

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY

PATHFINDER

The Geospatial Intelligence Magazine

MARCH / APRIL 2005



GEOSPATIAL LOCATION

▶ Going to War with

GEOINT

- >>"Reachback" Capability Makes a Difference in Iraq
- >>NGA Support Teams Stand with the Warfighter
- >>Searching for Undergrounds with a High-Tech Toolkit



ON THE COVER

The warfighter with an eye on geospatial intelligence reflects the power of this new discipline to save lives while making a revolutionary difference to mission success. Craig Milsovic and Kevin Cartwright designed the cover, based on a concept by Leon Samuels. Photography by Rob Cox.

GETTING PUBLISHED

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Paul Hurlburt



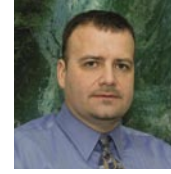
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GEOINT is making a revolutionary difference.

Letter to our Readers

In 2005 the Pathfinder is spotlighting the many ways that NGA and the geospatial-intelligence (GEOINT) community are making a difference to the safety and security of our country and beyond. In every issue, we will show you why this new discipline matters from the vantage point of a particular end use. In this issue, we focus on GEOINT's power to support our warfighters, as it makes a revolutionary difference to mission success and in many cases saves lives.

NGA's Military Executive, Air Force Brig. Gen. Dale Waters, sets the stage, as he shares his perspectives based on his trips to the field and meetings with our many and varied customers. Because NGA is having such a powerful impact, he says, there is an urgent need "to develop and field an end-to-end architecture" that will deliver GEOINT "wherever it is needed." He also anticipates the day when the services carry more of the GEOINT load for the last tactical mile, but he applauds NGA's direct support of the "trigger pullers" today.

Up front, we discuss NGA's extensive support to tsunami relief efforts, including a carrier battle group and a force of 13,000 sent to the scene by U.S. Pacific Command. Many elements of NGA helped government and international organizations gain situational awareness in a 12-country region devastated by the tsunami.

Then—in a story by Greg Anderson—Marines fighting in Al Fallujah tell how much they appreciated "view sheds" of sniper positions his branch provided through NGA's "Reachback" capability. Greg goes on to describe how Precision Engagement's Reachback services evolved, in a real-world example of "horizontal integration," to the point of being truly "revolutionary." Of course, Reachback is only part of the support NGA provides to the warfighter. Tom Cooke of NGA's Office of Global Support explains why the Agency made a "conscious business decision to push support" to the warfighter through deployed NGA Support Teams and why this has made an essential difference.

And staying on top of a growing threat—adversarial underground facilities—is the theme of Michael Klumb's insightful article on NGA's search for solutions through collaboration and creative applications of technology. We continue as Anthony Fugate shows how custom imagery on a quick turnaround serves the warfighter, while Amanda Park explains how analysts helped to reinvent imagery support for the U.S. Central Command.

Concluding with our new "Departments," we revisit warfighter support as Linda Johnson looks at Gridlock—a program that promises real-time targeting from non-metric airborne platforms. NGA's Historian looks back on our genealogy, while Laura Cubarney looks forward to the "Enterprise" in the making.

In the May-June Pathfinder, we'll take up the same theme—"How NGA Is Making a Revolutionary Difference"—with a different end use—navigation, in the air, on land and at sea, as well as in space.

Mark Schultz

Director, Office of Corporate Relations



On My Mind

Perspectives on Support to the Warfighter

By Brig. Gen. Dale C. Waters, USAF, NGA Military Executive and Director for Military Support

As NGA's Military Executive, I have the privilege of traveling the world to talk with our warfighting customers about NGA support. I get direct feedback from the very top, like our visit with Paul Bremer, who was then the American ambassador in Iraq. But I also talk to intelligence professionals, planners, civil affairs specialists, and yes, trigger pullers in every service and command.

At each stop, the first words I hear are high praise for NGA products and people. In particular, I hear praise for the experience and professionalism of our deployed and externally assigned NGA analysts and staff officers, who provide geospatial intelligence (GEOINT) capabilities to our warfighters they cannot currently provide for themselves. While these deployed analysts are often the "face of NGA" to our deployed forces, I always make the point that they are merely the "tip of the NGA iceberg" representing the commitment and capabilities of the entire NGA work force dedicated to warfighter support.

GEOINT's Power Underutilized

Frankly, I view the news from the field as mixed—NGA's stock is riding very high, but our nation's combat forces could be doing so much better if they improved their own capabilities to fully leverage GEOINT—and if we engaged more actively to help them build that top-to-bottom capability. This is not meant as criticism of the services nor of NGA, but just the recognition that the power of GEOINT for our nation will not be fully realized until it can be delivered to all of our customers and partners from the President to the foxhole.

We are currently doing much of the heavy lifting with NGA analysts deployed with fielded forces. These "NGA deployers" are doing an incredible job. Still there are many warfighters who are not reaping the

full benefit of GEOINT because they do not have the training, systems or connectivity to leverage it. In many cases they do not even know what they are missing. The work ahead is to sustain and improve NGA's robust deployed support while working with all our customers, especially the uniformed services and combatant commands, to develop and field an end-to-end architecture that will deliver the "good stuff" wherever it is needed.

When I arrived at NGA 16 months ago, I truly did not know what to expect. As a fighter pilot and commander, I had been using NGA products—maps, charts, flight information publications, imagery and targeting materials—without knowing much about the organization that produced them. As I moved into my new position and began to travel and represent NGA, two things became readily apparent: First, the range of activities at NGA is incredibly complex and these activities were immensely important to our customers, especially our combat forces. Second, our nation's warriors loved what we were doing for them. The post-9/11 decisions by our Director, General Clapper, and NGA leadership to build and deploy more robust capabilities were paying huge benefits. Recognizing that others within NGA had done all the hard work, it was tempting to just bask in the praise that was heaped on NGA wherever I traveled. However, I also heard the occasional feedback reminding me of things we could all be

doing better. That got my attention, and I was very pleased to see that the Director and our leadership were also focusing on the same issues.

Obviously, I'm not the only one at NGA who talks to customers. In particular, NGA's Office of Geospatial-Intelligence Management (OGM), under the leadership of Mr. Tom Ferguson, has the primary responsibility for customer relations and for building and coordinating the National System for Geospatial Intelligence, the NSG. OGM is leading the community in developing the entire architecture I mentioned above, which will deliver GEOINT from the White House to the foxhole. Last year, General Clapper tasked OGM to conduct a Geospatial-Intelligence Activity Assessment (GAA), which dispatched teams of NGA experts to visit each of the commands and services, to conduct top-to-bottom reviews of capabilities and needs. They captured comprehensive data on the same issues, needs and opportunities that I was hearing on my visits. The GAA is helping us define the way forward and I thank all those across NGA who helped in that tremendous effort—an effort that will continue, by the way, as a regular part of our leadership role in the NSG.

The Stories Keep You Going

Let me digress for a minute and give some tales from my travels. I mentioned Ambassador Bremer above. When I was sitting in his office with General Clapper in Baghdad, we noticed an NGA product on his wall. It was the only picture in a rather austere and utilitarian office. It was a view of Iraq showing progress in rebuilding the country during the time the Ambassador had been there. NGA was helping him tell that story to his visitors—Iraqis and other partners alike.

On other stops, young Army and Marine officers have told me how our products

have literally saved the lives of their troops—by showing them fields of fire and likely sniper locations, or by giving them imagery and maps that provided alternative travel routes that came into play when they were ambushed. Special operators have told me how tailored products produced by our deployed analysts have given them the routes, threats and detailed GEOINT they needed before they descended on terrorist locations—everything they needed before they kicked in some doors. One day I came across some A-10 combat pilots with fresh oxygen mask marks on their faces minutes after they landed from a mission. They had expended every round—missiles, rockets, and 30mm cannon—on Taliban forces engaged with U.S. Marines in Afghanistan, and they were using our imagery products to help them do it. These are the stories that keep you going. If you are not a believer in the power of GEOINT already, I suggest you find one of our NGA analysts who has deployed with U.S. combat forces and ask him or her about that experience. You will believe.

Still, it bothers me that the huge strides made in transforming our NGA enterprise have not been matched by equal strides across the community. In many cases, there is simply nobody home on the receiving end of GEOINT. We are currently filling some of those gaps with NGA deployers, but the need is clearly greater than NGA's capacity alone. It must be a community effort. I would like to mention a couple of recent changes at NGA that General Clapper has put in place to try to move the community forward. He has empowered our NGA Support Team (NST) Chiefs with expanded authorities to represent NGA to the combatant commands and services. Our NSTs are not simply production elements for the warfighters; as enablers, they are helping our customers build and coordinate their part of the GEOINT

Continued on page 34

NGA Assists in **TSUNAMI DISASTER** Relief and Recovery

By Paul Hurlburt

When reports of a magnitude-9.0 earthquake and resulting tsunami striking the Indian Ocean reached the United States Dec. 26, NGA sprang into action. Contingency plans were activated to ensure that mariners and relief workers entering the affected landmasses had the best possible understanding of the situation they would encounter and that national and international leadership had the best information at hand to assist them in determining where to send help.

The Agency tapped both national and commercial sources to provide the most complete, timely and accurate information. Analysts used national imagery to assess damage to specific structures while products derived from commercial imagery showed the overall scope of the damage—called “apocalyptic devastation and destruction” by NGA’s Director, retired Air Force Lt. Gen. James R. Clapper Jr.

NGA provided imagery products of the affected areas to the Agency for International Development’s Office of Foreign Disaster Assistance (OFDA), U.S. Pacific Command (PACOM)—in whose region the tsunami occurred—and other government agencies. Many NGA products were also shared with the United Nations and international relief organizations.

Assessing Damage

NGA products were critical to PACOM and U.S. Transportation Command (TRANSCOM) officials, who said their relief effort was one of the most complex ever mounted by American forces. PACOM sent an aircraft carrier battle group and a helicopter carrier expeditionary fleet, along with scores of cargo planes, to the scene. Ten days after the tsunami struck, more than 20 ships and 75 aircraft, and more than 13,000 U.S. soldiers, sailors, airmen and Marines had deployed to help provide relief.





An air crewman passes out supplies to locals in a village just inland from the coast of the Island of Sumatra, Indonesia. U.S. Navy photo by Photographer's Mate 3rd Class M. Jeremie Yoder.

NGA analysts assessed how the damage from the tsunami affected access into and out of the damaged areas. The Navy used NGA satellite images to identify sandy beaches where supplies might be brought ashore by landing craft when local ports were blocked. NGA also assessed damage to infrastructure, such as roads, bridges, ports and airfields. In preparing maps based on the latest satellite imagery, analysts in the Analysis and Production Directorate's Readiness, Response and Recovery Branch determined that at least 50 or 60 percent of the bridges and roads in the affected area were unusable. These maps were delivered to relief workers instantly over the Internet.

"It's critical to provide information to folks that are bringing in relief," said public affairs officer Stephen Honda. "We can look at airports to see if the airfield is damaged to prevent aircraft from landing, or tell if there are hazards in harbors that would prevent ships from coming in."

Warning Mariners

Mariners look to NGA for warnings about hazards in their area of operation. "Notices to Mariners" are transmitted to both Navy and merchant marine ships 24 hours a day by the Agency's Maritime Safety Division.

A Dec. 29 notice warned that ports of call could be heavily damaged "to include unknown new bottom configurations, ship wrecks, shoreline changes and depth limitations." The notice also said "aids to navigation may be damaged, inoperable, off station or even destroyed. . . . Proceed with extreme caution." Follow-up notices provided more specific information as it became available. Wrecks and debris fill port and coastal waters throughout the region, and many buoys and other navigational aids were washed away.

Re-charting Affected Areas

Besides debris and damage to infrastructure, both satellite imagery and the on-site reports collected by Maritime Safety revealed an area that no longer matches existing maps and charts.

"We see massive erosion of the islands," said NGA Hydrographer Chris Andreasen. "That sediment had to go somewhere, so I'd expect shoaling in channels and areas where vessels typically try to navigate."

To re-chart shipping channels and ports, the Navy deployed two ships equipped with sonar immediately after the tsunami. More extensive surveys of the entire region will take years, according to Andreasen. "We've never seen anything like this before."

Although NGA has produced satellite maps to indicate damaged areas, a more time-consuming task awaits. Officials say it will take years to re-chart the Indian Ocean's transfigured islands, coastlines and ports. The massive undertaking is sure to involve partnerships with many of the countries in the region.

"Coproduction is certainly the way ahead for re-mapping many of the areas affected by the tsunami," said Jay Moeder, NGA's Issue Manager for South and Southeast Asia. "Currently, discussions are under way with regional partners to establish a

Left: A Landing Craft Air Cushion (LCAC) departs a beach landing area in Meulaboh, Indonesia after delivering disaster relief supplies. U.S. Navy photo by Chief Photographer's Mate Jerry Woller.



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Above: Banda Aceh, Indonesia, South Overview (Before Tsunami)

Right: Banda Aceh, Indonesia, South Overview (After Tsunami)



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prioritized production effort to provide new charts and maps in the most timely and efficient manner.”

GEOINT's Value

Geospatial intelligence proved invaluable in providing immediate support to the many agencies responding to this natural calamity. Now it will play a role in the rebuilding of the region as the Agency begins

the process of updating the mapping and charting products of the region.

“I want to thank everyone at NGA whose hard work is helping to produce geospatial intelligence that will make a difference in this time of great need. The work that we are doing to support Tsunami relief efforts is the right thing to do—and it is our duty,” Clapper said in an e-mail to employees.

Air crewmen sit in the cabin of their MH-60S full of rice en route to various villages along the northwest coast of Sumatra, Indonesia.

U.S. Navy photo by Photographer's Mate 3rd Class M. Jeremie Yoder.



The Right Thing To Do

In an e-mail to employees, NGA Director retired Air Force Lt. Gen. James R. Clapper Jr. said he was personally struck by the many stories he had heard about the concern and compassion of NGA employees for the victims of the tsunami. He added, "I would like to share with you one that particularly moved me:

"An NGA employee observed a young Marine NCO walking across the parking lot. It was still dark, rainy and cold. As the Marine approached the sidewalk, he glanced up and saw the American flag at half-staff, in honor of those lost during the recent tsunami disaster. He came to attention, rendered a perfect salute, and then proceeded into the building.

"This young Marine was clearly unaware anyone saw him, yet he took the time to salute and pay respectful tribute to those affected by this disaster. He epitomizes the values to which we at NGA try to adhere—doing the right thing even when no one is looking."

The work that we are doing to support Tsunami relief efforts is the right thing to do—and it is our duty. Let's continue to work together to help those affected by this great misfortune."

Through an NGA-wide extension of the 2004 Combined Federal Campaign, employees contributed more than \$24,000 to support the tsunami relief efforts of the American Red Cross.





‘REACHBACK’ Capability Makes a Difference in Iraq

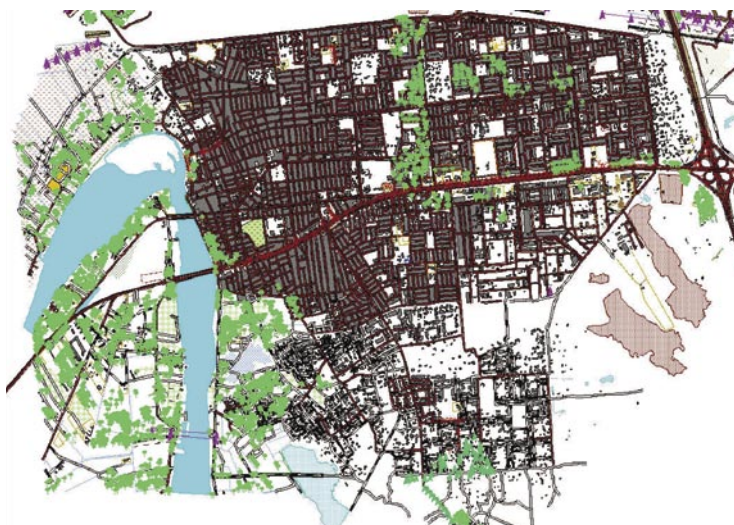
By Greg Anderson

Outstanding support on sniper position view sheds [precise lines of sight]... Your team’s efforts were once again above and beyond, particularly considering the short fuse . . . Your hard work on behalf of the Marines on the deck, taking the rounds, is certainly appreciated”—Capt. Mark Cover, 1st Marine Expeditionary Force (I MEF).

In the last quarter of the 20th century a campaign to promote long-distance phone calls used the line “Reach out and touch somebody!” During the first years of the 21st century, NGA’s Office of Precision Engagement has implemented a similar concept, with a message to warfighters to “reach back for timely and tailored geospatial intelligence (GEOINT)!”

In one successful application, “Reachback” gave Marines fighting in Al Fallujah, Iraq, last October a GEOINT advantage for tactical operations and decision making, as the captain indicated above.

Some 11,500 features are shown in this Vector Line Map of Al Fallujah produced by NGA's Precision Engagement Office to support the 1st Marine Expeditionary Force. Vectors are geospatially referenced points, lines and polygons used to portray features like buildings, rivers and roads.



This viewshed, over Al Fallujah was built from PRT selected reference point (rather than one of the points requested from I MEF) and draped over a 1 meter CIB, using High Resolution Terrain Information (HRTI) Digital Elevation Model (DEM). The green shaded section represents areas visible from the reference point and corresponding height value input requested from the user. The utility of the Viewshed is function of the quality (i.e., accuracy, density, currency) of the DEM collection, input from the warfighter, and NGA's ability to respond to time sensitive requests from warfighter.

The support began in late March 2004 when Precision Engagement received a request from the I MEF related to the murder of four American contractors in Al Fallujah. Within a few days Precision Engagement collected a set of High-Resolution Terrain Information (HRTI) and feature data over key transportation nodes and mosques within Al Fallujah's urban landscape. This information formed the foundation for a series of precise lines of sight, or view sheds, used to counter sniper fire from

Iraqi insurgents. The new tactical GEOINT minimized the exposure of I MEF elements, while increasing the effectiveness of the Marine sniper teams.

As the situation in Al Fallujah evolved, so did the nature of Precision Engagement's Reachback support. In April, Precision Engagement learned that analytical services it provided to the warfighters—with the collaboration of NGA analysts in theater—was incorporated into briefings given to decision makers at the highest levels of government.

Word of the success of NGA's Reachback capability began to spread throughout both the user community and the Intelligence Community largely because of the trust Precision Engagement earned from the I MEF.

Over the summer Precision Engagement continued to aggressively support Reachback requests for operations in Iraq and worldwide, providing mission-specific data sets, HRTI and other products. For example, one of the Reachback requests came from the U.S. Strategic Command and Defense Intelligence Agency in support of the interagency Underground Facilities Analysis Center. (An article on the Center appeared in the January-February Pathfinder.)

A common thread to Reachback support was GEOINT that covered a variety of urban settings, the most notorious being the area adjacent to a shrine at An Najaf. Once again, precise and time-sensitive GEOINT was critical in helping minimize coalition casualties during the ensuing



Commercial imagery, like this overview of Baghdad International Airport, is useful in both combatant and non-combatant operations.

operation. Precision Engagement and NGA's in-theater analysts expanded their GEOINT support to include commercial imagery, which can be disclosed to Iraqi military units and government decision makers.

When U.S. forces finalized their plans for last fall's Operation Phantom Fury, Precision Engagement provided a dense and precise HRTI dataset to the north of previously collected Al Fallujah datasets. The impact of this type of GEOINT was evident in a story published in the Los Angeles Times, Nov. 16, 2004.

"U.S. forces had engaged for weeks in small attacks on the city's southern and

eastern edges," the Times reported. "It was all a ruse. The insurgents apparently bought it . . . When the invasion began a week ago, U.S.-led forces stormed from the north in concentrated formations across three miles."

The impact of Precision Engagement's GEOINT support over Al Fallujah continued to evolve as the warfighters' needs changed. In the period immediately following Operation Phantom Fury, Precision Engagement provided geospatial datasets and analytical skills to document and assess collateral damage. The support helped defend the United States against potential insurgent-initiated disinformation intended to undermine the operation's value in the eyes of world.

NGA's skill base for providing timely, relevant and accurate GEOINT in support of national security is optimized through Reachback efforts like those illustrated by Precision Engagement. Bridging the gap in continuity between NGA in-house GEOINT talents and those of deployed representatives in theater gives our warfighters a unique advantage.

One of the most important lessons of this combat support is that horizontal integration, across sensor types and intelligence organizations, is a huge advantage. These examples from the past year illustrate the often-evolutionary nature of discrete production requirements and needs on the battlefield. But in a broader sense, they show that the partnership within NGA, and more importantly, with the rest of the Intelligence Community is making a revolutionary difference. Reachback is a key to our success.

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY

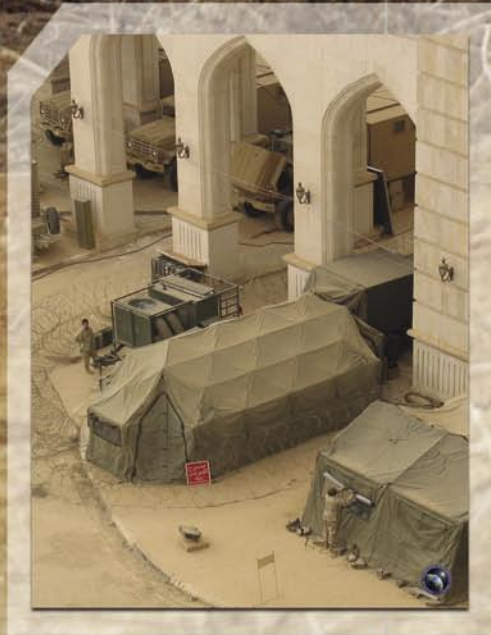
GEOINT

It Makes the Difference



Al Fallujah, Iraq

© 2002 Digital Globe



Warfighter Support

GEOINT: Timely, accurate, and relevant information for those who serve in harm's way.

WWW.NGA.MIL



Photo Courtesy of Department of the Army

NGA Support Teams Stand with the Warfighter

By Thomas M. Cooke

In an era of unprecedented advances in information technology (IT), the idea of an intelligence agency deploying analysts to sit alongside customers seems to defy conventional wisdom. Indeed, much effort has been directed at establishing “reachback” capabilities (using communications technology to access intelligence that resides stateside or otherwise out of theater). Valuable as such capabilities are, NGA is also positioning more people and equipment at various locations worldwide than ever before. These deployments are part of a concerted effort to extend the National System for Geospatial-Intelligence (NSG) into each command headquarters and national government agency.

By providing experts at each customer site to help interpret and manipulate geospatial intelligence (GEOINT) products and services, NGA is providing the Intelligence Community (IC) with a worldwide intelligence baseline from which subsequent analysis can be derived. This forward presence turns the reachback model upside down, creating a “push-forward” capability that has consistently proven its value in direct support.

With its push-forward capability, NGA has taken the initiative to work directly with customers at their locations to provide timely, relevant, accurate and actionable GEOINT. This enables NGA analysts to garner unique insight into the intelligence problems facing their customers and help identify intelligence requirements so they can provide what the customer needs.

NGA Support Teams

NGA has made the conscious business decision to push support to its

ever-widening customer base. NGA Support Teams, or NSTs, may include imagery and geospatial analysts, remote replication system operators (to produce both standard and nonstandard products), and staff officers from other NGA directorates (such as Source Operations [the former Central Imagery Tasking Office], Acquisition, Enterprise Engineering, and so forth) who understand the power of NGA’s in-field capability.

At the strategic/operational level, NSTs are found at each combatant command headquarters, are assigned to each of the military services, and are embedded within the Central Intelligence Agency, Defense Intelligence Agency, National Security Agency, State Department, Department of Homeland Security and other national-level organizations. Within these organizations, the NST chief serves as the NGA director’s personal representative and is the single point of contact for all GEOINT support. The NST uses either NGA-specific IT systems or organic systems provided by the host organization. In some cases, members of the host organization rate the contributions of the NST. Now fully enmeshed with the staff organization they support, NSTs are providing GEOINT for both operational planning and execution.

At the tactical/operational level, NSTs are assigned to both the Joint Task Force and component level in theater (or to lower tactical units, depending on the specific intelligence requirement). They are provided with a robust communications suite and the analytic tools needed to support the 24- to 96-hour intelligence requirement cycle. They deploy for generally 90-day rotations, during which

time they live alongside their customer, enduring the same austere conditions and dangers. (One NGA analyst was injured in December 2003 during a rocket attack in Baghdad).

Why does NGA do this? Four developments are driving NGA's push-forward capability—

1. The emergence of the Information Age has inundated warfighters with data and information, complicating decisions. NGA Support Teams can help sift through the information and provide visualization that matters, GEOINT that enables.
2. Speed matters. The Internet and the availability of remotely sensed data have leveled the playing field, and so our warfighters' success is dependent upon their ability to make correct decisions faster than our adversaries. The proximity of NGA Support Teams creating real-time tactical decision aids tailored to specific situations takes advantage of this speed.
3. Advanced denial and deception techniques, complex GEOINT methods and the fleeting nature of issues facing our warfighters demand the availability of deep analytical expertise—expertise most readily available from the talent of a deployable NGA civilian analyst pool.
4. Education. The concept of GEOINT as an intelligence discipline is relatively new. Having analysts work alongside customers helps integrate this capability.

Because of the close relationship NGA has developed with customers, both have evolved together in their ability to adapt the unique capabilities of digital products. Customers who would have asked for a 1:25,000-scale map of a city now understand that they can request and receive a digital fly-through of the same city,

complete with annotated ingress/egress routes in a three-dimensional format. At the same time, NGA has developed its ability to anticipate the customers' needs and provide expertise and products in time for them to take advantage of it, thanks in part to this close relationship.

Field Experiences

In 2001 NGA, then known as the National Imagery and Mapping Agency (NIMA), sent analysts to work alongside Special Operations forces operating throughout Afghanistan. Their mission was clear: serve as the forward-deployed GEOINT expert and provide products as required by the customer. To accomplish this task, NGA analysts were equipped primarily with a standard satellite-communications suite and a robust laptop (loaded with specific software designed to manipulate images and map data to create nonstandard products).

The Task Force K-Bar commander stated the products provided in theater, which integrated dynamic and real-time information, were absolutely critical in ensuring the safety and success of the teams conducting combat missions against the Taliban and Al Qaeda. But the rough terrain and inclement weather took its toll, and NGA recognized that a more rugged capability was needed.

In record time, NGA designed, procured, and fielded a tactical suite of communications and analytic tools to support field operations: the Mobile Integrated Geospatial Intelligence System, or MIGS. Basically "NGA in two Humvees," the MIGS, when deployed, provides its own generator power, life support, communications bandwidth, and analytic tools to develop tailored GEOINT products based on operational requirements. Manned by a volunteer cadre of government civilians and supported by contractor expertise, the MIGS provides a nexus for GEOINT

NGA's Mobile Integrated Geospatial Intelligence System, shown on the grounds of Baghdad's Abu Gharyb palace, provides the capability to develop on site geospatial intelligence products tailored to operational requirements. NGA Support Team members deploy with the system, which includes communications and analytic tools.



production at the Joint Task Force level and is now considered by many to be indispensable in supporting crisis operations.

During Operation Iraqi Freedom, NGA downloaded a major portion of its Iraqi GEOINT database onto more than two hundred hard drives and delivered them—through the NSTs in theater—to operational forces throughout the area of operation. One Army Warrant Officer stated that it would have taken him one year with a dedicated T-1 line to download what NGA provided on one piece of hardware. With this database in hand, NST personnel worked alongside their operational and tactical customers and built tailored products in support of fluid military operations. The NST analysts also served as liaisons to incorporate the latest national-level information to continually update the database.

On the flip side, NGA analysts had real-time access to the latest tactical information coming from the maneuver units. Using this knowledge, the deployed

NSTs provided feedback to the NGA “motherhip” to ensure seamless support throughout the strategic, operational and tactical intelligence-support spectrum.

The Department of Defense has initiated several studies to investigate ways in which to limit the IC’s forward presence at all levels. These studies are not without merit. At the tactical/operational level, it is dangerous to deploy civilian analysts where they could very well become casualties.

As technology improves and the war-fighter understanding of GEOINT grows, the day may indeed come when NGA personnel are no longer needed “at the pointed end of the spear.” But in the near term, NGA is committed to providing whatever support is needed to place timely, relevant, accurate and actionable GEOINT into the hands of those who need it. Tactical operations notwithstanding, NGA is now committed to improving its NST presence—and concomitant GEOINT support—wherever the need is identified.

Searching for Undergrounds with a High-Tech Toolkit

By Michael Klumb

Discovering the location of adversarial underground facilities is a difficult task. Being underground, most of the significant features are not visible in standard panchromatic imagery. To probe alternative signatures, NGA uses innovative technologies from academia, government labs and the commercial sector.

Classifying Urban Terrain

Historically, most underground facilities of interest have been located in rural areas. U.S. military forces, however, are increasingly involved in military operations in urban terrain, as adversarial forces move to the cities and underground to take advantage of the clutter an urban environment provides.

To be successful in the search for underground facilities in urban areas, analysts employ a multiplicity of innovative methodologies. One method to reduce urban clutter and consolidate a plethora of objects into a limited number of categories is to classify the land in accordance with its physical properties. The physical qualities of urban artifacts—streets, lots and buildings—form distinctive patterns when mapped.

The Advanced Research Labs at Pennsylvania State University are involved in delimiting “urban terrain zones” (UTZs)—image-based products that classify the varying types of urban environments. Data contained in UTZs includes building dimensions, construction types, proximity and street patterns. This type of information, combined with other geospatial data, is the foundation for performing numerous types of analysis including site selection, network analysis

and movement, and obstacle modeling. In addition to supporting the search for undergrounds, these analyses can support military operations, humanitarian aid, peacekeeping and non-combatant evacuation operations.

NGA has used UTZs as a major input to Orion, a high-performance spatial event-modeling framework. Upon extracting a model, Orion creates a forecast, based on features of interest defined by the user. Since all input data layers are georeferenced, the resulting forecast guides analysts to areas most likely to contain the features of interest, such as underground facilities.

Distinguishing Recurring Features

One of the NGA’s longest-running partnerships is with Los Alamos National Laboratory, which has developed an application called Genetic Imagery Exploitation (GENIE) to find multiple occurrences of objects in an image. The premise of GENIE is to test scores of trial solutions and, as in genetics-based evolution, combine elements of the best or “fittest” ones to form new solutions. The solutions in this case are chains of image-processing steps to find a particular feature. A major advantage to this approach is that the physics describing the appearance of the selected feature does not have to be understood. The user just has to identify a few examples of the feature, and GENIE evolves a solution to find similar features.

NGA has used GENIE successfully to find areas of interest in multispectral imagery and conducted evaluations of GENIE as a general feature-extraction tool. Some of Los Alamos’ new tools are directed



To defeat underground and deeply buried targets, NGA is collaborating with government, industry and academia in the search for creative applications of technology.

- distributed large-image data management, and
- understanding quantitative change.

NGA provided CenSSIS a large collection of commercial imagery data. Initial work focused on image registration, classification and data management. The foundation of the image registration work was based on algorithms developed by the medical community for registering retinal images.

CenSSIS provides access to top-quality personnel with applicable expertise. It is hard to beat the return on investment that this relationship provides NGA.

toward shape recognition, which would complement GENIE nicely.

Borrowing Techniques from Medicine

The Center for Subsurface Sensing and Imaging Systems (CenSSIS) is an engineering research center funded by the National Science Foundation. Established in 2000, CenSSIS is a collection of academic, industry and government partners. The vision of CenSSIS is to use similar techniques to solve diverse problems. Fields of interest include subcellular biology, medicine, underwater exploration and underground diagnosis. CenSSIS' Web site can be found at <<http://www.cenassis.neu.edu>>.

NGA is leveraging CenSSIS' expertise in:

- image registration and geo-location,
- four-dimensional sensor fusion,
- object recognition,
- multispectral and hyperspectral image classification,

Using Radar Data

The use of radar data to discover features about the Earth's surface has many applications that make collaboration fruitful. NGA has been working with Vexcel Corp., which has developed a technique that can be used to detect underground construction where the ground has subsided. Vexcel used commercial Radarsat data to determine where the ground had subsided after construction of a subway line in London.

The involvement with groups outside of the Intelligence Community has brought NGA some long-lasting working relationships, cutting-edge scientific techniques, and the ability to solve some specific, but difficult, problems. Many of these groups, and others, offer technologies or concepts that can be used in solving intelligence problems. Supporting outside projects helps NGA stay at the front of emerging technologies and give its customers the best quality product possible.

Custom Imagery Meets Special Needs

By Anthony Fugate

Custom imagery for the warfighter is just that—anything to meet a special request: a single image product, image cutouts for the Global Broadcast System, image mosaics, image-derived products (“IDPs”), printed image graphics, three-dimensional models and more.

For years, the Custom Product Activity of the National Reconnaissance Office produced these products. The organization moved to the National Imagery and Mapping Agency, now NGA, when the new intelligence agency stood up in 1996.

As the Operational Integration Support Branch in NGA’s Analysis and Production Directorate, the organization has a different name now, but the mission remains the same, to provide timely, relevant and accurate custom imagery products to the warfighter and other customers.

Quick Turnaround

NGA has gradually inserted and integrated much of the technology that was

unique to the branch into other production areas. The branch’s greatest asset remains its ability to provide quick turnaround, up-to-date, mission-ready image data. These products typically involve large datasets and come primarily in the form of image mosaics and image libraries.

An image mosaic product uses multiple images to provide a greater area of coverage to meet customer needs. The images are geo-registered, tonally balanced, rescaled and orthorectified to provide a near seamless product. (Orthorectification corrects distance distortion caused by uneven terrain.) Because the branch outputs the image mosaics to the format specified by the customer, with image segments based on file requirements, the product is “mission ready” upon delivery.

Image library products on the other hand contain multiple single images that typically offer sporadic, piecemeal coverage of large areas (entire countries for example) and are used to provide a solid baseline of the latest imagery over an area of interest for use in creating tailored products in

A geographic information system applications engineer loads mission-ready imagery data to a FireWire drive for dissemination. FireWire drives are external hard drives that can be utilized to transmit large image datasets not conducive for broadband transmission.



Photo by Tony Boone



© 2002 Earthwatch Inc., Longmont, Colo.

Custom imagery is just about anything to meet a special request, like this orthorectified image cutout of Islamabad using commercial imagery. A cutout is a portion of a larger image. Orthorectification is a process that removes distance distortions in satellite and airborne imagery caused by uneven terrain.

the field. These libraries come in two types—raw and orthorectified—and in optional formats.

From the very beginning, support to crisis operations has been a dominant factor for the branch. Initially, the majority of support was in the form of image libraries, involving ingesting raw imagery data, processing it with orthorectification software, and then distributing the data to customers on tape. This process required 24/7 operations, took weeks to complete, and involved the hand carrying of hundreds of tapes to the customer. Today, through technological advancements and custom software the branch developed, the process of creating image libraries is mostly automated and the product can usually be shipped to the customer quickly and easily. What once took weeks, now typically takes only days or even hours.

In-Theater Support

It should come as no surprise that since Sept. 11, 2001 and the beginning of Operation Enduring Freedom, the branch's biggest customer has been the U.S. Central Command (CENTCOM). Since the establishment of the Geospatial Intelligence Library (GIL) in theater, NGA forward-deployed personnel have had a centralized location that allows for greater

and faster access to critical recent data. The branch's initial support to the GIL involved providing the common imagery baseline that was replicated and disseminated by the GIL to some 50 remote locations throughout the theater.

Due to the initial success of the imagery baseline, the branch coordinated with the NGA Military Executive, Air Force Brig. Gen. Dale C. Waters, and established a process to provide the GIL baseline imagery updates every 90 days. These 90-day updates provide NGA deployed personnel and customers with a relevant common imagery baseline for mission planning and product generation. This, in turn, reduces the need to rely on dated information, saving the warfighter time and potentially lives, while increasing NGA's ability to meet specific customer needs.

The impact of these image libraries on the warfighter perhaps can best be described by a quote from Lt. Col. Wolf Kressin, NGA's CENTCOM Geospatial Intelligence Officer (GIO):

"We have always turned to [the branch] because of [your] speed, quality and responsiveness," Kressin said. "You have been our ace-in-the-hole since October 2001."

While CENTCOM is the largest customer in terms of requests it is by no means the only customer. Over the past year alone the Operational Integration Support Branch has completed over 325 image products for various internal and external NGA customers.

The branch recently developed a robust, automated archive capability that populates a database with all the custom products the branch creates. Information from the database is available by hardcopy or e-mail. Ultimately, the plan is to make this information available to customers via a secure Web site.

Imagery Analysts Take Action to Prepare CENTCOM for Conflict

By Amanda R. Park

The global war on terror presents the Intelligence Community with several unprecedented issues, not the least of which is how to maintain situational awareness on a given set of individuals and their locations.

While attempting to do just that, imagery, intelligence and target analysts at the U.S. Central Command (CENTCOM) recognized a gap in the availability of data to represent a nefarious presence at military installations within their area of operation.

Military installations are often assumed to be above reproach when considering conventional targeting options. But in fact, they present an attractive objective for the activities of terrorists.

NGA analysts helped to craft a solution to this data shortage on military installations, which centered on a database that is also used to update national imagery databases.

The database maintains geographical information that can only be accurately reported via imagery exploitation. Among its basic fields are geographic coordinates

for the center of a military installation; its elevation, length, width and azimuth, and the corresponding mapping data with production date. These fields are the foundation for all imagery intelligence collected, produced and maintained on a given installation.

As directed by the Department of Defense, CENTCOM is the responsible producer of intelligence on military units and orders of battle as well as installation and facility data within its 27-country area of responsibility. This responsibility translates to imagery analysts in the form of biannual detailed installation descriptions and annotated graphics that provide an authoritative physical description and outline of a given installation. Without imagery reporting, a vast majority of installation information cannot be accurately represented in the database.

Working Towards a Solution

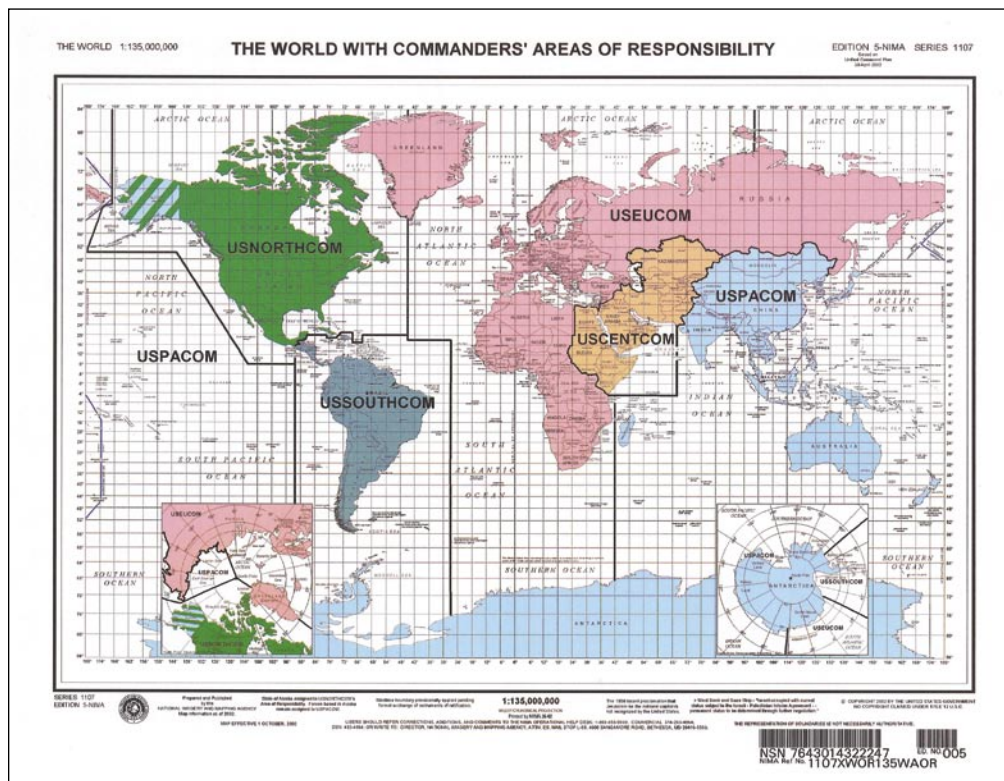
In the aftermath of Operation Iraqi Freedom (OIF), senior database analysts at CENTCOM identified a shortfall of accurate geographic coordinates for military installations. Without this basic data, imagery collections could not be fully exploited, should there be a need to plan for operations and contingencies, including targeting. Consequently, imagery analysts and database analysts agreed to collaborate on a solution, while adhering to each other's directives, manuals and operating procedures.

Imagery analysts who support CENTCOM received training on the specific information the database analysts require and how the system integrates it. The training led NGA to modify the way imagery analysts' reports are formatted to integrate

CENTCOM Headquarters at MacDill Air Force Base in Tampa, Fla.



The U.S. Central Command (CENTCOM) area of responsibility, as shown in orange on this NGA chart, stretches from the Horn of Africa to Central Asia.



the required information. The database analysts also trained, with a senior imagery analyst briefing them on how to interpret the information disseminated within an imagery report.

NGA imagery analysts took over the responsibility of evaluating installation/facility data change requests submitted to CENTCOM. The change freed up valuable time for the database analysts to focus on maintaining specific unit and orders-of-battle information and providing other support directly to the warfighter.

As a result of the combined effort by imagery analysts and database analysts, CENTCOM now has the most up-to-date records within the Intelligence Community. Even more importantly, the warfighter now has better information to prevent infiltration by terrorists. With a clear understanding of the database and its role in intelligence production, NGA's CENTCOM imagery analysts were successful in assisting senior database leaders in their efforts to obtain some key intelligence data.

Better Foundation for Future

By having an in-depth knowledge of the imagery tradecraft and working closely with database analysts, CENTCOM imagery analysts provided the Intelligence Community with valuable, timely and accurate data, tailored to both the warfighter and the policy maker. By providing frequently overlooked information, NGA imagery analysts ensured that critical intelligence is maintained at the highest levels of quality on a daily basis.

In the long term, the improved data set provides a portion of the foundation for all intelligence produced and maintained in the database, ultimately streamlining the collection, exploitation and dissemination of intelligence required to formulate a comprehensive assessment of a given installation or issue. Daily maintenance is the key to ensuring that the imagery analyst, command and database are constantly prepared to support conflict.

Industry

Real-Time Targeting with Gridlock

By Linda Johnson

The war on terror puts an emphasis on intelligence like no war has done before. There is an urgent need to quickly find, identify and neutralize terrorists in any theater of operations.

An important component in this war is the ability for the warfighter to rapidly produce precise coordinates for coordinate-seeking weapons like the Joint Direct Attack Munition (JDAM). But today's intelligence, surveillance and reconnaissance (ISR) sensors and platforms were designed only for situational awareness; they lack the metric accuracy to return precise coordinates.

To provide this critical ability, NGA's InnoVision Directorate has developed Gridlock, a technology that speeds up the target acquisition process.

Gridlock takes imagery obtained on ISR missions and uses algorithms to register the images with highly accurate, previously obtained reference coordinates. Depending upon the size of the mission image, processor speed and other factors, Gridlock can produce an image with precise coordinates in under a minute. The smart image is embedded with metadata so that its positional accuracy approaches that of the reference coordinates.



A typical concept of operations for Gridlock shows an unmanned aerial vehicle (upper left) gathering imagery of a time-critical target. Using Gridlock, warfighters in the Distributed Common Ground System (DCGS) create a georegistered smart image in one minute. They distribute the targeting information to an appropriate command-and-control targeting authority (C2 Node), which transmits the precise coordinates to the fighter pilot (upper right).



An F/A-18 Hornet conducts a mission in the skies over Afghanistan in support of Operation Enduring Freedom. U.S. Navy photo by Lt. Steve Lightstone.

Gridlock gives warfighters a target's latitude, longitude, elevation and error estimates with the click of a mouse. Gridlock images comply with the National Imagery Transmission Format, which means they can be stored in image libraries for later use.

BAE Systems is the lead developer for Gridlock. The U.S. Central Command (CENTCOM) is the operational manager, and the Air Force is the transition manager. The Defense Information Systems Agency is helping to incorporate Gridlock into its Global Command and Control System.

Gridlock received positive feedback in demonstrations for Air Force and Marine Corps operators in demonstrations last year.

"It was awesome compared to the manual process I've used previously," said Capt. Jeff Reed of 8th Air Force.

The operators saw Gridlock as more than a targeting tool. It can also be used for more precise battlefield situational awareness and as a flight planning aid, they said.

Testing by CENTCOM is under way at MacDill Air Force Base, Fla. The Air Force Transformation Center at Langley Air Force Base, Va., is also planning to test Gridlock this spring to prepare for potential transition to the field.

"This technology is a must for the next generation of precision weapons," says Jim Heskett, Chief of the Advanced Airborne Division. "We remain committed to developing new technologies or improving current capabilities to help our soldiers fight and win the global war on terrorism."

21st Century Enterprise ‘Thrusts’ Give NGA Direction

By Laura Cubarney

The threats facing the nation and the world are more elusive today than at any other time in history; they include multiple and unconventional fronts, the enemy’s technology advances, and changes in the international landscape. These threats require a faster, more sophisticated response.

NGA is making a difference to our nation’s warfighters and decision makers as they face these threats with transformed capabilities.

The Enterprise Operating Framework is the methodology for transforming NGA. It provides a strategic approach to understanding the needs of NGA’s customers, including improvements in the Agency’s skills, expertise, data architecture, workplace, processes, programs and policies to better meet those needs.

The Enterprise Operating Framework is being implemented in two-year cycles. It is made up of eight thrusts, all of which work together to accomplish the transformed enterprise:

- Analytic Depth
- Source Management
- Integrated Business Environment
- Rapid Innovation
- Corporate Customer Management
- Web Portal
- Work Environment
- Leadership and Governance

What follows is a look of three of these thrusts.

The Analytic Depth thrust is working with the Production and Analysis Directorate and Source Management Directorate to develop and deploy Communities of Practice. These Communities will provide analysts with a means to share knowledge and tradecraft, strengthening their expertise and building collaboration across geographic, occupational and organizational boundaries.

Communities of Practice will prepare new analysts and strengthen seasoned ones to contribute to Communities of Interest—groups of analysts from different organizations and occupations with the right combination of skills and expertise for a specific issue or crisis. Other working groups, integrated operations or multi-disciplinary teams will also tap into the expertise of Communities of Practice.

The Corporate Customer Management thrust will improve NGA’s customer management capabilities by developing the Customer Insight Database to better understand and manage customer needs. This database will change the way NGA’s customer information is stored, integrated



and shared across the enterprise. It will enable NGA to collaborate with mission partners like the National Reconnaissance Office and the National Security Agency.

NGA's customer information will be a key input to the Rapid Innovation thrust's Enterprise Needs and Requirements process. This process will enable an integrated approach for collecting, analyzing and prioritizing needs across the enterprise.

The Rapid Innovation thrust has also developed a streamlined

Technology Insertion process and is establishing an Enterprise Technology Roadmap. Together, these initiatives will ensure that innovation investments clearly support NGA's mission and strategic goals. They also will foster greater coordination and collaboration among organizations responsible for developing, integrating, implementing and maintaining innovations at NGA. Increasing NGA's ability to quickly identify and take advantage of emerging technologies will help the Agency stay ahead of the ever-evolving threat posed by our adversaries.

Increased analytic capabilities, enhanced customer insight and rapid technology insertion are only a few examples of how NGA is identifying, planning and developing capabilities to meet the challenges of today's environment and prepare for tomorrow. Throughout 2005, the Enterprise Operating Framework thrusts discussed here and the five others will continue to deliver capabilities that enable NGA to remain the premiere provider of geospatial intelligence in the 21st century.

Our Heritage

NGA Has Proud Genealogy

By Martin Gordon

The National Geospatial-Intelligence Agency has a long, proud genealogy. Its roots are in the nation's need to know what is out there militarily, diplomatically, geographically and scientifically.

As a military leader and former surveyor himself, Gen. George Washington realized the vital importance of accurate maps to successful combat strategy. He commissioned the Scotsman Robert Erskine to survey roads, sketch the countryside and manage the fledgling mapping units that provided blueprints for the successful prosecution of the American Revolution. Recognizing the value of fresh intelligence, Washington also directed Lt. Col. Thomas Knowlton to lead reconnaissance missions in a company of military and civilian volunteers that came to be known as Knowlton's Rangers.

The United States geospatial intelligence effort began in earnest in 1803 with President Thomas Jefferson. In a classified tasking, Jefferson sent Meriwether Lewis, William Clark and their Corps of Discovery to explore the newly acquired Louisiana Purchase and other lands west of the Mississippi River. They were to report on European and Indian military forces and alliances, trade patterns, and the geography, plant life and animals they found.

As the nation looked west, other military and civilian expeditions followed Lewis and Clark and expanded our knowledge of the Earth. Likewise, our maritime interests grew as the U.S. Navy developed its own charts.

Tensions developed as the decades passed and in 1861, Civil War broke out between

Northern and Southern states. The Army, prodded by civilian contractors, now began to find ways to go above the Earth's surface to gain intelligence about Confederate forces. Balloons provided platforms for civilian and military observers to study the forces now visible before them. Interpreters such as George Armstrong Custer drew maps and wrote reports sent back to the Earth's surface, which analyzed troop movements and dispositions.

This use of technology continued. But in 1914, with the outbreak of World War I, the first modern technologies appeared. Airplanes gave observers the ability to stay above the Earth in a systematic way, while cameras provided ways of recording what was happening for analysis back on the ground. Later in the Second World War, starting in 1939, these technologies leapt forward.

These abilities to rise above the Earth and record what is there continue to evolve to this day. Computers with their digital capabilities began to mature, as they were needed for our Cold War effort against the Soviet Union from the late 1940s to the early 1990s.

It is these three technologies plus the continual need to meet the nation's defense and intelligence needs as economically as possible that have shaped our Agency. NGA is the result of years of efforts to organize how we create, interpret and distribute what has evolved into geospatial intelligence. Our heritage is long and complex, but it shows how we have grown along with the nation and its technological base.

Partnerships

NGA and NSA—Aligning the Eyes and Ears

By Matt Reiner



Shortly after 9/11 and long before intelligence reform was being discussed in Congress, NGA and the National Security Agency (NSA) formed a unique working relationship. The two agencies now work together on collection management and co-production, as well as planning, architecture and personnel matters. This increase in integration has provided great benefit to customers, decision makers and the nation as a whole.

NSA, headquartered at Fort Meade, Md., is “America’s cryptologic organization,” specializing in “activities to protect U.S. information systems and produce foreign intelligence information.” With its focus on Signals Intelligence (SIGINT), NSA serves as the listening post for the intelligence community. NGA is then able to use that information, along with other intelligence sources, to produce Geospatial Intelligence (GEOINT) and show what is happening on the Earth at a given point in time.

In a strategy NSA Director Lt. Gen. Michael V. Hayden often refers to as “a lot more Grant, a lot less McClellan,” both he and NGA Director retired Lt. Gen. James R.

Clapper Jr. were able to move quickly on collaboration rather than planning for it in the future. As General Clapper stated during the 2004 GEOINT Symposium in New Orleans, the collaboration has worked well because “neither the agencies nor the directors are in competition with one another. What we see are the complementary strengths that we each bring to the table.” Analysts are able to share information at the working level, allowing for more initiative, creativity and intelligence sharing.

Partnerships within the Intelligence Community are not uncommon to NGA. Indeed, NGA has several representatives in such agencies as the Defense Intelligence Agency (DIA), the State Department, and other members of the Intelligence Community (IC). What makes the NGA-NSA partnership unique, however, is the similarity in missions. SIGINT and Imagery Intelligence (IMINT) both operate with high levels of urgency. The data produced from both disciplines often has a short span of operational relevancy and must therefore be disseminated to stakeholders in a timely manner.



Neither the agencies nor the directors are in competition with one another. What we see are the complementary strengths that we each bring to the table.

—Lt. Gen. James R. Clapper Jr. (Ret.)



NSA Headquarters, Fort Meade, Md. NSA, “The Ears of the Nation,” is known as “America’s cryptologic organization” and specializes in Signals Intelligence (SIGINT).

Both leaders have found ways to capitalize on their respective agencies’ intelligence disciplines and better respond to customer needs. They have managed to do this in three ways:

- Having analysts from each agency working alongside their counterparts, including personnel in positions of authority,
- Having better connectivity between NSA and NGA networks and

- Combining two separate tasking structures to allow customers to receive information from both agencies.

The partnership has affected other areas besides the workplace. For example, NGA recently adopted the NSA approach to manage the length of deployments for employees overseas. The integration has also been seen in field elements, where NSA and NGA employees are collocated in areas such as the U.S.



NGA Headquarters, Bethesda, Md. NGA, “The Eyes of the Nation,” produces geospatial intelligence (GEOINT), which relies on data from many sources.

Pacific Command in Hawaii to support intelligence requirements.

No matter where someone sits—whether it’s in the White House or in a foxhole—the ability to obtain better information from the nation’s eyes-and-ears partnership will ultimately enable better decisions, shorten wars and save lives. This collaboration effectively demonstrates that intelligence

information can no longer be shared just at the top level. While enemies are operating in smaller groups and with more flexibility and creativity than ever before, members of the Intelligence Community must do the same. The information sharing between NGA-NSA is a good start and will help keep our nation safe in the next century.

architecture. We have also recently combined our Service and Joint Forces Command NSTs, our NGA Exercise Program, and our Readiness function under the new Office of Military Support (OMS), which is led by Colonel Andy Marotta. I won't try to relate here the full range of activities taken on by OMS, but the focus again is on helping the joint and service warfighters develop fielded GEOINT capabilities, then exercise those capabilities and assess our readiness across the force.

“Reachback,” Advanced GEOINT Critical

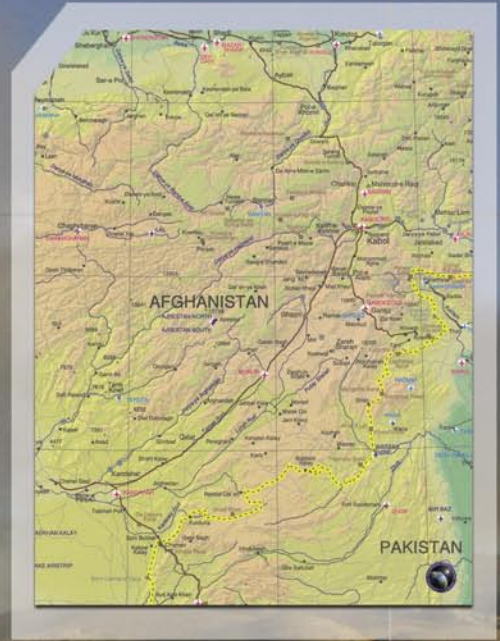
I could not be more proud of being a part of NGA at this critical time in America's history. The talent and commitment of our work force is truly incredible. I've

mentioned our deployed analysts several times, but I need to emphasize again as I did at the beginning that they form only the tiniest bit of the capability we push into the fight. Basic GEOINT products and reach-back support are every bit as critical to the warfighter. Finally, in addition to the blocking and tackling they demand from useveryday, our customers are starved for the transformational GEOINT capabilities we are developing—Advanced Geospatial Intelligence (AGI), airborne, and commercial remotesensing. The warfighter's needs are great, their appetite is insatiable, and our challenge is to continue our robust support for ongoing combat operations while dragging the whole community forward with us to build a true end-to-end GEOINT capability.

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY

GEOINT

It Makes the Difference



Kabul International Airport, Afghanistan

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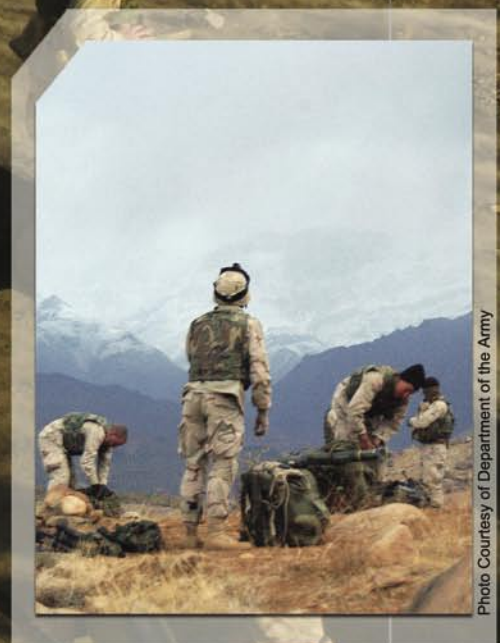


Photo Courtesy of Department of the Army

The War On Terror
GEOINT: Helping to find a hidden enemy.

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Photo Courtesy of Department of Defense



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