



National Geospatial-Intelligence Agency Magazine

PATHFINDER

Know the Earth... Show the Way... Understand the World

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NCE
The New
Headquarters
for GEOINT



On My Mind

NCE —The New Headquarters for GEOINT

NGA has consolidated its East Coast operations at Fort Belvoir, Va. In September we cut the ribbon marking the official opening of our new, purpose-built facility. This move, bringing more than 8,500 NGA federal government, contractor and military employees together in one location, ushers NGA and geospatial intelligence into a new era. It provides a secure, modern and collaborative working environment for the men and women in the East who conduct and enable our mission.

The timing couldn't be better. In today's world of fiscal austerity, diffuse threats and decentralized military challenges, our mission partners rely on us more than ever for timely, relevant GEOINT. Our vision of providing both online, on-demand access and broader and deeper analysis is now putting the power of GEOINT in the hands of our users, and our new facility enables us to exploit the latest tools and collaborative strategies in support of that effort.

The collocation of our 24/7 "watch" centers—the NGA Operations Center, Source Fusion Center and office of Time Dominant Operations—has improved their collective knowledge sharing and mission effectiveness. With upgraded technology and a knowledge wall consisting of forty, 80-inch screens, the new center enables GEOINT visualization in a commanding way. We can provide dynamic, rather than static, information and provide the geospatial and geographical context for it as well. At the same time, we have dedicated space for our crisis action and focus cells to tap into these capabilities as well as interact with our operations center team. Our Libya weapons of mass destruction focus cell capitalized on these new spaces and capabilities.

NCE's computer systems, built on a new information architecture that eliminates numerous disparate systems, help our analysts more effectively and efficiently meet the evolving needs of our mission partners. The new and more flexible architecture model includes applications that can ride on any server through cloud technology and virtual user profiles. Because more data has been digitized for the new system, analysts can now locate imagery within minutes that might have taken days to find on archived tape. With this greater access to data, our GEOINT experts spend less time searching for imagery and more time using their analytical skills to develop anticipatory intelligence and solve other hard intelligence problems.

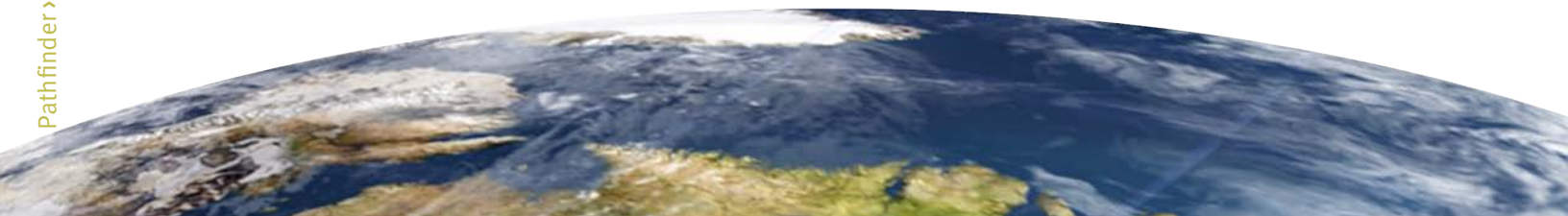
Our NGA Campus East is also the largest Leadership in Engineering and Design (LEED) gold-certified building in the world, a certification conferred by the U.S. Green Building Council. Read more about this honor in our story on p. 12.

At the same time, we are working to modernize our West offices in St. Louis and Arnold, Mo. We will complete a qualitative decision study in early 2012 which will determine whether we modernize or build new. We want our West personnel to benefit from the technology and infrastructure improvements we are enjoying in the East.

Our new home for GEOINT is helping us realize our vision, unify our culture, more efficiently execute our mission and increase productivity. NGA will continue to achieve unprecedented levels of success across the full spectrum of GEOINT operations while advancing environmental sustainability and stewardship.

Letitia A. Long

LETITIA A. LONG
Director



CONTENTS

- 2 On My Mind: NCE—The New Headquarters for GEOINT
- 4 NGA Domestic Operations Team East Supports the MLB All-Star Game
- 5 NGA in the News
- »» F E A T U R E S
- 6 The NGA Vision: Creating New GEOINT Value
- 8 The Unclassified NSG: Same Vision, Different Domain
- 9 Pushing GEOINT's Boundaries
- 10 Earthquake Moves Ground Monitoring Station
- 12 NGA Completes BRAC Move to New Headquarters
- 14 NGA Springs to Action: The Pan-Arab Crisis Action Team
- 16 Target Vetting: Seeing Through the Fog of War
- 18 NGA Psychologists Explore Challenges to GEOINT Analysis
- »» O U R H E R I T A G E
- 21 Remembering Vietnam 4: After Dark with Patricia Lynn

On the Cover

The National Geospatial-Intelligence Agency (NGA) officially recognized the opening of its new headquarters at Fort Belvoir North Area, Springfield, Va., during a ribbon-cutting ceremony Sept. 26 that also served as the kickoff of NGA's week-long celebration of the agency's mission, workforce and 15th anniversary. Purposefully built to better support the mission of geospatial intelligence, or GEOINT, NGA's headquarters, known as NGA Campus East, was authorized by the 2005 Base Realignment and Closure Act to consolidate NGA operations throughout the National Capital Region of the Washington, D.C., metropolitan area.

NGA photo by Rob Cox. Cover design by Amy Battison.

On the Back Cover

The World War II Memorial in Washington, D.C., honors the 16 million who served in the armed forces of the United States, the more than 400,000 who died, and all who supported the war effort from home. The memorial is a monument to the spirit, sacrifice and commitment of the American people. NGA recognizes and honors all veterans on Veteran's Day.

Photo of the World War II Memorial by Rhoda Branch, Yvie Len Photography. Back cover design by Amy Battison.



12



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Office of Corporate Communications
Telephone: (571) 557-5400
DSN 547-5400
E-mail: pathfinder@nga.mil

DIRECTOR

Letitia A. Long

DEPUTY DIRECTOR

Lloyd Rowland

OFFICE OF CORPORATE COMMUNICATIONS, DIRECTOR

Vonna Heaton

EXTERNAL COMMUNICATIONS BRANCH, CHIEF

Gary Biggs, Acting

EDITOR

Susan H. Meisner

GRAPHIC ARTIST

Amy Battison

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NGA Domestic Operations Team East Supports the MLB All-Star Game

BY TY MARR, GEOSPATIAL ANALYST, DOMESTIC OPERATIONS

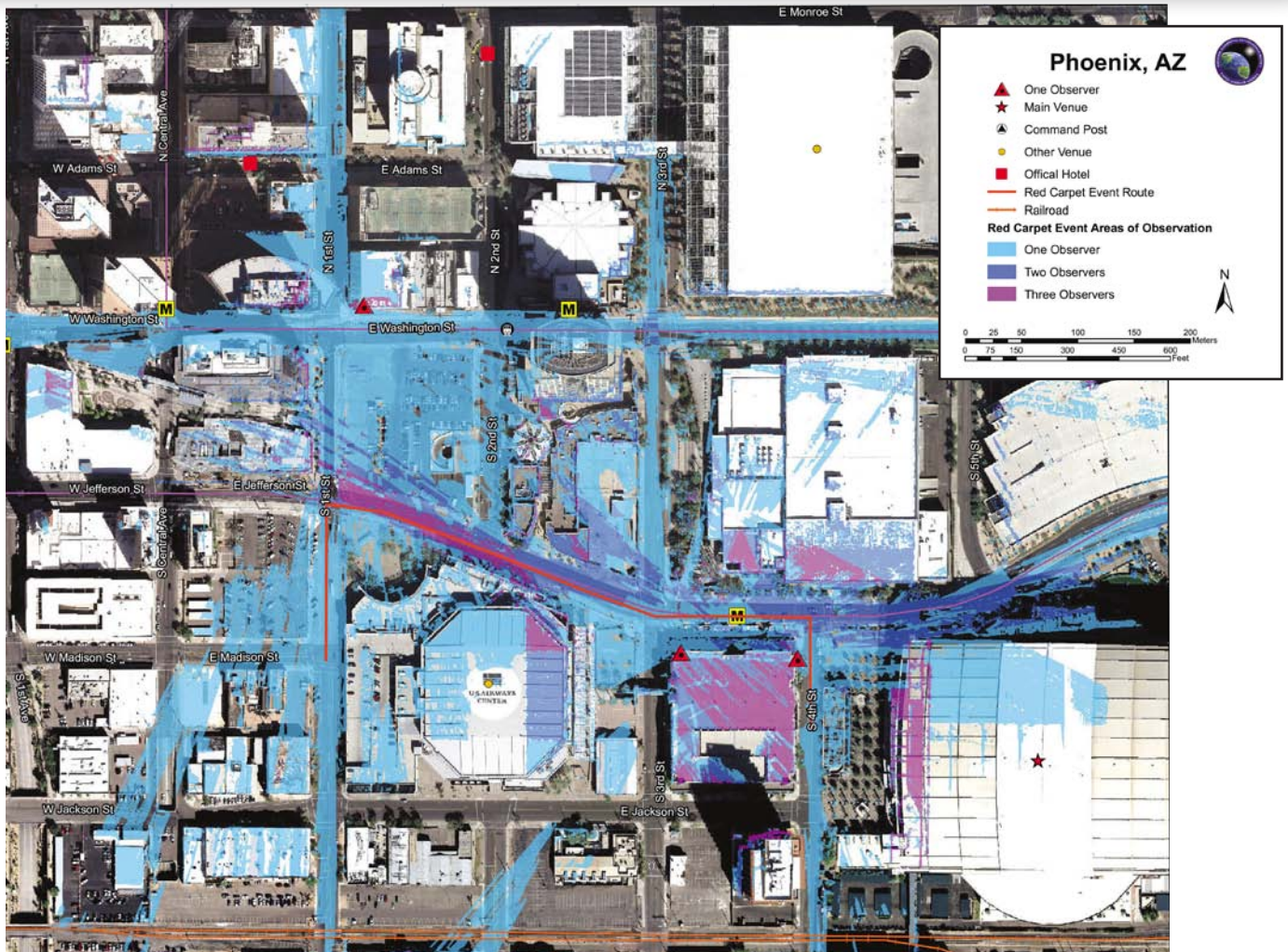
National Geospatial-Intelligence Agency (NGA) analysts frequently serve as geospatial intelligence (GEOINT) ambassadors to state, local and federal agencies.

In July 2011 NGA’s Domestic Operations Team East traveled to Phoenix to provide on-site support of the Major League Baseball All-Star Game that month. NGA personnel provided City of Phoenix personnel with advanced GEOINT training in line-of-sight analysis for use during sniper/counter-sniper observer planning and route planning. The team provided vehicle-borne, improvised explosive device-estimated damage graphics to the Department of Homeland Security/ Transportation Security Administration and City of Phoenix Bomb Squad for areas of concern in and around the Phoenix International Airport. Additional planning graphics concentrated on counterterrorism efforts.

In 2008 a team from NGA provided GEOINT support to city personnel for an additional special security event—the Super Bowl—as requested by the FBI’s Phoenix Field Office. The team demonstrated the utility of geospatially referencing many types of incidents and events, which reveal patterns and relationships. The City of Phoenix realized the power of GEOINT to not only inform key decision makers but also improve day-to-day operations. The city developed geographic information system (GIS) capabilities in their fire and police departments and other city-run departments. This year’s work built on those earlier efforts.

The City of Phoenix expressed appreciation for NGA’s support in making the MLB All-Star Game a success. Said City Manager Dennis Murphy, “Thank you for coming to Phoenix and assisting us in understanding the power of applying GIS to our situational information needs.”

The future of GEOINT in the City of Phoenix is bright.



Depicted is the Red Carpet Event parade route areas of observation for the MLB All-Star Game.

NGA IN THE NEWS

NGA Releases Updated History

“The Advent of the National Geospatial-Intelligence Agency (NGA)” is the best place to begin learning about the agency’s history, according to NGA Historian Dr. Gary Weir. “This publication provides basic information and a narrative outline of the evolution of the National Imagery and Mapping Agency/NGA from the earliest experiences of our predecessor agencies and activities in the 18th century to the present move to NGA Campus East.”

“NGA uses history to better understand its present and its future,” said NGA Director Letitia A. Long in an introduction to the primer. “While firmly rooted in a legacy that extends back to surveyors like the young George Washington and explorers like Meriwether Lewis and William Clark, GEOINT combines extraordinary modern technologies and diverse personal skills to solve today’s most difficult and complicated intelligence problems.”

The primer is the historical starting line. Read it online at www.nga.mil.



NGA, Esri Sign New Cooperative Research & Development Agreement

The National Geospatial-Intelligence Agency (NGA) and Environmental Systems Research Institute, Inc., (Esri) agreed to continue a Cooperative Research and Development Agreement (CRADA) relationship established in 1999 by activating a new agreement in June. Esri has been a long-standing partner with NGA in the development of geographic information system solutions supporting the needs of the National System for Geospatial Intelligence community. In a CRADA each partner funds its own activities and areas of cooperation are mutual. The Esri-NGA partnership has provided benefits by encouraging collaboration resulting in the advancement of Esri’s geospatial software solutions supporting GEOINT processes.

“There have been many examples of Esri rapidly responding to address a critical need identified by NGA in support of a crisis situation or production requirement,” said David Wesloh of the Office of Chief Information Officer, NGA’s principal investigator for the CRADA. Under the latest CRADA agreement, Esri and NGA will work closely to address enhancements to Esri software to better support imagery exploitation, geopositioning, mapping and charting and Web-based solutions.

NGA has 22 active CRADAs and is developing several others.

Redesigned NGA Website Puts GEOINT in the Hands of Users

By Reishia Kelsey, Office of Corporate Communications

The National Geospatial-Intelligence Agency (NGA) launched a new public website on Oct. 5, 2011. The new website allows users to easily access NGA mission partner items of interest, corporate information, career and student opportunities, as well as quick links to NGA’s social media presence.

This launch is a critical step in implementing NGA’s vision of putting the power of geospatial intelligence (GEOINT) in your hands. Over the next year, NGA plans to make further website enhancements to improve the user’s experience by providing a customizable interface and a GEOINT application marketplace. The goal is to provide a single access point for NGA’s unclassified geospatial information, critical to a wide spectrum of GEOINT consumers.

“We’ve designed this website with the public and partners in mind,” said NGA Director Letitia A. Long. “NGA wants to make it easy for the public to understand who we are and for our mission partners to have a single location for unclassified geospatial and safety of navigation data to do their jobs every day or for use during a crisis.”

For more about NGA’s website and what it has to offer, visit www.nga.mil.



The NGA Vision: Creating New GEOINT Value

BY KIRSTEN PETREE, CONTRACTOR, VISION IMPLEMENTATION COMMUNICATION TEAM

“The National Geospatial-Intelligence Agency (NGA) is changing the way it does business; this includes the sources and processes we use, the way geospatial intelligence is developed, how we make our analytic expertise available, and the depth of our analysis,” said Mike Rodrigue, Director of the Vision Integration Team (VIT). “We are moving away from a target-based model toward an issue-driven, activity-based environment,” he added.



NGA photo by Larry Franklin

NGA Director Letitia A. Long met with almost 200 senior leaders at an all-hands meeting in August to hear the strategic initiative leads for vision integration share their plans and priorities about how initiative implementation, both individually and collectively, will enhance the critical contributions to NGA’s customers and the broader community.

In the past year, NGA embarked on an effort to incorporate the agency’s vision of putting the power of GEOINT in the users’ hands into every facet of the agency’s operations. NGA aims to change the users’ online experience by opening up all GEOINT content through a data-rich environment of geo-referenced and time-tagged information. “All data must be tagged—at least spatially and temporally,” said Keith Barber, lead for the vision’s online, on-demand access to GEOINT knowledge goal. “We also are making decisions on how to shift from how we deliver GEOINT to how we make GEOINT available.”

Providing users ready access to online data will allow NGA analysts more time to put GEOINT data in context. It will also facilitate implementing activity-based intelligence (ABI) using new technology, techniques and phenomenologies to conduct analysis. NGA will provide users access to information in a manner that best suits their needs based on a service delivery model of self, assisted

and full service. This will provide more effective and efficient customer service and help eliminate duplication of GEOINT across the community.

In the past six months, NGA has made significant strides toward creating new value by broadening and deepening GEOINT analytic techniques. Through the use of integrated learning cells, or incubators, the agency and its partners have begun to foster an environment that enables participatory analysis within and across GEOINT tradecrafts and specialties. These learning cells tested different analytic approaches and identified needed capabilities. Using diverse sources and tools, the learning cells created more flexible workflows that enabled deeper analysis and identified technical and process solutions that could be scaled across the enterprise.

“NGA has also brought new analytical approaches and production processes like ‘Living Intelligence’ to these groups, successfully challenging the traditional approaches to GEOINT,” said John Goolgasian, lead of the broadening and deepening analytic expertise goal. “While these are significant achievements, they are only the start. Over the next 12 to 18 months these approaches will spread across the enterprise and result in advances in our analysis and production,” he added.

Living Intelligence is a joint project between NGA and Intelink to transform the agency’s proprietary, finished intelligence process and reduce the amount of duplicative analytic production.

The learning cells demonstrated how analysts develop and communicate enduring solutions to intelligence issues. The biggest challenge over the past few months has been to transform operations while meeting current mission needs. “We are not developing new processes and products in a lab. We are creating new value to meet real requirements in the real operational environment,” said Rodrigue.

Added James Griffith, Deputy Director of the VIT, “As our work to deliver vision-critical capabilities accelerates, the agency will require a slightly modified governance structure to ensure overall success and accelerate implementation.” NGA’s approach to vision implementation is evolving as is the role and functions of the VIT, formerly the Vision Implementation and now the Vision Integration Team. Since its stand-up, the VIT has made progress in moving the vision forward based



NGA photo by Larry Franklin

North America and Homeland Security Division employees (from left to right) Katie Baucom, Nat Wolpert and Rich Benjamin, demonstrate Disaster Strategic Initiative applications to NGA employees in preparation for the upcoming GEOINT Symposium.

on accomplishments from across the agency. “These changes are improving the way NGA meets its current needs and will allow NGA to meet future demands more effectively and efficiently,” added Griffith.

NGA recently identified an initial set of eight strategic initiatives that will further refine and accelerate vision integration. These initiatives will provide overarching accountability in achieving results.

The strategic initiatives currently focus on:

- **Online GEOINT services**—expand NGA’s user base and deepen NGA’s relationships with users through a single Web presence that makes all GEOINT data, products and knowledge accessible and usable online, on-demand through a self-, assisted- and full-service delivery model. Greatly enhance the users’ experience by making it interactive and intuitive.
- **GEOINT data architecture and management**—define, develop and implement a geospatial data management architecture that enables efficient use and utility for operations and analysis across the three service levels (self, assisted and full) regardless of the users’ role, location, mission or security domain.
- **Open information technology environment**—develop and implement an open IT architecture supporting all strategic initiatives while improving access to GEOINT content and applications for all community members regardless of role, mission, location or security domain.

- **Agile acquisition**—develop and deliver a suite of tailored processes that meet customer expectations for rapid satisfaction of mission requirements.
- **Three activity-based focus areas**—demonstrate and determine the value of an integrated analytic approach to address regionally specific key intelligence questions while enabling self-service to the maximum extent possible and on-demand access to timely and relevant GEOINT content. These learning cells will provide analytic and technology solutions, enabling the discovery of GEOINT data, enhanced GEOINT contribution and delivery options that meet the mission needs of partners and customers.
- **Leader development**—help model the future by promoting core leadership values at NGA. Effective leaders at NGA have never been more important. Leadership needs to emphasize corporate behavior by optimizing efforts for the agency, not only for individual business units.

The efforts to implement the vision will continue to inform, influence and drive decisions that will impact the future of GEOINT at NGA and within the broader GEOINT community. The ability to improve access to GEOINT content, enable sharing of GEOINT applications, fine-tune customer service and strengthen analytic capabilities and processes relies on everyone in the GEOINT community. NGA, along with the National System for Geospatial Intelligence, will achieve the vision of putting the power of GEOINT in the hands of all users. ✨

The Unclassified NSG: Same Vision, Different Domain

BY KELLY KEMP, STAFF OFFICER, OFFICE OF GEOSPATIAL INTELLIGENCE MANAGEMENT

Geospatial intelligence (GEOINT) is foundational. It puts information in context, and its visual nature allows users to understand and exploit vast amounts of information. NGA and the National System for Geospatial Intelligence (NSG) embrace this foundational nature of GEOINT in the pursuit of an integrated multi-intelligence, multi-domain environment.

The Intelligence Community has made great strides in the classified arena and now is focusing on its unclassified missions and partners. A matrixed team from across the NSG is developing a strategy that addresses the unclassified realm's unique tasking, collection, processing, exploitation and dissemination requirements. The ability to operate in the unclassified arena will dramatically improve NGA's ability to share information and support customers with homeland security, disaster response and special security events needs. This is the unclassified NSG (UNSG).

The strategy for the UNSG uses the lead federal agency model. This model allows NGA to support its partners (Federal Emergency Management Agency, Department of Homeland Security and Department of State) under existing authorities and enables them to serve their constituents faster and more thoroughly. By fusing multiple, unclassified data sets, NGA and the lead agency

can create a common operational picture that displays relevant GEOINT, facilitates collaborative planning, and increases situational awareness during a special security event or crisis.

The UNSG aligns with NGA's vision and will ultimately provide NSG partners with online, on-demand access to geospatial data and products in the unclassified domain. Its open structure will increase partner responsiveness, available content and the value of the information, while no longer requiring data, applications and services to originate within NGA. The UNSG will create a framework that others can build upon, offering a flexible, multi-security level (MSL) environment that permits analysts to work on unclassified systems without the need to transfer data between multiple systems. It will also tailor the information our partners receive by allowing them to pull the data they need rather than NGA pushing ill-suited products on them.

Recent natural disasters reinforce the need for a more comprehensive approach for sharing data. In the last two years alone, NGA has supported efforts on the Deep Water Horizon oil spill, the Haiti and Chilean earthquakes, western forest fires, Hurricane Thomas in Haiti, floods in Pakistan and Japan's earthquake and tsunami. Each event requires NGA analysts to spend

Paul Weise, Director of the Office of Geospatial Intelligence Management and Chief Functional Management Officer, meets with the Functional Management Council (FMC) monthly to develop and coordinate National System for Geospatial Intelligence strategies and activities and resolve issues that cross multiple functional management areas. Depicted is Weise, fourth from left, meeting with the FMC, composed of Delegated Functional Managers.



NGA Photo by Larry Franklin

precious time transferring archived NGA data, commercial imagery and other vital information between classified and unclassified systems. On several occasions, NGA's partners and the volunteer community produced information long before NGA could. The UNSG allows analysts to dedicate more time to exploitation in the critical hours immediately following a crisis and less time shifting information between domains.

NGA is working to forge new links to the disaster response community and to understand their unique needs, timeframes and capabilities. The National Defense University and the Naval Postgraduate School already hold quarterly exercises with the volunteer technical community, but NGA is beginning to participate and shoulder more of the responsibility. This August, NGA and the volunteers ran an exercise that explored the viability of sharing commercial imagery to verify

and update key infrastructure data, such as roads and streets, medical facilities and disaster response centers, as well as to define the timelines that users have for unclassified GEOINT data. These exercises also allow experts to examine the legal, policy and licensing issues involved with sharing unclassified commercial imagery and the technical hurdles surrounding data interoperability.

The hard work is not finished. NGA Director Letitia A. Long is seeking a unified NSG approach for disaster response and information sharing during crises. Integrating NSG processes and requiring the GEOINT community to move forward together will provide better support domestically and internationally. By conducting these exercises now, the NSG is promising that disasters may slow us down, but policies and data incompatibilities will not keep us from being there when we are needed most. ✨

Pushing GEOINT's Boundaries

BY NATE CASH, STAFF OFFICER, OFFICE OF GEOSPATIAL INTELLIGENCE MANAGEMENT

The National Geospatial-Intelligence Agency's (NGA's) game-changing vision is driving the agency forward, producing improvements across the board and keeping NGA relevant in a world of rapidly advancing technology. NGA Director Letitia A. Long's November 2010 call to action galvanized NGA, but other members of the GEOINT community initiated complementary programs that extend her vision beyond NGA.

The U.S. Army's Nett Warrior (NW), named after Medal of Honor recipient Army Col. Robert Nett, is taking the online, on-demand concept and putting it into the field. Nett Warrior's modular system uses state-of-the-art computer, communications and global positioning technologies to digitally link dismounted soldiers on the battlefield. Users obtain map data via Army channels while heavily relying on NGA orthorectified digital imagery data for mission planning, navigation and situational awareness, along with digital terrain elevation data for line-of-site analyses.

Using imagery and geospatial information is an efficient way to track developing situations and provide agencies with information to maximize aid and investment decisions.

The U.S. Agency for International Development recently announced it is creating a Geospatial Information Center to provide imagery and geospatial data to its employees and other aid workers, allowing them to rapidly track events and quickly distribute information. Similarly, the Federal Emergency Management Agency and Department of Homeland Security use geospatial products to provide first responders with a deeper understanding of emerging crises. NGA is collaborating with each of these agencies, providing them with access to data and ensuring that its distribution affects the widest benefit possible.

All of these agencies, working with NGA, are pushing GEOINT to its boundaries and forcing the community and industry to rethink GEOINT's possibilities. ✨

Earthquake Moves Ground Monitoring Station

BY ELIZABETH K. LOESCH, ORBITAL ANALYST, GPS BRANCH

The National Geospatial-Intelligence Agency (NGA) plays two key roles in keeping GPS accurate: maintaining the World Geodetic System 84 (WGS 84) reference framework, and determining the precise orbits of the GPS constellation.

Determining whether earthquakes—such as the March 11, 2011, Sendai, Japan, earthquake affected ground monitoring stations—is part of the job.

The basic theory of plate tectonics is that the rigid crust of the earth floats on a liquid subsurface. This rigid crust consists of large sections called plates, and these plates are made up of both continental and oceanic crust. Interactions of these plates can be constructive (plates meet and add to each other creating mountains), destructive (plates meet and one is subducted under the other), or transverse (the plates meet and slide past one another). Each plate has its own respective motion, differing direction and velocity. Plate boundaries can be very complex.

Major Earth events, such as the magnitude 9.0 earthquake in Japan, can cause large local displacement of the crust. Earthquakes liberate massive amounts of energy along plate boundaries. This released energy transfers through the rock. Local displacement can

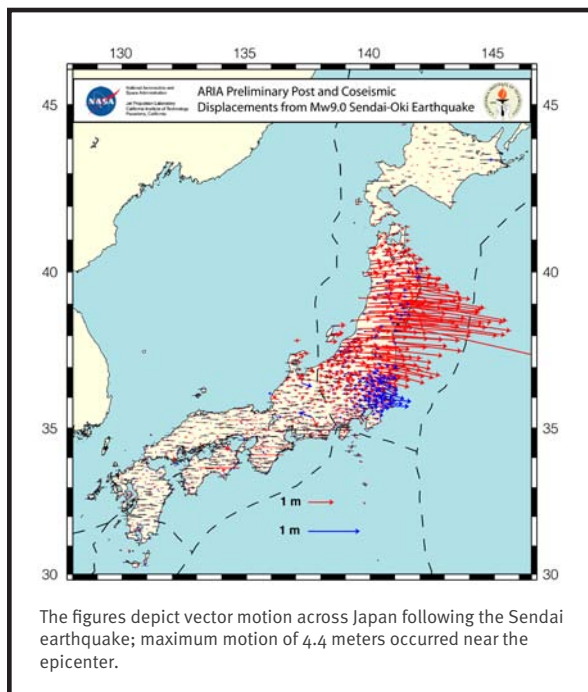


Figure 1: NASA image



Figure 2: NGA image

effectively lead to movement of objects relative to their pre-event location. Typically the entire plate moves in a particular direction with an average velocity, however these local displacements may have an independent magnitude and direction (Figure 1). Local displacement may also not propagate through the entire plate or transfer any significant energy to surrounding plates.

NGA's GPS Division consists of two segments; one focuses primarily on data flowing through an established ground monitor station network (Figure 2). This ground monitor station network relays data from the satellite constellation to NGA and the U.S. Air Force (USAF) and is a critical element of GPS. The second segment of the branch is responsible for a daily post-processing calculation of the precise location of the GPS satellite vehicles in their respective orbits (precise ephemeris). Division analysts use a number of parameters to calculate the precise ephemeris, including the exact location of the ground monitor stations. Physical movement of a monitor station changes the established parameters analysts use to calculate the precise ephemeris. They account for the natural influence of plate tectonic movement in the established variables. An unexpected change in the values (such as local movement at the ground monitor station due to a major earthquake) would introduce error into the precise ephemeris calculations and in the reference



frame itself.

Analysts review the locations of the ground monitor stations nearest to a major Earth event to evaluate if a parameter they use to calculate precise ephemeris has changed. This procedure is an established best practice following a major earthquake. The GPS Division determined movement occurred at the Osan, Republic of Korea Monitor Station after the Sendai earthquake. The total movement was 4 centimeters (1.57 inches) east (Figure 3). The average annual movement for this

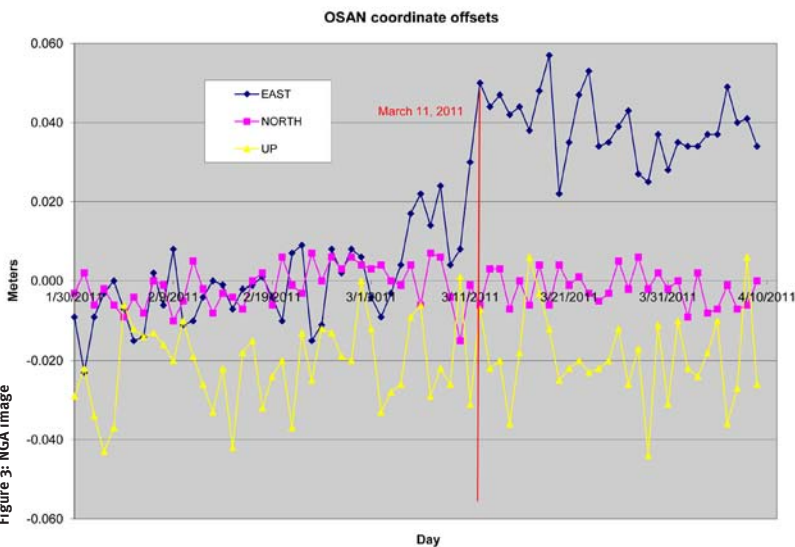


Figure 3: NGA image
This graph depicts movement of the Osan, Republic of Korea Ground Monitor Station. The March 11 earthquake is noted on the graph, and movement of the station is observed in the eastern direction. Total movement due to the earthquake is 4.0 centimeters.

station is 3.17 centimeters (1.25 inches), so the Sendai earthquake represents more displacement in one instance than it normally experiences all year. While this movement is detectable, it is still within the 5 centimeter (1.97 inches) operational tolerances for NGA/Air Force station movement, explained Senior Orbital Analyst Bob Wong. “Just because a change is within a certain tolerance does not mean we cannot detect it. The Osan Monitor Station movement is detectable, so for the sake of being rigorous, we recommended to the USAF that new coordinates be used at the first convenient opportunity.”

The Foundation of GPS

Warfighters rely heavily on GPS for positioning, navigation and timing applications. WGS 84 provides the foundation for the common operating picture. All GPS users immediately realize WGS 84 coordinates from GPS signals. The NGA GPS monitor stations, combined with the USAF GPS monitor stations, form the basis of the WGS 84 reference frame. They essentially define the center of the Earth. Analysts must account for a sudden shift of a few centimeters or small changes in the velocity of the stations to ensure the highest level of accuracy of the reference frame. To ensure that errors in the reference frame do not grow due to these small changes, they must apply corrections. These corrections ensure high standards in integrity and accuracy of the WGS 84 reference frame.

NGA is also responsible for determining the precise orbits of the GPS constellation the Department of Defense (DOD) uses and making this information available to all GPS users. To generate this information, NGA uses a worldwide GPS ground monitoring network that collects data continuously. NGA’s Geomatics Office is responsible for the precise orbits of both the WGS 84 and DOD GPS.

After an earthquake or other major Earth event, analysts can determine the change in local positions quickly and accurately. They track the changing velocities of plates or portions of plates at high accuracy, giving a more complete picture of what has happened to the Earth itself. After the coordinates of the moved sites are determined, the GPS branch sends updated information to the USAF for their use in determining the orbits of the GPS constellation. The GPS signal then delivers corrections to the reference frame to GPS users through the GPS signal. ✨

NGA Completes BRAC Move to New Headquarters

BY LAURA LUNDIN, OFFICE OF CORPORATE COMMUNICATIONS

The National Geospatial-Intelligence Agency (NGA) officially recognized the opening of its new headquarters at Fort Belvoir North Area, Springfield, Va., during a ribbon-cutting ceremony Sept. 26 that also served as the kickoff of NGA's week-long celebration of the agency's mission, workforce and 15th anniversary.

Purposefully built to better support the mission of geospatial intelligence, or GEOINT, NGA's headquarters, known as NGA Campus East (NCE), was authorized by the 2005 Base Realignment and Closure Act to consolidate NGA operations throughout the National Capital Region of the Washington, D.C., metropolitan area. The facility's construction, which began in September 2007, was overseen by the U.S. Army Corps of Engineers.

"We've met the goal of opening this facility through hard work, planning and dedication," said NGA Director Letitia A. Long. "An important part of our federally mandated move was to create a facility 'purpose-built' for the geospatial intelligence mission."

To that end, the facility provides NGA's workforce with a secure and modern working environment that emphasizes both physical and virtual collaboration, as well as a state-of-the-art information technology infrastructure designed to support the current and future needs of the agency by leveraging technologies, such as cloud technology and virtual user profiles, already used extensively in commercial industry.

Work spaces are also specifically designed to create a more collaborative environment and help increase synergy across the agency as a whole, with coworkers sharing a more visible and accessible existence with each other and leadership.

"The building we dedicate today is bringing us all closer together—both physically and figuratively," Long said. "I've already seen improvements in our collaboration with each other."

Paul B., an analyst with NGA's Production and Analysis Directorate, who moved to the facility in July, agrees. "Being able to walk across the atrium to talk to my counterparts in other offices about a particular region or topic we are working on is extremely beneficial," he said, emphasizing that this face-to-face collaboration adds both context and depth to NGA's geospatial products.

Additionally, Paul B. has seen a difference in the IT systems of the facility.

"The overall systems appear to run much more smoothly," he said. "We use a lot of applications that require a lot of RAM and memory, and the new system seems to have improved the processing time of our applications."

The facility also supports greater collaboration across the geospatial community with a world-class conference center onsite to support the outreach

NGA Director Letitia A. Long (in red jacket), NGA employees and a host of distinguished guests cut the ribbon in front of NGA Campus East.



needs of NGA’s Intelligence Community and Department of Defense partners, as well as dedicated office spaces where liaisons from agencies, such as the Defense Intelligence Agency and the U.S. military services GEOINT offices, are collocated with NGA personnel in order to enhance the mission support NGA provides.

These factors all enhance NGA’s support to 24/7 operations.

You can’t overstate the mission of NGA,” said U.S. Representative for Virginia’s Eighth Congressional District James P. Moran. “You work around the clock keeping an eye on the world.”

In August 2011, the NCE facility achieved gold certification under the U.S. Green Building Council, Leadership in Energy and Environmental Design (LEED®) Version 2.2 for New Construction and Major Renovations rating system. NCE achieved 40 of 51 possible points under the gold level, which required a minimum of 39 points for certification.

“It is now the largest U.S. federal building in the world to achieve that certification,” said Moran.

NGA qualified for the gold certification by meeting the five key performance areas of sustainable sites, water efficiency, energy and atmosphere, materials and resources and indoor environmentally quality, with additional credit given for innovation and design process—all completed without additional cost to the construction budget.

NCE’s LEED gold certification points to the building’s positive environmental impact and will lead to financial savings due to lower operating costs realized through energy and water conservation. Environmentally friendly features, like a rainwater collection system and low-flow indoor plumbing fixtures, transparent roofing system and energy efficient lighting, have already shown significant cost savings.



NGA Director Letitia A. Long, at left, shakes hands with U.S. Representative for Virginia’s Eighth Congressional District James P. Moran, while Director of National Intelligence James R. Clapper Jr. looks on. Clapper and Moran were amongst the distinguished attendees at the ribbon-cutting ceremony at NGA Campus East Sept. 26.

NSA photo by Tony Boone

As NGA looks to better meet the current and future needs of its geospatial intelligence users—in times of peace, in times of crisis and in times of war, the new NCE facility will act as a cornerstone in the future success of the geospatial mission.

“This [building] represents, in my view, a living testament to geospatial intelligence,” said Director of National Intelligence James R. Clapper Jr.

Distinguished attendees participating in the ribbon-cutting ceremony included Virginia Sen. Mark Warner, Moran, Clapper, Undersecretary of Defense for Intelligence Michael Vickers, former NGA Director retired Vice Adm. Robert B. Murrett, Virginia House of Delegates Member Mark Sickles, Fairfax County Board of Supervisors Chairman Sharon Bulova, and Commander, Baltimore District, U.S. Army Corps of Engineers Col. Dave Anderson. ✨



NSA photo by Tony Boone

NGA Springs to Action: The Pan-Arab Crisis Action Team

BY GREG ANDERSON, SPECIAL ISSUES MANAGER, ANALYSIS AND PRODUCTION DIRECTORATE

As U.S. and NATO aircraft and missiles struck Libyan air defense elements in March 2011, the National Geospatial-Intelligence Agency (NGA) initiated a Pan-Arab Crisis Action Team (CAT) to support them.

Unanticipated uprisings were not unique to Libya; the scope of events required NGA to develop an approach nimble enough to adjust to events spanning two continents, strong enough to deal with regional issues, and able to avoid impacting other global obligations. NGA's strategy shifted from a focus cell to the more deliberate CAT staffed by an even more diverse group with a greater breadth of regional and functional expertise.

"May you live in interesting times" is reputed to be the English translation of one of three ancient Chinese proverbs and curses that seemed appropriate to the wave of demonstrations and protests that erupted across the Pan-Arab World. The

origin of the proverb might be in question but its essence wasn't lost on those who looked to NGA and its partners across the Intelligence Community (IC) for insight and actionable intelligence. Key to NGA's successful response was leveraging established and dynamic partnerships in support of combat support elements, policy and decision makers within the U.S. government and a coalition that included NATO and Arab partners as well as partners within the Allied System for Geospatial Intelligence.

The Arab Spring, as this revolutionary wave of demonstrations and protests was called, presented a perfect storm of demographic, economic, political, military and technological challenges. NGA's geospatial capabilities provided an intelligence foundation for the fusion of strategy and policy decisions and actions of the United States and the international coalition.

While not a new concept, three factors made the Pan-Arab CAT unique:

- The geographic scope of the area, which included at least 13 countries covering 9.2 million square kilometers
- The international complexities of the United States, NATO and Arab coalition partners
- Its status as the first CAT based in St. Louis, exercising a critical element of the NGA Business Continuity Plan

"May you come to the attention of those in authority" is the second of two lesser-known proverbs that reflected the operational tempo of the Pan-Arab team. In less than 24 hours an issue-driven focus cell, in place since late January 2001 and covering developments in Tunisia and Egypt, transformed into a CAT to meet the demands of a dynamic Pan-Arab event. During the next three months analysts logged over 600 requests for information (RFIs), of which customers submitted over 360 during the Pan-Arab CAT's timeframe.

Operators are "using the [NGA] products on almost a daily basis ... to inform military brass of the situation on the ground, and NGA products have become the primary source for most of the J2 [joint intelligence] all-source products," said an NGA liaison officer at Al Udeid Air Base in Doha, Qatar.



DOD photo

The Arleigh Burk-class guided missile destroyer USS Barry (DDG 52) launches a Tomahawk cruise missile to support Joint Task Force Odyssey Dawn.

John Heyworth, the English writer, penned the quote, “Many hands make light work” in 1546, but the essence of his adage reverberated with many employees who lightened the load for critical geospatial intelligence (GEOINT). Their diverse expertise helped NGA link critical skills with discrete needs, minimizing the impact on other intelligence accounts, such as support to operations in Iraq and Afghanistan.

“May you find what you are looking for” is the third related proverb, and it summarized the impact that the Pan-Arab CAT had over its three months of existence. NGA support helped shape U.S. policy in Libya and enabled NATO and coalition partners’ initial operations. NGA adapted to the nuanced changes as Operation Odyssey Dawn became Operation Unified Protector, while staying sensitive to intelligence capabilities and requirements of the National System for Geospatial Intelligence (NSG), NATO and the coalition. Geospatial and imagery intelligence, coupled with relevant source holdings, gave national decision and policymakers a framework for what would become an increasingly collaborative effort across the NSG and IC.

Regional GEOINT analysts and country source experts served as the nucleus for NGA’s response, augmented by analysts from other regional and functional teams. Improvements in NGA’s analytical tradecraft and system connectivity, coupled with the professional and informal networks of managers and analysts, helped NGA mitigate the challenges of a cold-start surge across the Pan Arab World. RFIs fell into seven categories:

- Force distribution, where GEOINT provided the foundation for standard force graphics provided four times a day over Libya
- Targeting, where the Office of Targeting and Transnational Issues provided critical data in support of strike packages for U.S. and coalition forces, while vetting several hundred targets for pre-strike planning
- Source, which saw NGA leverage commercial and airborne imagery in a tiered strategy to ensure the collection of most-critical targets
- Humanitarian support, status of refugees and location and threat environment for humanitarian relief ships
- Infrastructure, which encompassed


oil production, water and sanitation and transportation networks

- Weapons of mass destruction
- Leadership, including the location and movement of various regimes and opposition elements

Analysts located several categories over different countries governed by closed regimes, while they knew even less about the opposition and their benefactors. The role of social media and the Internet, one catalyst for the Arab Spring, amplified some of the confusion stemming from the streets and Internet nodes across the Pan-Arab world. Analysts tempered finding what NGA was looking for by the reality that governmental and non-governmental organizations, citizens and anarchists and the international and local media were often transmitting what they wanted the international community to find.

The challenge for the IC was to monitor the messages to heighten NGA’s situational awareness, while validating the accuracy of the information. GEOINT-based reporting was often the most effective way to communicate the intelligence gleaned from open sources and the proliferation of personal electronic media.

While the world’s Arab Spring is now well into the Arab Fall, the ripples of this movement have proven to be an ongoing challenge to NGA, policy and national decision makers. During the early summer of 2011 NGA responded to the perceived stalemate in Libya by morphing the Pan-Arab CAT into a Pan-Arab Cell which freed up resources to return to their parent organizations. In August—with the apparent collapse of the Libyan regime resulting from an increasing opposition offensive in western and eastern Libya—the expansion of coalition strikes leading to the liberation of Tripoli presented new challenges to NATO and the coalition. NGA focused its analytical expertise around a Libyan focus cell. The proverbial curse of “living in interesting times” has been with NGA since its creation, and one final quote by Heyworth applies to NGA and future citizens of the Pan-Arab world.

Said Heyworth, “If you will call your troubles experience, and remember that every experience develops some latent force with you, you will grow vigorous and happy, however adverse your circumstances may seem to be.”

Target Vetting: Seeing Through the Fog of War

BY GREG ANDERSON, SPECIAL ISSUES MANAGER, ANALYSIS AND PRODUCTION DIRECTORATE

“It is a riddle, wrapped up in a mystery, inside an enigma...” said Sir Winston Churchill in reference to Russia over 60 years ago, but analysts could also apply the phrase to the importance of target vetting to the National Geospatial-Intelligence Agency’s (NGA’s) role and responsibility as part of the Intelligence Community (IC). Target vetting is a collaborative process by which the IC provides a critical review of one or more potential targets that could become part of a kinetic strike option. It marks the point in the targeting cycle where geospatial intelligence (GEOINT) takes on an element of lethality to those who threaten the country’s national security interests.

The Office of Targeting and Transnational Issues (PR) hosts a cadre of geospatial and imagery analysts who unravel the riddles, the mysteries and the enigmas that enable the “continuation of politics by other means,” as Prussian Gen. Karl von Clausewitz wrote in the 19th century.

Thousands of military actions, operations and strike packages have benefitted from NGA’s stewardship of the nation’s GEOINT. Precise, relevant and time-sensitive GEOINT is a force multiplier for the military. NGA’s imagery and geospatial analysts assist targeting support with facility characterization and functionality—a tradeoff which can have life or death impact. A failure to correctly characterize an area could trigger events that have strategic and political impacts that could harm U.S. interests.

What is Target Vetting?

Target vetting and validating determine whether a target remains a viable element of the target system, and whether it is a lawful target under the Law of Armed Conflict (LOAC) and Rules of Engagement (ROE). Commanders weigh the potential benefit of striking a target against the potential costs. By engaging IC assets they establish a reasonable level of confidence in a candidate target’s functional characterization based on a review of the supporting intelligence; the goal is achieving a

community-wide assessment of the candidate target’s intelligence validity. NGA draws guidance from Joint Publication 3-60, “Joint Targeting.” By providing fundamental principles and doctrinal guidance for the conduct of joint targeting across the range of military operations, this publication codifies the expectations of national decision makers, to include the commander-in-chief. It addresses operational-level considerations for the commanders of combatant commands (COCOMs), joint task forces and their subordinate components to plan, coordinate and execute targeting successfully. Additionally, it addresses time-sensitive target considerations.

Target vetting supports the COCOMs’ target development process, including validation, by providing the commander and staff with the opportunity to gain IC concurrence; each relevant IC agency provides an assessment of target characterization based on the intelligence derived only from its discipline. The review and validation

consist of nine separate elements that include naming convention, location, functionality and critical elements of the actual target, and also elements related to collateral

“It is a riddle, wrapped up in a mystery, inside an enigma...”

—Sir Winston Churchill

objects and the intelligence gain/loss concerns. Target vetting also provides an opportunity for the IC to contribute to the COCOM targeting and planning efforts through a formal voting process. Once relevant members have voted, they consider the target vetted and ready for COCOM validation.

Target Vetting and the U.S. Constitution

“Knowing the Earth” in the context of target vetting is commensurate with knowing the target. “Showing the way” can be equated with providing the terrain, aeronautical and threat analysis a COCOM needs to get the weapon to the target, while “understand the world” touches on the consequences of NGA’s support to both the national and international community; GEOINT is a tool with the power to change, save and take lives. The United States and coalition partners have an obligation to adhere to the LOAC and ROE, weighing the potential benefits of striking

a target against the potential costs. The LOAC arises from a desire among civilized nations to prevent unnecessary suffering and destruction while not impeding the effective waging of war. A part of public international law, LOAC regulates the conduct of armed hostilities. It also aims to protect civilians, prisoners of war, the wounded, sick and shipwrecked.

Customary international law and treaties drive LOAC. Article VI of the U.S. Constitution states that treaty obligations of the United States are the “supreme law of the land,” and the U.S. Supreme Court has held that international law and custom are part of U.S. law. In particular, military personnel must consider LOAC when planning and executing operations and must obey LOAC in combat. Those who violate LOAC may be held criminally liable for war crimes and court-martialed under the Uniform Code of Military Justice.

Target Vetting in the World of Social Media

During Operation Desert Storm in 1991 the world watched the results of target vetting and validation through the eyes of CNN reports. The fog of war has been and always will be a challenge, but the commitment and professionalism of IC partners to mitigate as much doubt as possible continues to save lives. Some of those lives could be the aircrew of coalition aircraft flying a second mission to take out a target, or the non-combatants who tweet an account of a nearby explosion. Either of these options has a bearing on international support of the goals of the United States and coalition partners. The IC—in conjunction with the COCOMS—is confident that with professionalism and commitment to excellence NGA can help hold a coalition together and advance the common cause of the international community. ✨



U.S. National Satellite Imagery Systems

This image depicts the successful aftermath of a strike by a flight of B-2 bombers on the Ghardabiya Airfield south of Sirte, Libya, early in Operation Odyssey Dawn. A rigorous target vetting process, followed by precision targeting, helped neutralize a threat to U.S. and coalition forces while minimizing the risk to civilians.

NGA Psychologists Explore Challenges to GEOINT Analysis

BY MEREDITH KRAUSE, PH. D., AND MARY TRAMONTIN, PSY.D., LICENSED CLINICAL PSYCHOLOGISTS, SECURITY AND INSTALLATION OPERATIONS DIRECTORATE

Since 2009 the National Geospatial-Intelligence Agency's (NGA's) Deployment Psychological Services Program has provided screening, training and consultation designed to optimize the personal resilience and operational success of our forward-deployed workforce. The completion of more than 2,000 individual psychological screenings has highlighted the stresses, strains, pitfalls and pay-offs associated with the application of cutting-edge geospatial intelligence (GEOINT) tradecraft and technologies in the field. These screenings have underscored the need to look beyond the expected set of deployment-related stressors (e.g., separation from loved ones, austere or hostile living conditions, long work hours) to consider some novel and unanticipated challenges associated with GEOINT analysis in general, and with the application of emerging tradecraft and technologies more specifically.

Recent exponential growth in the collection and analysis of full motion video has presented some of the most pressing and unanticipated challenges to personnel and organizations engaged in this activity. The accumulation of extraordinary amounts of data around the clock has required significant increases in staffing resources and training opportunities focused on this evolving tradecraft. The very nature of video exploitation has also posed unanticipated strains to the analytical cadre, who are repeatedly exposed to disturbing images or content and who are expected to sustain high levels of vigilance and perceptual accuracy despite the potential for monotony, fatigue and desensitization.

Potentially Harmful Media Exposure

Potentially harmful media exposure includes viewing graphic images of events such as war-related killings (of both combatants and non-combatants), disasters' aftermaths and harm to children. Exposures can include audio and may be occurring in real-time, or have been captured and recorded as stills or as video clips of past events.

For deployment psychologists at NGA and its sister agencies in the intelligence, military and law enforcement communities, the impact of repeated exposure to potentially harmful media has emerged as an issue to assess and monitor. Research has linked exposure to disturbing media representations

to resultant adverse reactions ranging from mild to severe. According to R.B. Thomas and J.P. Wilson's work in the *International Journal of Emergency Mental Health*, one of the more insidious effects, vicarious traumatization, is associated with subtle and detrimental changes over time in one's core beliefs, expectations, relationships and view of self and/or others as a result of repeated exposure to traumatic material.

Stress reactions, on the other hand, connote the common and temporary negative reactions to events that challenge existing coping strategies. Such reactions affect cognitive, physical, emotional or spiritual functioning and often remit when acknowledged and addressed. Exposure, for example, to graphic images may initially engender emotional, cognitive or even spiritual recoil. This response may in turn trigger the adaptation and internal adjustments required for continued involvement or may prompt transition to another analytic setting or activity.

In an effort to better understand the risks posed by potentially harmful media exposure as well as relevant individual and organizational factors, NGA's deployment psychologists are teaming with analysts, supervisors and psychologists around the Intelligence Community to systematically explore the stressors inherent in media/video analysis. Psychologists hope to develop standards of best practices for managing and mitigating any identified negative consequences.

Vigilance Fatigue

One of the more overlooked but powerful threats to accurate GEOINT analysis and production has been termed "vigilance fatigue." Used in the medical, financial and psychological arenas, it results from a failure to accurately appraise bona fide risks or anomalies due to:

- Prolonged exposure to ambiguous and/or questionable information
- Information overload
- Overwhelming pressure to maintain exceptional, error-free performance
- Faulty strategies for structuring decision-making under conditions of uncertainty and stress, according to a 2005 article by M.S. Krause on vigilance fatigue in policing.

Individual/Intrapersonal Factors	Contextual/Environmental Factors	Task-Specific Factors
<ul style="list-style-type: none"> ◆ Boredom proneness ◆ Complacency ◆ Limited span of attention ◆ Poor visual scanning/pattern recognition skills ◆ Reliance upon cognitive heuristics ◆ Risk tolerance (↓) ◆ Subject matter expertise (↑) ◆ Negative affect (e.g., anxiety, worry, depression, anger) ◆ Job dissatisfaction/burn-out ◆ Lack of job commitment/engagement ◆ Limited motivation ◆ Physical/mental fatigue and sleep deprivation ◆ Limited social support ◆ Limited stress tolerance and coping skills ◆ Failure to use leave/respite 	<ul style="list-style-type: none"> ◆ No access to tools designed to support information processing and decision making ◆ Stress and arousal level (↓) ◆ Inadequate staffing levels ◆ Rotating/unpredictable shiftwork assignment ◆ Presence of groupthink ◆ Lack of team/office cohesion ◆ Lack of management support (topcover) ◆ Inconsistent approach to managing errors and risk ◆ Limited training opportunities ◆ Poorly designed physical environment (overall comfort level and attention to ergonomics) ◆ Disjointed policy and procedure ◆ Lack of access to feedback regarding the accuracy of decisions 	<ul style="list-style-type: none"> ◆ Poorly designed physical environment (overall comfort level and attention to ergonomics) ◆ Disjointed policy and procedure ◆ Lack of access to feedback regarding the accuracy of decisions ◆ Information/data overload ◆ Low base rate (rare) targets/outcomes ◆ Time pressure to complete task ◆ Presence of complex data/tasking requirements ◆ High task monotony ◆ Data of questionable quality ◆ Presence of novel or unusual data ◆ Presence of ambiguous or contradictory data ◆ Presence of emotionally charged information ◆ Immature tradecraft
<p>Note: (↓) denotes factors that require careful balancing, as extremes will contribute to vigilance fatigue</p>		

Table 1. Common Contributors to Vigilance Fatigue in Individuals

This concept is applicable to GEOINT analysts who are routinely tasked with processing large amounts of imagery, video or data; identifying critical risks, changes or irregularities under time pressure; and conveying this information to decision makers who require both accuracy and specificity. Vigilance fatigue poses a threat in theater as well as stateside. In a combat zone, long work hours, limited rest/recuperation time, limited opportunity for data verification and/or product review, and the pressing need to provide products in a timely manner play a role. In a non-deployed context, dynamic and static individual, environmental and task-specific factors interact to determine an individual’s susceptibility to vigilance fatigue.

Factors contributing to vigilance fatigue, which are presented in Table 1, require individual, managerial and organizational monitoring and intervention in order to effectively mitigate potential adverse impact on GEOINT analysis. As this table demonstrates, vigilance fatigue is more likely to emerge when certain individual, environmental and task-specific factors interact

to degrade perceptual accuracy, impair decision making, erode accountability/verification processes or overwhelm established analytical processes, practices and technologies.

Vigilance fatigue is associated with reductions in mental efficiency, perceptual accuracy, decision making and/or threat sensitivity due to prolonged and repetitive engagement in security, intelligence or law enforcement activities focused on ambiguous or unknown targets or threats.

Given the number of threats to sustained vigilance, an effective mitigation response must include a combination of policy and practice initiatives, training and staff development and technological support/advancement. This three-pronged approach, outlined in Figure 1, addresses the aforementioned individual, contextual and task-specific threats to vigilance fatigue.

Policy and practice initiatives in the areas of human capital management, organizational climate and culture, and team development may result in the recruitment, development and retention of analysts who are assigned to accounts that fully leverage their skills, offer

adequate opportunities for challenge and engagement, maximize job satisfaction and employee motivation, and foster group cohesion, collaboration and mutual support. These are all factors critical to sustained attention. A focus on interagency collaboration and information sharing is another important practice and policy concern as it allows an analyst’s enhanced access to needed information, opportunities for validating and corroborating data, and encouragement to think outside a traditional GEOINT box.

Training and staff development programs allow for ongoing refinement of both analytical personnel and emerging tradecraft. The vigilance fatigue concept could easily be introduced in basic GEOINT training courses, thus sensitizing developing analysts to the factors that may compromise their decision making throughout their careers as well as encouraging their reliance upon individual, team, environmental and task-specific mitigators. Advanced training initiatives may incorporate complementary strands from the areas of analytical thinking/processes, hardiness/resilience, time and stress management, attention control and energy management, continuous quality improvement strategies and information management approaches (e.g., standardized use of metadata). The Army Center for Enhanced Performance has pioneered an integrated training model that optimizes performance and stress resistance by honing attention control, goal-setting, energy management and imagery/visualization skills.

Technological advancements hold considerable promise for combating vigilance fatigue. These developments, which have been developed in response to the burgeoning data deluge associated with round-the-clock image collection tools such as unmanned aerial vehicles and the continued pressure for flawless and uninterrupted analysis of this data, are designed to enhance accurate information processing by highlighting patterns and irregularities, reducing the distraction posed by competing information (i.e., distinguishing true signal or sign from background noise or clutter), and structuring or supporting decision making.

While these strategies may offer short-term solutions to the challenges posed by emerging GEOINT advances, a holistic consideration of long-term solutions is critical to sustaining an effective and vigilant analytical workforce. Holistic solutions require ongoing partnerships among subject matter experts in the fields of GEOINT and their colleagues in the fields of psychology and the behavioral sciences, human resources and human development, education and training, and organizational dynamics and leadership. It is only through such collaboration and broad perspective-taking that agencies will be able to anticipate, identify and mitigate critical vulnerabilities in the human-tradecraft interaction and generate the appropriate strategies needed to optimize analytical performance and outcomes in an ever-changing threat terrain. ✨

Policy and Practice	Training	Technological Development
<ul style="list-style-type: none"> • Human capital management • Organizational climate and culture • Team development • Ergonomic and conducive physical environment • Interagency collaboration • Information sharing and data management 	<ul style="list-style-type: none"> • Vigilance fatigue • Analytical thinking and decision making under uncertainty • Group/team analysis • Hardiness and resilience • Attention control and energy management • Time and stress management • Information management • Continuous quality improvement 	<ul style="list-style-type: none"> • Decision-support tools • Feature recognition software • Cue filtering and augmented display systems • Visual analytics (e.g., social network analysis) • Spatial organizers

Figure 1: Practical Strategies for Combating Vigilance Fatigue

Remembering Vietnam 4: After Dark with Patricia Lynn

BY DR. GARY E. WEIR, OFFICE OF CORPORATE COMMUNICATIONS

On the 50th anniversary of the first direct American military involvement in Vietnam, the Department of Defense has called upon U.S. citizens to remember with respect and gratitude those who served in Southeast Asia. This series of six articles—of which this is the fourth—illuminates the significant role played in Southeast Asia by people in the tradecraft communities that now comprise the National Geospatial-Intelligence Agency.

Sometimes the platforms made all the difference. In early May 1963, two Martin RB-57E reconnaissance aircraft arrived at Tan Son Nhut Air Base in Saigon, South Vietnam, to join Detachment 1 of the 33rd Tactical Group. General Dynamics had recently modified these RB-57E's, which were primarily known as target-towing craft. The changes included a completely redesigned nose, which now housed a 36-inch KA-1 forward oblique camera and a KA-56 panoramic camera. The bomb bay now carried a KA-1 vertical camera, a K-477 night and day camera, an infrared scanner and a KA-1 left oblique camera. The RB-57E's also had a viewer in the rear cockpit permitting the crew member seated there the same view as that of the infrared scanner.

The RB-57E started life as the Canberra bomber produced by the English Electric Company and was offered to the U.S. Air Force as a possible replacement in 1951 for its Martin B-26, which was rapidly reaching the end of its useful service life. The Air Force needed an aircraft capable of attacking the North Korean supply lines, which were very active at night due to daytime U.S. reconnaissance. The B-26 proved very vulnerable to ground fire, and a ready-made, night-capable replacement would help disrupt the North Korean logistics system. Even with the engine nacelles (cover housing) reworked to accommodate the Wright YJ65-W-1 jet engine, the aircraft failed to fulfill its promise, and the production run of the B-57A, conducted under license from the British, ceased after eight aircraft. Instead of discarding the licensed design, the Air Force revised its thinking with regard to this airframe, recasting it as the RB-57E and producing 67 copies that served well into the period of United States involvement in Vietnam. When Martin Marietta Aircraft produced the RB-57E variant, they also provided the aircraft with the rotating bomb bay characteristic of their experimental XB-51.

When the first two RB-57E's arrived in 1963, U.S. forces immediately put them to use, conducting reconnaissance over both North and South Vietnam. This was the force's first use of an effective, although limited, night reconnaissance capability. Their very regular sorties went under the unusual code name "Patricia Lynn."

According to Vietnam air-war chronicler Douglas Gordon, the Patricia Lynn pilots flew regularly through 1963 and 1964, and Detachment 1 of the 33rd Tactical Group at Tan Son Nhut received two additional aircraft, with each of them returning to the United States on an irregular basis for upgrades to the reconnaissance systems as the demands of the war increased.

By 1967, the Air Force drafted the Patricia Lynn aircraft into the effort to interdict the Ho Chi Minh Trail, especially in the vicinity of the Mu Ghia and Tchepone Passes and the Ashua Valley. The program, called Combat Skyspot, focused on guiding bombers to truck assembly points on the trail and then conducting bomb

damage assessment afterward. For a number of previous nights the RB-57E's would conduct reconnaissance flights. Then they would help guide the bombers to the target, returning almost immediately to collect bomb damage imagery. The Air Force wanted to assess the effectiveness of the attack before the North Vietnamese had a chance to clear the evidence of the raid. Used at night, the infrared sensors on the RB-57E's provided the best intelligence on their Ho Chi Minh Trail results. Very often the RB-57E's would have to negotiate a curtain of anti-aircraft and small arms fire on their way back by the target to collect imagery for the assessment. This experience prepared the Air Force for the repeated sorties they would soon have to make over Khe Sanh in support of the Marines in their extraordinary stand against the North Vietnamese in 1968. Reincarnated, the RB-57E helped illuminate the night in Vietnam, a surprising use encountered many miles and years after its World War II-era design. ✨

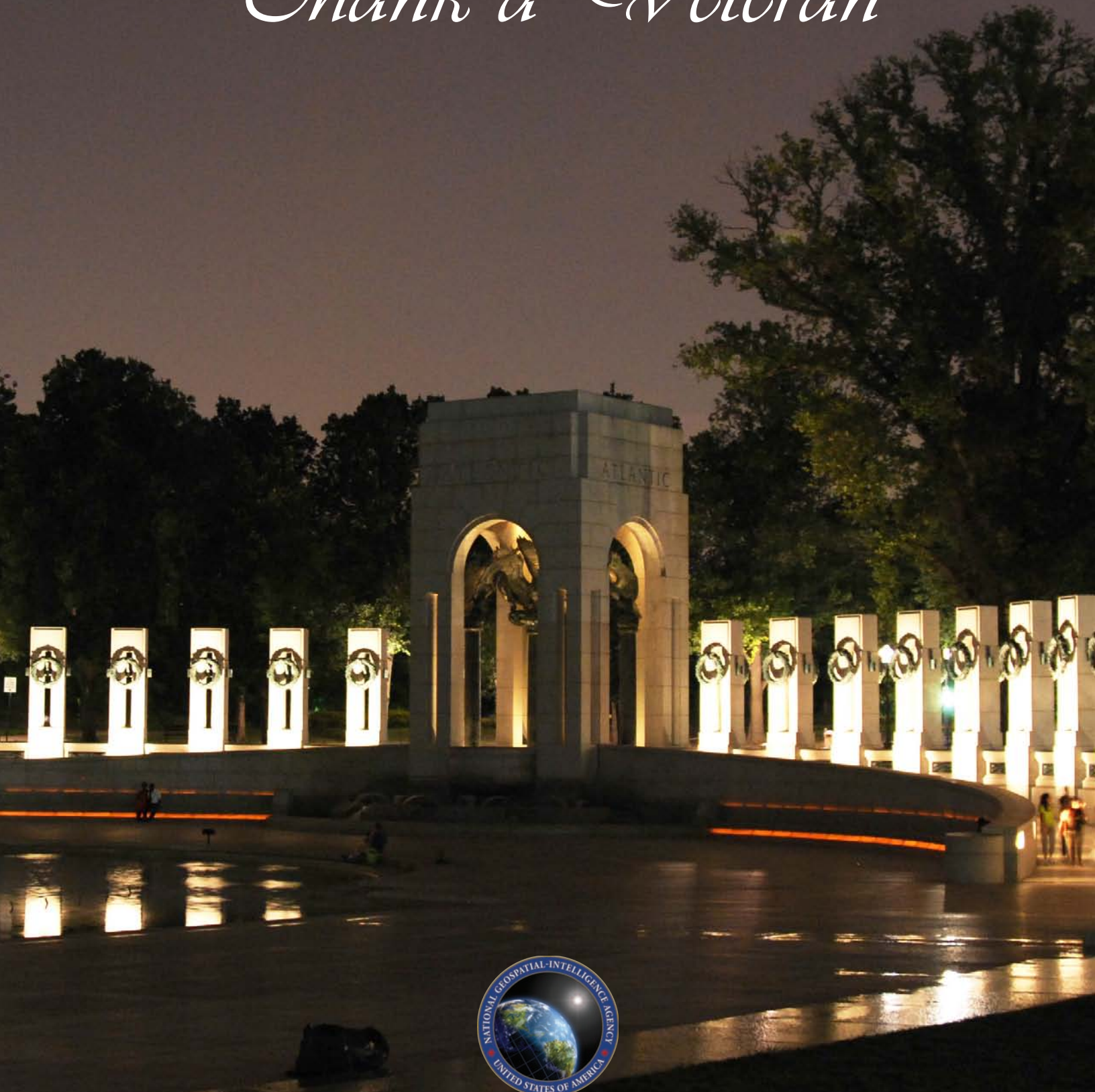
LiDAR

Fundamentally similar to radar, LiDAR—light detection and ranging—uses pulses of laser light to calculate the range and reflective intensity of objects on and above the ground. Whether imaging smooth or rugged terrain, or natural or man-made objects, a LiDAR sensor can generate accurate, three-dimensional models over large areas in a short amount of time. Whether mounted on an aircraft, vehicle or stationary tripod, LiDAR helps NGA build a new generation of high-resolution terrain models for those that need it most—the warfighters.

NGA LiDAR image of the Grand Canyon

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