionable intelligence to protect fellow warriors and are engaging the enemy 24/7/365. The Sentinel weapons system allows us to project power and create desired effects without projecting the vulnerability associated with the deployment of the enterprise into the combat zone. As we continue to evolve this foundation of modern warfare, we must capture this new reality in doctrine, training, techniques, and procedures, and joint and Service cultures—taking us beyond a "deployed-only" mindset that sells short the full advantage of our nation's modern warfighting capability and the distributed ISR operators around the globe who make it possible. **JFQ**

N O T E S

[1] The Active-duty Air Force sites are DGS–1, Langley Air Force Base, VA; DGS–2, Beale Air Force Base, CA; DGS–3, Osan Air Base, Republic of Korea; DGS–4, Ramstein Air Base, Germany; and DGS–5, Hickam Air Force Base, HI.

[2] There are four Air National Guard partner sites: DGS–AL, Birmingham Air Guard Station, AL; DGS–AR, Little Rock Air Force Base, AR; DGS–KS, McConnell Air Force Base, KS; and DGS–NV, Reno Air National Guard Base, NV. Two more sites are scheduled for activation in 2009: DGS–IN, Hulman Field, IN; and DGS–MA, Otis Air National Guard Base, MA.

[3] Prior to the realignment, Air Force DCGS was split between Air Combat Command (8th Air Force)—the parent command of the 480th ISR Wing, U.S. Air Forces–Europe—and Pacific Air Forces, cutting across command chains and combatant command areas of responsibility. This construct was unwieldy and detracted from the major strength of the global network-centric capability of Air Force DCGS.