NGA—Then and Now
Celebrating 10 years of GEOINT

By Vice Admiral Robert B. Murrett, Director, National Geospatial-Intelligence Agency

This year NGA celebrates 10 years of the geospatial intelligence (GEOINT) discipline. A decade ago, NGA's predecessor, the National Imagery and Mapping Agency (NIMA), was formed when eight different organizations and a critical mass of skills and technologies were combined. NIMA's essential experts brought together diverse capabilities to create ideas and possibilities never imagined before. This convergence laid the foundation for GEOINT and one unified mission. The creation of NGA in 2003 was an acknowledgment of this revolutionary step in both name and practice. Today NGA is the premier provider of GEOINT, supporting defense and intelligence missions worldwide and some of the nation's most difficult intelligence challenges. In addition, NGA has played a key role in support of natural disaster and humanitarian crisis response and national security defense. From NGA's discovery of ethnic cleansing atrocities in Kosovo to support for cities hosting the Olympics and response to Hurricane Katrina, NGA's 10-year anniversary has been a yearlong celebration of an incredible legacy and a rich history of support.

NIMA: The Early Years

NIMA was formed in October 1996 when the nation's most capable imagery and geospatial assets were combined. NIMA brought together the Defense Mapping Agency, Central Imagery Office, Defense Dissemination Program Office and National Photographic Interpretation Center. This new Agency also incorporated parts of the CIA, Defense Airborne Reconnaissance Office, Defense Intelligence Agency and National Reconnaissance Office.

From 1996 to 2003, the organizations forming NIMA were learning to work together. This posed many challenges, among them learning to work with personnel and missions from eight separate organizations, each with its own history and corporate culture. NIMA, however, continued the work of its predecessors. For example, the Agency influenced world events by creating animated renditions of imagery and geospatial data that allowed users to visualize inaccessible terrain. These types of technological innovations were the hallmark of NIMA's formative years, even in the face of its greatest challenge: to consolidate diverse ideas, technologies and missions.

NIMA's first year saw unprecedented advances. As part of this, NIMA joined forces with the NASA Goddard Space Flight Center to create the Earth Gravity Model (EGM96). This revolutionary new model improved accuracy in Global Positioning System readings, satellite orbit determination and measurements collected by geodetic satellites, which meant more accurate navigation and targeting.

NIMA: Expanding its Footprint

During the late 1990s, NIMA's footprint expanded, bringing its technologies to regions of global concern. In 1997, NIMA produced 78 imagery-derived maps covering a total of 13 million acres in support of the effort to suppress the wildfires in Indonesia. These maps not only helped the Indonesian authorities identify affected areas, but also enabled the U.S. military reserve units deployed to assist with fire suppression efforts. That same year, NIMA became the

leader of the Image Collateralization Initiative, providing operational sites to electronically distribute secret collateral satellite imagery within the Department of Defense (DoD). By eliminating higher security restrictions, NIMA was better able to develop the system needed for this kind of imagery and ensure more timely delivery of its products to those who needed them.

In 1998, NIMA brought support to the decades-old border dispute between Peru and Ecuador. The new Agency created maps and image products used in the negotiations between Peruvian President Albert K. Fujimori and Ecuadorian President Jamil Mahuad. The conflict came to a conclusion on May 14, 1999 with a ceremonial laying of a boundary stone in the disputed area of the Amazon jungle.

That same year, NIMA also provided support to Operation Desert Fox in Iraq. This conflict emerged when Baghdad was bombed by American and British forces for violating a United Nations order for inspection of weapons. NIMA's role was to create products like digital terrain data over Iraq, which was used for mission planning. The Intelligence Community (IC) came together to support the operation, with NIMA playing an essential role in increasing weapon accuracy.

In 1999, NIMA supported Operation Allied Force in Kosovo. In that conflict, NIMA personnel provided NATO-led Operation Allied Force over Kosovo with maps, navigational support, imagery-derived products and intelligence briefings. These products were used not only by the 21,000 U.S. military personnel involved in the operation, but also by military personnel from the other 19 countries comprising NATO. Additionally, NIMA developed NIMA-in-a-Box in support of U.S. armed forces. The product is a combination of hardware (a notebook computer) and software containing NIMA's imagery and geospatial information, providing on-the-spot information to deployed units. Two configurations of NIMA-in-a-Box were developed for Operation Allied Force in Kosovo.

In the late 1990s, NIMA assisted the U.S. Drug Enforcement Agency and its international partners in stopping the production and international transport of illegal drugs through the production of reports monitoring suspected international drug trafficking in multiple hemispheres.

During that same time period, NIMA supported humanitarian relief efforts in Rwanda and Uganda with quickly produced Landsat images used by United Nations relief workers to deliver aid shipments to refugee camps.

At the beginning of the new century, NIMA was exploring new frontiers through the expansion of its technologies and capabilities. The Shuttle Radar Topography Mission (SRTM), launched aboard the Shuttle Endeavour in 2000, was a joint mission between NIMA and NASA. The Space Shuttle Endeavour spent 11 days in flight and acquired elevation data over approximately 80 percent of the Earth's surface using the technique known as interferometric synthetic aperture radar. Producing this volume of quality data through cartographic means would have taken tens of thousands of extraction hours.

After nearly a decade, SRTM data continues to yield data for a variety of scientific applications in geology and geophysics, including earthquake research, volcano monitoring and hydrological modeling. Civilian applications include enhanced approach and ground safety systems for aircraft and better location of cell phone towers. Military applications include improved flight simulators and missile and weapons guidance systems.

In 2000, as part of NIMA's effort to enhance system capabilities and geospatial production tools, the National Imagery Exploitation System (NIES) replaced the Imagery Data Exploitation (IDEX II) system. The NIES included the Integrated Exploitation Capability (IEC), which provides access to both NGA and commercial imagery, all-source intelligence and tools for multi-intelligence data fusion. As part of the National System for Geospatial Intelligence (NSG), the NIES brought more accurate imagery and GEOINT to the warfighter in less time.

In support of the presidential inauguration in 2001, NIMA provided near real-time situational awareness for the first time by combining commercial maps, aerial photography and imagery in support of the military, Secret Service and FBI. In 2001, NIMA assisted U.S. agencies in charge of aiding the Ecuadorian government with the cleanup of a fuel spill affecting Ecuador's Galapagos Islands. NIMA provided a map of the concentration of the spill. The map was essential to conducting the cleanup and preventing additional damage to the unique ecosystem of these islands.

Even in light of NIMA's many successes in advancing the geospatial discipline in the first years of the new century, there was no one event that defined NIMA's history more than the Sept. 11, 2001, attacks on the World Trade Center and Pentagon. Never before had an attack of such magnitude been achieved on American soil. It was NIMA's

support following the terrorist attacks that spurred the recognition of GEOINT as an individual intelligence entity and ushered in a new era for the Agency.

NGA and the Emergence of GEOINT

Two days after the Sept. 11 attacks, retired Air Force Lt. Gen. James R. Clapper Jr. took the helm as NIMA's second director and first civilian director, succeeding geospatial pioneer Army Lt. Gen. James C. King. Soon after Clapper's arrival, he began to promote products that emerged from a variety of new initiatives. This fusion of source and imagery that had emerged during Gen. King's tenure at NIMA now became known as geospatial intelligence, or GEOINT.

As Director of NGA, Clapper also assumed the role of GEOINT Functional Manager of the NSG. In this role, he quickly developed and published a series of formal communications that established a working doctrine for GEOINT. The first of these, the Geospatial Intelligence Basic Doctrine, appeared in July 2004.

The ensuing global war on terrorism and the events surrounding Sept. 11 dramatically changed the nature of NIMA's priorities and products. Recognizing that new threats could occur at any time or place, Clapper decided to make regional analytic overview more robust and embed NIMA analysts throughout the combat support and IC networks. His innovative concept of a unifying discipline and doctrine evolved into a new agency name, the National Geospatial-Intelligence Agency (NGA).

NIMA officially became NGA with the Nov. 24, 2003, signing of the fiscal 2004 Defense Authorization Act. The name change was more than just semantics. It reflected both the new product NGA was developing as well as the growing unity of the Agency's parts. GEOINT combined traditional geospatial, imagery and other resources to present digital representations of world locations and natural and manmade activities. This evolution meant that NGA could keep ever-growing masses of information up-to-date. The information or data could be quickly transmitted, easily stored and efficiently used by those in the military, civilian and national sectors.

The passage of the Homeland Security Act in 2002 clarified NIMA's role in supporting its national partners and helped strengthen the Agency's relationship with other domestic agencies. After the Sept. 11 attacks, the Agency quickly began to utilize tactics, techniques, procedures and solutions it had long used overseas, applying them to domestic situations with congressional approval.

Some of these new tasks included surveying the World Trade Center site to aid reconstruction efforts and supporting the CIA's counterterrorism activities. NGA played a significant role in site examination and response planning for major national and international events, such as the Winter Olympics in Salt Lake City in 2002 and Turin in 2006 and the summer games in Athens in 2004. During these events, NGA provided maps and GEOINT for training and security. The same period saw more involvement in newly intensified efforts to protect the President of the United States, Vice President and other high-ranking officials and provide better security for U.S. military and other government facilities.

To provide this support, NGA utilized the same capabilities for scene visualization, situation analysis, intelligence data fusion and contingency planning that were provided to its military customers. The same technology that enabled flight simulation was now being used for walk-through and drive-through animations for special world events. Analysts collected data from a variety of sources, just as they did in support of the military. During deployments in support of security planners at national political conventions, NGA added commercially available terrain data, derived from radar, to avoid the limitations of cloud cover. Such high-resolution data has become the standard for other major, non-intelligence activities.

With the challenges, changes and events that transformed NIMA into NGA, there also emerged new tools and practices that better defined and advanced GEOINT. During Operation Allied Force in Kosovo, for example, NGA recognized the need for a deployable system that could withstand harsh terrain and environmental conditions. This new system had to move with the troops to bring more robust, timely and actionable GEOINT directly to wartime consumers. It was out of this idea that the Mobile Integrated Geospatial Intelligence System (MIGS) was born. MIGS is a mobile, fully self-sustaining suite of communications, life support and transportation equipment. It utilizes the High Mobility Multipurpose Wheeled Vehicle and includes a mounted satellite link, integrated power and server control and internal backup power. The MIGS has proven highly useful in military operations in the Near

Kabul International Airport, Afghanistan

East and during cleanup operations after Hurricane Katrina in New Orleans in 2005. In each instance, the MIGS permitted remotely accessible GEOINT exploitation and the ability to reach back to other facilities for support.

Shortly after Sept. 11, NIMA developed systematic ways of using the emerging technology for real-time airborne tracking and targeting. Just prior to the launch of the military action in Afghanistan, NIMA set up new centers at three of its main offices for exploiting airborne imagery. In mid-2002, NIMA leadership established an Airborne Analysis Cell, recognizing airborne imaging platforms as an untapped source of raw intelligence. The cell was constructed in less than four months and improved support to U.S. combat forces. An Operational Fusion Center was also established, placing geospatial and imagery analysts together in the same spaces. This union of analysts created a synergy that provided even more complete and accurate answers to forces in the field.

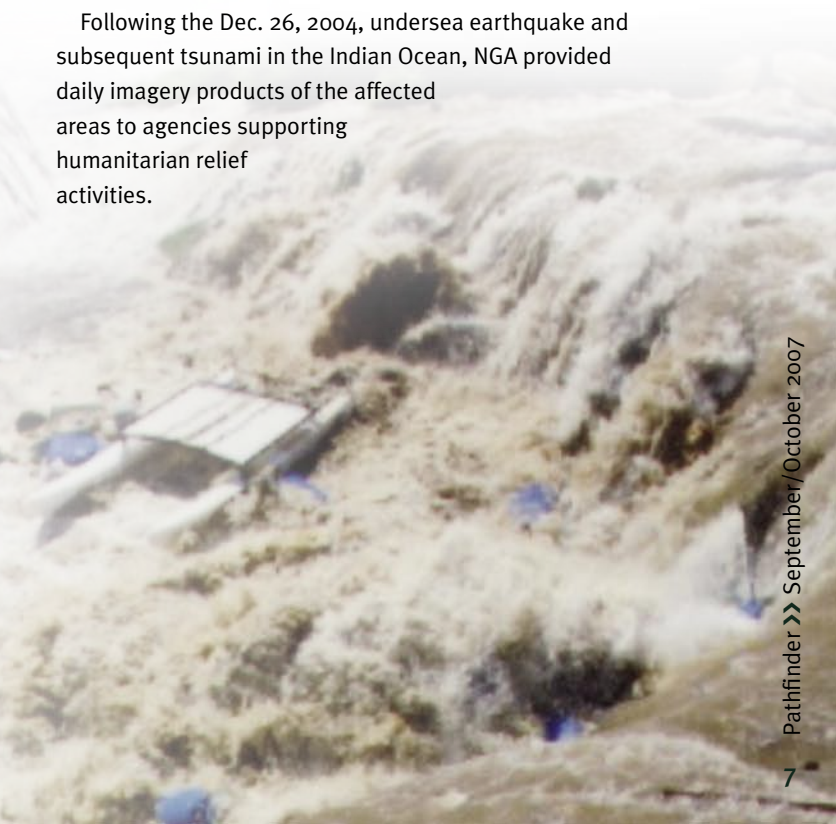
On Oct. 7, 2001, in swift response to the attacks of Sept. 11, NIMA's new product, GEOINT, followed American forces into Operation Enduring Freedom (OEF). When OEF began, the Taliban controlled more than 80 percent of Afghanistan and seemed poised to overwhelm their domestic opponents. By Oct. 20, U.S. and coalition forces had destroyed virtually all Taliban air defenses, and U.S. Army Special Forces detachments joined with anti-Taliban leaders to coordinate operations on multiple fronts. By mid-December, U.S. Marines had secured Kandahar Airport, and the Taliban capital was in the hands of anti-Taliban forces. Within weeks, the combined international effort reduced the Taliban and al Qaeda to isolated pockets of fighters. Seventy-eight days after the beginning of combat operations on Dec. 22, Army Gen. Tommy Franks arrived in Kabul to attend the inauguration of the Afghan interim government. By mid-March 2002, the coalition removed the Taliban from power in Afghanistan. The U.S. Transportation Command addressed all force positioning and most logistical needs in theater through the assistance of special maps, aeronautical navigation data and NIMA-supplied GEOINT products.

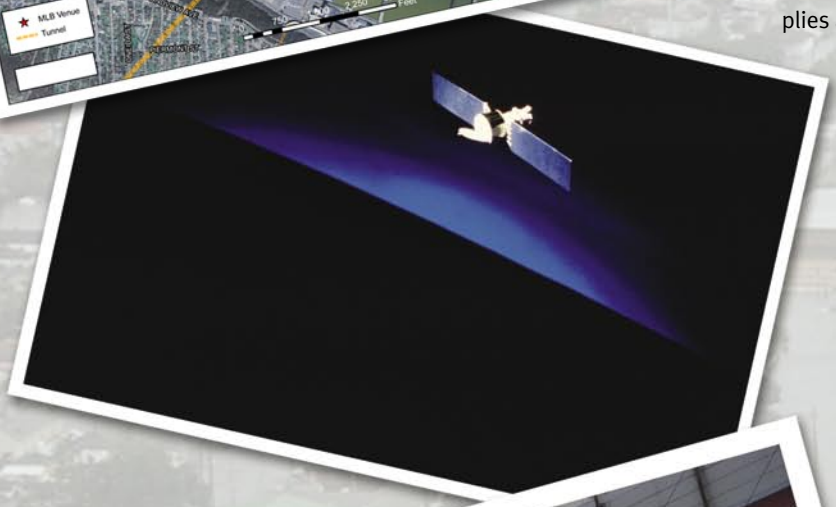
On March 19, 2003, U.S., United Kingdom and other coalition forces began conducting military operations designed to depose Saddam Hussein and identify and remove any possible weapons of mass destruction in its possession. During Operation Iraqi Freedom, imagery from reliable commercial satellites supplemented the Agency's own assets to supply the necessary imagery in support of diplomatic initiatives, humanitarian relief and reconstruction efforts. The military and humanitarian efforts in Afghanistan and Iraq spurred the largest overseas deployment of NGA personnel in the Agency's history.

Borrowing practices used by other agencies and defense consulting firms, NGA began embedding analysts with deployed customers. The NGA deployments formed part of a concerted effort to extend the NSG into each command headquarters and national government agency. By providing support team experts at each customer site to help interpret and manipulate GEOINT products and services, NGA gave warfighters and the IC a worldwide, firsthand intelligence baseline for their own analytical and operational needs.

NGA's support to some of the most difficult defense and intelligence missions extended to its support of several significant humanitarian efforts. In 2003, following the Space Shuttle Columbia disaster that killed the seven astronauts on board, NIMA analysts worked with NASA and the Federal Emergency Management Agency (FEMA) to precisely map the likely trajectory of shuttle debris to focus search efforts more precisely. The NIMA efforts helped recover human remains and most of the dispersed debris.

Following the Dec. 26, 2004, undersea earthquake and subsequent tsunami in the Indian Ocean, NGA provided daily imagery products of the affected areas to agencies supporting humanitarian relief activities.





These agencies included the U.S. Agency for International Development's Office of Foreign Disaster Assistance (OFDA) and the U.S. Pacific Command (PACOM). With these geospatial products, OFDA and PACOM determined priorities for emergency relief efforts and orchestrated the deployment of life-supporting supplies and personnel to the region.

The imagery products showed the scope of the damage caused by the earthquake and resulting tsunami. NGA assessed the impact on infrastructure, including damage to roads, bridges, ports and airfields, and identified how that destruction affected access to damaged areas.

In the fall of 2005, NGA was poised to provide unprecedented support for relief efforts during the most destructive hurricane season on record. Before the first waves hit the Louisiana shore on Aug. 29, 2005, NGA's assistance to Hurricane Katrina relief had begun. For first responders from the Gulf Coast counties in the hurricane's path, the Agency provided numerous graphics for relief efforts that depicted the locations of major airports, police and fire stations, emergency operations centers, hazardous


NGA photo by Phil McCabe

Photo courtesy of Department of the Army

materials, highways and schools. FEMA and other government agencies effectively utilized NGA information and products, which were based on imagery from commercial and U.S. government satellites and American military airborne platforms.

In support of both Hurricanes Katrina and Rita, NGA forward-deployed more than two dozen analysts and two MIGSs to the affected areas to provide timely, on-site support.

GEOINT's New Frontiers

Over the last 10 years, GEOINT has demonstrated its unique ability to illuminate critical situations in ways that permit relevant intelligence and military policy decisions and humanitarian response actions. Today NGA is meeting the ever-increasing need for relevant and responsive GEOINT in an era of unprecedented global change. As the Agency's priorities evolve and shift with changing times, new challenges emerge.

To ensure NGA's success in this new environment, the Agency's leaders developed 12 strategic goals. These 12 Focus Areas are designed to guide NGA's strategic direction, enable the Agency to better accomplish its objectives and align the Agency with the nation's larger intelligence and defense directives.

NGA photo by Rich Benjamin

One of the Focus Areas calls on NGA to "look outward and be the most collaborative partner with the IC and warfighter," setting a high standard for collaboration and integration across the intelligence and defense communities. At the swearing-in ceremony for the new Director of National Intelligence in February this year, President Bush charged Director Mike McConnell to "better integrate" and continue to improve collaboration within the IC. Soon after, Director McConnell announced the need to move the IC beyond the "need-to-know" and "need-to-share" philosophy to a "responsibility to provide" mindset.

Recognizing that increased collaboration is key to its mission success, NGA has invested heavily in building collaboration based on three key principles: partnerships, technology and standards.

Partnerships

NGA has a strong tradition of collaborating with colleagues across government, non-profit academia and industry arenas to exchange ideas, share best practices, display new GEOINT solutions and technologies and discuss potential tradecraft advances as they relate to GEOINT.

NGA is not the only producer of GEOINT in the government, but it is the only agency with the unique and important role as the Functional Manager for the NSG. The NSG vision is an integrated collaborative community of GEOINT professionals embedded within the Agency's operational partners to meet their warfighting and intelligence needs. Through the NSG, NGA strives to combine technology, policies, capabilities, doctrine, archives, people, data and communities necessary to produce GEOINT in an integrated multi-intelligence, multi-domain environment.

Experience has shown that embedding personnel with mission partners is the most effective way to ensure GEOINT is accessed, understood and absorbed. Since 2003, NGA has made a concerted effort to embed personnel with IC, DoD and coalition partners through its NGA Support Teams. NGA continues to provide the precise "foundation" of knowledge about the Earth that all other intelligence disciplines build upon. At present, NGA personnel are on the ground in about 150 locations around the world, putting GEOINT to use as part of the mission team.

NGA is also increasingly relying on international partners to move GEOINT into new arenas. Foreign partnerships enable data and analytic exchanges that enhance the effectiveness of coalition activities. These additional sources of data also improve the timeliness and cost-effectiveness of NGA's GEOINT products. In the complex, frequently volatile world of international affairs, one constant remains: the need to deepen existing relationships and explore new ones as the globalization of GEOINT continues.

NGA's contractual relationships with industry also remain an integral part of the overall success of the GEOINT tradecraft. In January 2003, NGA established the Industry Interaction Program to serve as the single point of contact for industry to interact with NGA. This streamlined process facilitates collaboration on topics of potential interest to NGA, with the goal to make it easier to bring ideas and products right to NGA's doorstep. NGA will continue expanding and developing the relationship with industry to successfully manage the intelligence challenges of tomorrow.

Technology

NGA's mission partners have a growing need for user-friendly and responsive access to GEOINT information and services in the current online, on-demand environment. In addition to providing information on demand, NGA is moving toward a source-agnostic tasking, processing, exploitation and dissemination architecture. This means that the source of data is transparent to the end user.

Prior to 2003, NGA relied primarily on information from government satellite systems. Also, the Agency had little ability to ingest or disseminate still or motion imagery, and commercial imagery was received via hard media. Today NGA is able to exploit foreign sources and airborne still photography and full motion video feeds and can process electronic images collected through commercial imagery.

The Agency has made a significant investment to better integrate capabilities and technology with commercially available products, increase information sharing with mission partners and expand available mission support today and in the future. Commercially available products are enabling information to travel to the front lines more quickly and are better tailored to consumer needs. Prior

to NIMA/NGA, DoD and the IC were dependent on 300 IDEX workstations at 11 sites worldwide. Today, NGA has installed over 3,000 IEC high-performance exploitation workstations at over 150 sites worldwide.

NGA is working to facilitate Agency-wide transformation toward the dynamic, market-driven provisioning of geospatial data and services. By strengthening acquisition processes, NGA is better able to leverage commercially available technology and align GEOINT capabilities to changes in the operating environment. Because they are unclassified sources of geospatial data, commercial products facilitate broader information sharing with an ever-expanding number of domestic, intelligence, military and international mission partners.

For example, through an NGA partnership with industry leaders, the public has access to commercial geospatial imagery through the "public access" tab at http://www.NGA-Earth.org. First established in 2005 in direct response to Hurricane Katrina, NGA Earth provides current imagery to first responders, aiding in rescue and recovery efforts, while also providing unclassified views of the world in support of military and intelligence customers. In the near future, NGA Earth will deliver expanded area coverage, additional third-party data and near real-time unclassified imagery for operational planning.

Standards

As the functional manager for GEOINT, NGA has the responsibility for establishing GEOINT standards to ensure data is readily discoverable, accessible and usable. Data standards are critical for data sharing and collaboration and essential for Unified Geospatial Operations among NGA's mission partners. The National Center for Geospatial Intelligence Standards has engaged the GEOINT community and private sector to develop and mature a set of standards and specifications that will enable data and service interoperability in the context of a service-oriented architecture. These standards allow NGA to exploit all possible resources for data and ensure NGA can better provide the right GEOINT to the right consumer.

More to Come

These NGA initiatives illustrate how innovative technologies, capabilities and business practices are paving the way for multi-use and cross-over GEOINT products. GEOINT's ever-increasing relevance in combat and intelligence operations, disaster relief and homeland security planning highlight the need to continue providing user-friendly, timely and robust GEOINT. As in the past, NGA will continue to adapt as new priorities emerge, evolving with the changing environment. The NSG will work to best leverage commercial products to ensure delivery of predictive and actionable GEOINT to key decision makers. The applications for GEOINT are potentially limitless, and NGA will continue to explore new frontiers in exploiting all available sources and methods for GEOINT-derived products—today and beyond. P

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Photo courtesy of DoD