THE NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY

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SERVING THE FRONT LINE

September/October 2010

TODAY'S GEOINT

On My Mind

The GEOINT Advantage

This is my first column as Director of NGA. Pathfinder, reaching an audience that includes members of the defense and intelligence communities, the Congress, and our mission partners at home and abroad, is one vehicle to spread the word about NGA's activities and accomplishments.

The achievement of our goals depends increasingly on our ability to develop new phenomenologies, to make the most of our current capabilities and sensors, and to expand and enhance our tradecraft and products. In this issue of the Pathfinder, we highlight some of what's new in NGA's toolkit—how GEOINT goes beyond traditional imagery and mapping. NGA is expanding its use of commercial satellite synthetic aperture radar imagery and improving our ability to provide intelligence in low-light and bad weather conditions. We are creating highly accurate geospatial and intelligence products with light detection and ranging, or LiDAR. We are working with partners across the community to find technical solutions for increasing the dissemination of geospatial open source data so that first responders can more easily access and share the data and information they need to do their jobs.

NGA is producing cutting-edge products like animation and 3-D scene visualization to support operations and national and international special security events. We are making products that graphically describe how human geography depicts cultural terrain, products that are invaluable in today's global threat environment. We are partnering with academia in Antarctica to help with scientific research that could otherwise not be accomplished and with the international community to help prosecute war crimes.

In 2011, NGA will take another giant step toward advancing GEOINT when we consolidate our East Coast operations into one facility, NGA Campus East. By gathering our specialists and technologies currently scattered at several locations into a single "purpose-built" facility, NCE will facilitate the increased productivity, collaboration and innovation essential to expanding and enhancing our tradecraft and products.

During my 30 years in the defense and intelligence communities, I have seen the superb work of NGA and its predecessor organizations and the impact that NGA has had throughout the Department of Defense and the Intelligence Community. GEOINT has been—and will continue to be—a key element in supporting our country's defense, intelligence, humanitarian and disaster relief missions abroad. We also have responsibilities in support of domestic organizations and first responders when natural and man-made disasters strike within our borders.

Making the best possible use of today's capabilities and developing those we need most for tomorrow are central elements for our success. As we carry out that work, I am committed to providing the leadership that will enable NGA to build upon our tradition of advancing GEOINT and pushing it forward to our national and global mission partners. And I'm depending on all of you to continue to make the contributions that have become the hallmark of NGA's success.

Letitia A. Long

Letitia A. Long
Director

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On the Cover

The National Geospatial-Intelligence Agency is predominantly known for using imagery from satellites to produce geospatial intelligence. While imagery-based products are a primary mission for the agency, GEOINT encompasses much more than imagery and maps. The image on the cover is a LiDAR shot of the Presidential Palace in Haiti, collected after the earthquake devastated the country in January 2010. LiDAR is not imagery, it is a method of using pulsed laser light to detect distant objects and determine their elevation, position, velocity and other characteristics. By adding different colors to varying elevations, it can produce graphic representations that are accurate and understandable. LiDAR is one of the many technologies and applications that make up the broader discipline of GEOINT. *Cover design by Jason Collins and Kipling Williams.*

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Office of Corporate Communications
4600 Sangamore Road, Mail Stop D-54
Bethesda, MD 20816-5003
Telephone: (301) 227-9123,
DSN 287-9123
E-mail: pathfinder@nga.mil

Director
Letitia A. Long
Deputy Director
Lloyd Rowland
Office of Corporate Communications, Director
Kimberly Thompson
Public Affairs, Chief
Karen A. Finn
Editor
Marshall Hudson
Associate Editor
Laura L. Lundin
Graphic Artist
Ronald Kee

NGA IN THE NEWS

NGA Photo

NGA Welcomes New Agency Director

The National Geospatial-Intelligence Agency welcomed Letitia A. Long as its director at a ceremony on Aug. 9 at the site of NGA's future headquarters, NGA Campus East, which is currently under construction near Springfield, Va.

"I am excited by the opportunity to continue to serve our nation not only alongside NGA's outstanding and dedicated professionals but also with our partners and colleagues that span the U.S. Intelligence Community, the international community, academia and industry," Long said.

Secretary of Defense Dr. Robert M. Gates presided at the ceremony, and newly appointed Director of National Intelligence James R. Clapper Jr. provided remarks.

Long began her federal civilian service with the Navy in 1978 and subsequently served with the Office of Naval Intelligence, the Defense Intelligence Agency and the Director of Central Intelligence. Long was the Deputy Under Secretary of Defense for Intelligence (Policy, Requirements and Resources) from June 2003 until May 2006 and served most recently as the Deputy Director of the DIA from May 2006 to July 2010.

Long succeeded Vice Adm. Robert B. Murrett, who served as the NGA director for four years. The Director of NGA also serves as the Intelligence Community's functional manager for geospatial intelligence.

Navy photo

Capt. J. Todd Ross, ONI Commander, and Pamela Jackson, Chief, ONI/NAVO NGA Support Team and Director, Unified GEOINT Office, sign the MOA on the programmatic transfer.

ONI and NGA Sign Model Cooperation Agreement

On July 19, the National Geospatial-Intelligence Agency and the Office of Naval Intelligence finalized a Memorandum of Agreement, the first of its type between the two agencies.

The agreement codifies the relationship between the ONI and the NGA Support Team at ONI and outlines ONI and the NGA NST's responsibilities within the National System for Geospatial Intelligence.

The Model Cooperation Agreement outlines the operational model, agreements and business practices between ONI and NGA for geospatial intelligence support and transfers responsibility for national-level GEOINT planning and programming to NGA.

Photo Courtesy of FIFA

FIFA World Cup

» Soccer fans from the United States and across the world attended the 19th FIFA World Cup in South Africa this summer. National Geospatial-Intelligence Agency employees provided geospatial intelligence support to the events. For more, see the stories on pages 12-15.

NGA–AGCHO Coproduction

On Aug. 6, National Geospatial-Intelligence Agency analysts began reviewing the first Dari-language Image City Map co-produced by the Afghanistan Geodesy and Cartography Head Office.

The map, of Lashkar Gah, represents a significant advance toward AGCHO's becoming a modern mapping agency.

NGA has supported the development of AGCHO since 2007. In 2009, the agency sponsored an intensive, yearlong ICM pilot training program with 10 AGCHO cartographers.

The pilot culminated in the successful completion of 20 English-language ICMs coproduced by the AGCHO cartographers. AGCHO began creating maps in Dari versions, starting with Lashkar Gah.

AGCHO will produce additional Dari-language ICMs over the next year, enabling Afghan National Security Forces to better support close-in navigation, planning and urban area operations.

Arabic language map co-produced by Afghanistan Geodesy and Cartography Head Office.

NGA photo

LiDAR Supplies High Resolution Data

By Katherine G., Steve H., and Seana M.

As rebuilding efforts and military operations continue in Iraq and Afghanistan, the demand for high-quality terrain data has steadily increased.

To meet that demand, the National Geospatial-Intelligence Agency has incorporated the use of Light Detection and Ranging, or LiDAR, to provide high resolution data directly to the warfighter.

LiDAR produces high-resolution, 3-D terrain data. It characterizes the Earth's surface with a level of detail unachievable by more common remote sensing devices. The use of this technology is an asset to geospatial analysis and assists in providing mission partners highly detailed products.

LiDAR is fundamentally similar to radar, except it uses light pulses to find the range and intensity of an object instead of radio waves. This light pulse reflects off trees, buildings and any other above-ground features before finally reaching the ground and returning to the aircraft where the range is calculated.

LiDAR data can be used to produce 3-D models of the Earth's surface at a very high resolution, typically 1 meter or better. While it has been used by academia and various other research groups for decades, it is just now finding its niche within NGA.

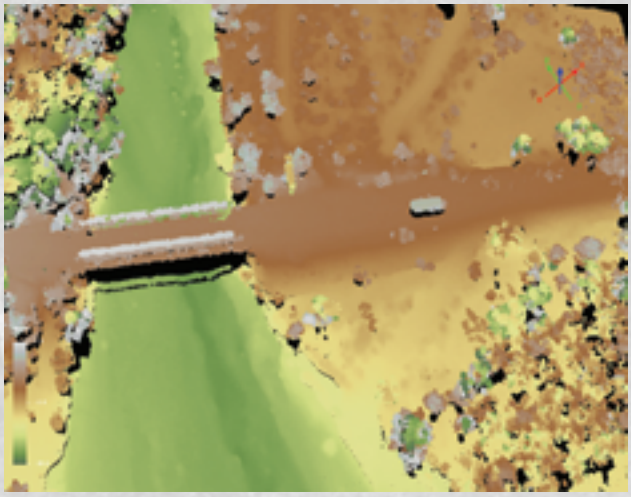
To date, LiDAR has been used predominately for the automated generation of Digital Terrain Models and Digital Elevation Models. LiDAR-derived DEMs can be manipulated easily and have a higher resolution, thereby having many advantages in comparison to other topographic surveying methods.

"LiDAR makes such an impact in areas where only low-level DEMs currently exist. The amount of detail results in greater precision, which is essential for creating products for the warfighter," said Jon K., NGA analyst.

Different LiDAR sensors may be used depending upon the objective of the collect. Bathymetric, topographic and atmospheric LiDAR sensors gather data using different regions of the spectrum. Typically, topographic LiDAR sensors are mounted on an aircraft platform for an aerial view of the collection area. Mobile LiDAR sensors are mounted on vehicles to provide 3-D street-views, while terrestrial sensors are mounted on a tripod for a high-resolution, stationary collect. The processed data is commonly referred to as a point cloud. A point cloud is composed of millions of individual points that have an x, y (latitude and longitude) and z (elevation) value. These points are representative of all objects on or above the Earth's surface, to include the surface itself.

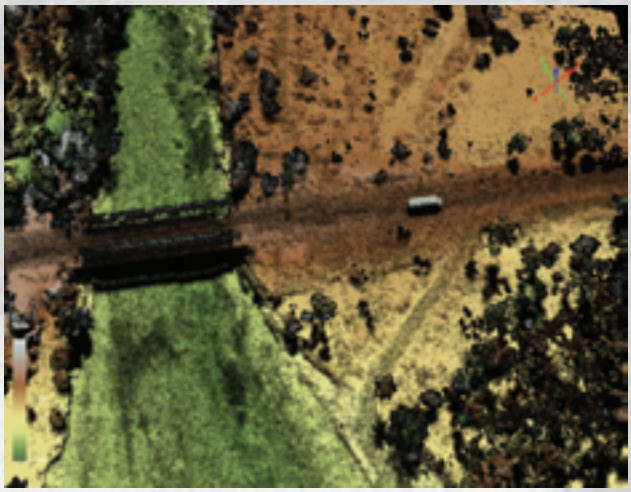
Some airborne LiDAR sensors are capable of imaging in two different modes: target and mapping. Target mode is where the sensor continually focuses on a target while the aircraft flies over. Staring at the target allows it to be saturated with laser pulses, generating a very high-resolution product. Mapping mode is a form of wide-area collection where the laser scans back and forth along a set path collecting data of the intended area.

Figure A



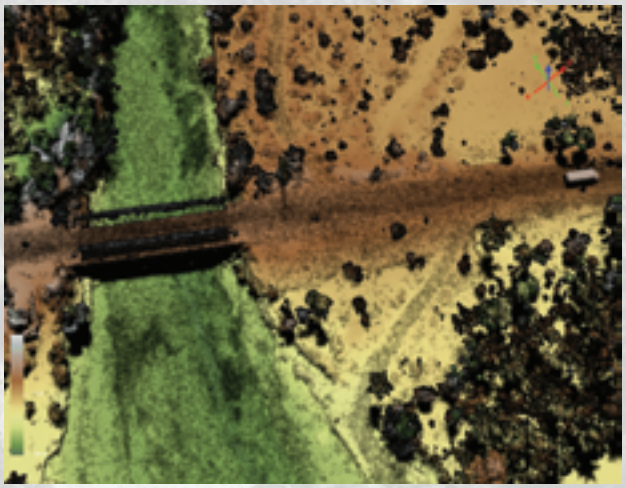
Data collected with 3-D al imaging laser radar systems provides information to analysts in several forms. Figure A shows data where elevation coordinates are broken into a discrete number of intervals. Points that fall within a particular interval are assigned a unique color, resulting in a false color visualization of the data.

Figure B



In addition to the 3-D data, it is possible to calculate a relative reflectance value that provides information concerning the reflectivity of the scene contents at the system's laser wavelength. The hue of the colors in Figure A can be scaled according to the relative reflectance, resulting in a product richer in information as shown in Figure B.

Figure C



Some laser radar systems are capable of performing multiple sequential scans over the scene of interest, which allows analysts to see any motion in the scene. Figure C shows a scan of the same scene in Figure B taken 6.5 seconds later. The speed of the truck was estimated to be 32 mph.

LiDAR Exploitation

In addition to precise terrain models, the unique characteristics of LiDAR data allow for a wide array of analytical capabilities to be used, such as change detection, line of sight analysis, foliage penetration and site characterization. Research is now being conducted on using LiDAR to perform automated feature extractions, 3-D urban modeling and vertical obstruction analysis.

Perhaps one of the most promising applications of LiDAR is foliage penetration: the ability to locate objects under tree canopies. During this process, the laser pulses pass between gaps in the foliage, just as light would pass between your fingers if you were holding a flashlight above your hand. The light then reflects back through the gaps to the sensor, recording a point.

"As it develops into a more mature tool, its possibilities continue to be uncovered," said Terri L., imagery scientist.

Though still being developed within private industry, semi-automated feature extraction will be another advantage of LiDAR, which allows objects in a scene to be categorized based on their size and shape in a master catalogue. Vegetation, buildings and roads are among the several categories being considered for inclusion. Once identified, features can be displayed as either 2-D shape files or, in some cases, 3-D features.

Whether it is for a basic elevation model or 3-D feature extraction, LiDAR is quickly becoming a primary source of high-resolution terrain data at NGA. As the technology matures and improves, scientists are pushing the boundaries of LiDAR and passing their knowledge and experience to analysts. Along the way, analysts can expect more high-resolution LiDAR data to be available for support of their mission needs.

Katherine G., Steve H., and Seana M. are imagery scientists in the NGA Sciences and Methodologies office.

NGA Employs Emerging Commercial Space Radars

By Thomas A.

As growing numbers of commercial space radar satellites deliver new data to countries around the world, NGA analysts and scientists are beginning to use these commercial systems to advance geospatial intelligence. In December 2009, the agency awarded three contracts for commercial satellite synthetic aperture radar imagery, data products and direct downlink services.

Access to these sensors improves NGA's ability to provide intelligence in low-light and bad weather conditions. Radar is an all-weather capability, making it extremely reliable and consistent.

Commercial Space Radar Imaging Improvements

The pace of development in the international commercial radar world has dramatically increased. From June 2007 through June 2010, six international commercial radar imaging satellites were launched. Italy launched three of its four-vehicle COSMO-SkyMed constellation, Canada launched RADARSAT-2 and Germany launched its TerraSAR-X and TanDEM-X satellites.

The Italian, Canadian and German commercial radars named above represent a significant improvement over previous commercial radar systems in that they provide images with resolutions as good as 1 meter and employ a special collection method that can vary the polarization of the energy that their sensors transmit to the ground. This permits them to collect images in different polarizations simultaneously and characterize the surface structure in interesting new ways.

The word "radar" is derived from the term "radio detection and ranging." Radar imaging systems emit microwave radio signals that are reflected from Earth's surface and returned to the sensor. The radar measures the parameters of the reflected waves, which are processed into images and other radar products. Many characteristics of radar images are based on the wavelength and polarization (orientation of the wave pattern) of the microwaves emitted from the sensor. Several combinations of wavelengths and polarizations are available in radar imaging.

These new radars support large-area collection at medium and coarse resolutions, and they can collect pairs or series of images for use in change detection and other specialized applications such as measuring very subtle changes and shifts in land surface structure. Finally, each vendor offers direct downlink services for fast regional support.

Overview of the New Radars

Italian COSMO-SkyMed

The COSMO-SkyMed system has three operating satellites, launched between June 2007 and October 2008. Of the three new commercial space radar systems, it provides the highest collection capacity and fastest access to any ground area. This multi-satellite constellation has the shortest time periods between so-called "coherent pairs" of images that are collected at different times from identical locations in space and used for change detection applications. COSMO also has the best native resolution of the three commercial systems. The resolution for commercial customers is limited to 1 meter.

The Italians will soon complete the full four-vehicle COSMO-SkyMed constellation. They are also working with Argentina to possibly launch an L-band (long wave) radar constellation called SAOCOM. Such a system would be well-suited to applications measuring small elevation changes in land surface and would also provide some foliage penetration capability.

Canadian RADARSAT-2

Launched in December 2007, RADARSAT-2 is an improvement to the very successful RADARSAT-1 vehicle that pioneered commercial space radar imaging and has been operating reliably for nearly 15 years. RADARSAT-2 is capable of imaging extremely wide swaths, as large as 500 km. Of the set of new space radars, it has the longest collection time per orbit and is the only quad-

polarimetric sensor. RADARSAT-2 is expected to excel in ocean surveillance applications. Its best resolution mode is 1 meter by 3 meters.

The Canadian Space Agency has funded a RADARSAT-2 follow-on program called the RADARSAT Constellation Mission, which may include three to six satellites.

German TerraSAR-X

TerraSAR-X may be the most geometrically accurate commercial radar system. NGA's commercial imagery program recently evaluated TerraSAR-X accuracy to be 1 meter or better, when ground elevations are known. This performance is possible because of the very accurate orbit determination program that the Germans use to enhance the raw radar measurements.

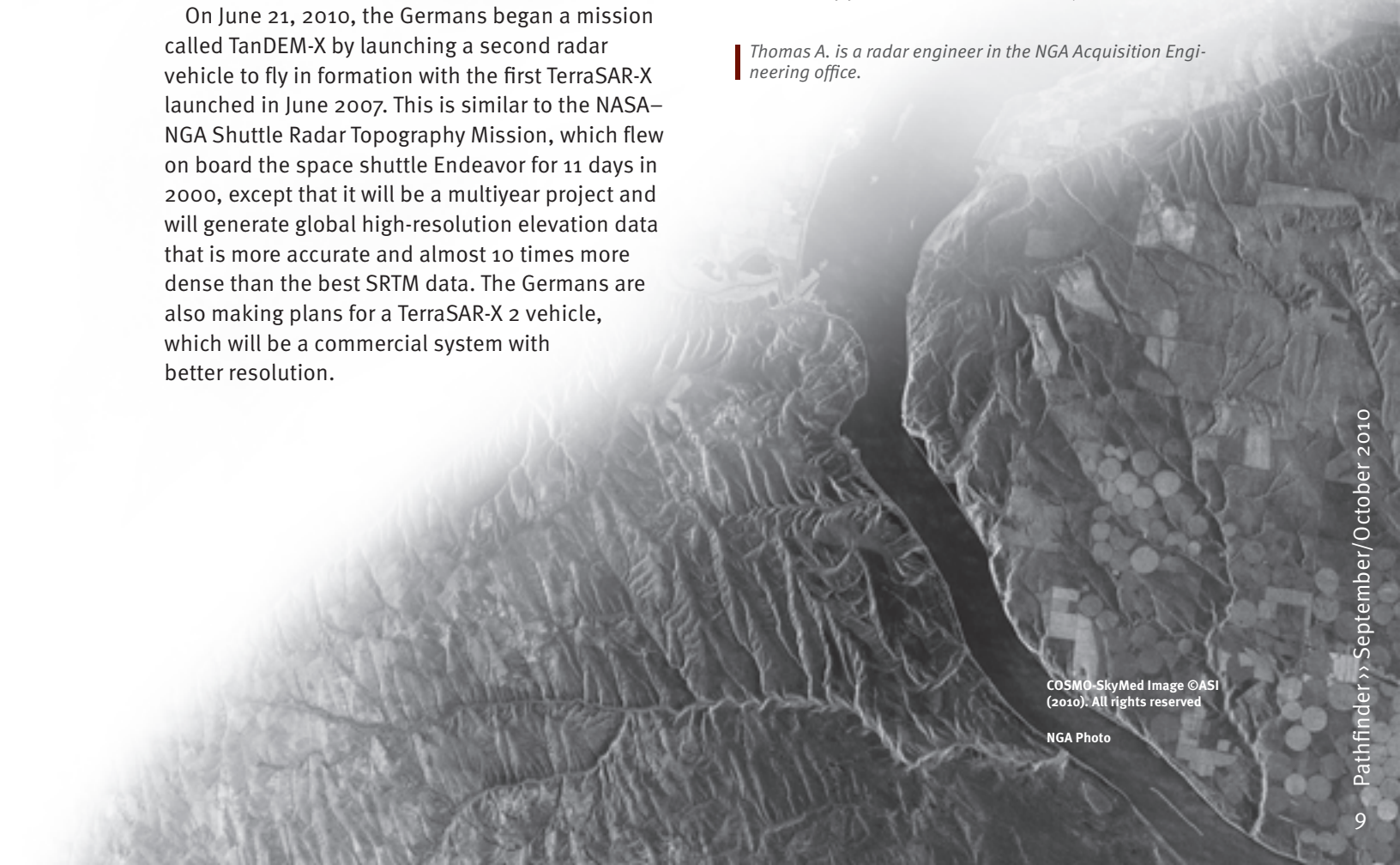
On June 21, 2010, the Germans began a mission called TanDEM-X by launching a second radar vehicle to fly in formation with the first TerraSAR-X launched in June 2007. This is similar to the NASA–NGA Shuttle Radar Topography Mission, which flew on board the space shuttle Endeavor for 11 days in 2000, except that it will be a multiyear project and will generate global high-resolution elevation data that is more accurate and almost 10 times more dense than the best SRTM data. The Germans are also making plans for a TerraSAR-X 2 vehicle, which will be a commercial system with better resolution.

The Utility of Commercial Space Radar

These commercial systems offer unique space-based imaging opportunities. Taken together they are a constellation with daily access to locations virtually anywhere on the Earth's surface. The systems can meet the swift demands of many GEOINT needs, including environmental and disaster support. They are particularly useful during hurricanes and volcanic eruptions when other sensors are blocked by clouds and dust particles.

These three international space radar systems have significantly improved the resolution, collection capacity and other advanced radar imaging methods available from commercial sensors. NGA finds value in these sensors because they provide unique
GEOINT support to national security missions.

Thomas A. is a radar engineer in the NGA Acquisition Engineering office.

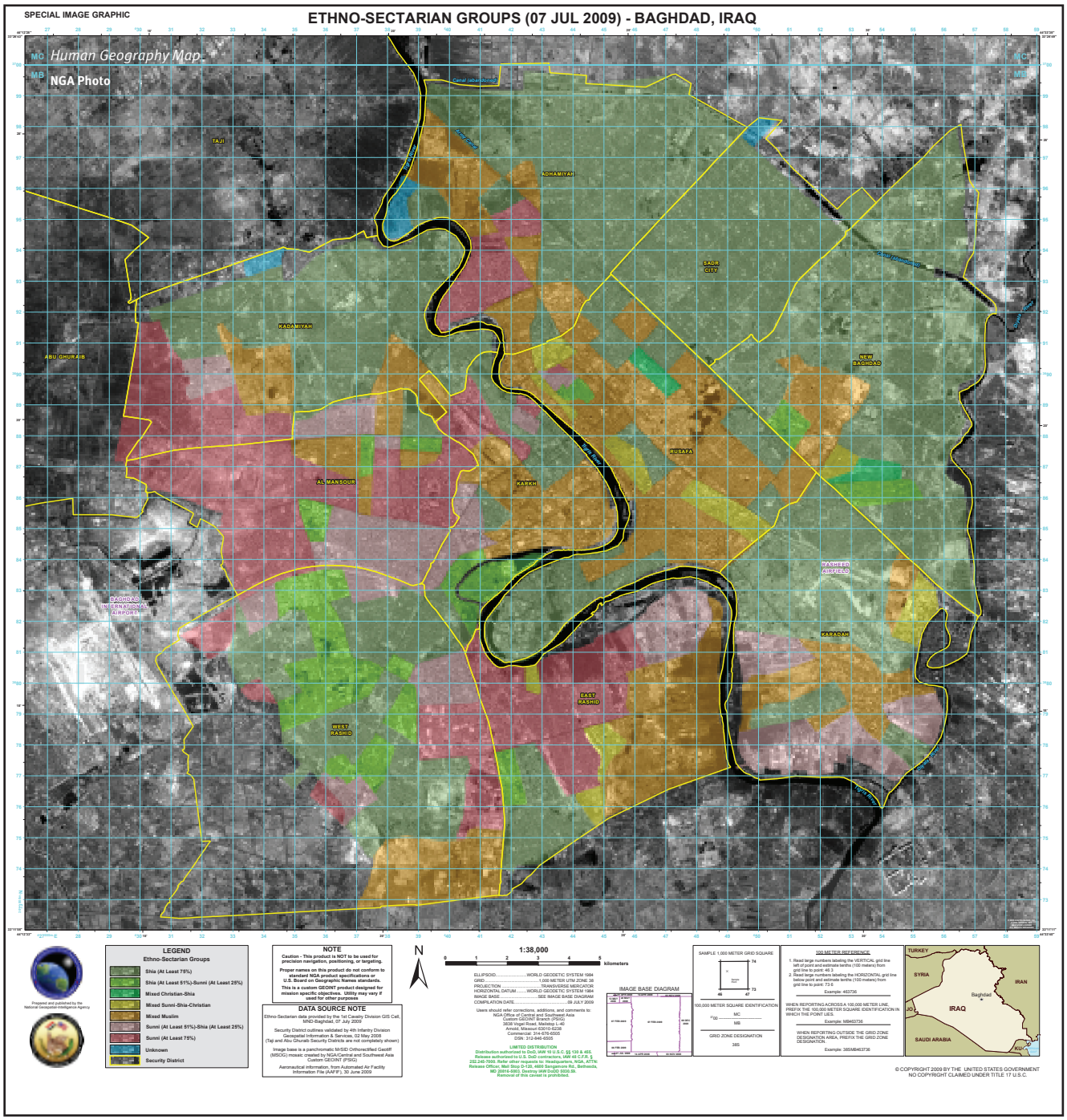


COSMO-SkyMed Image ©ASI (2010). All rights reserved

NGA Photo

Human Geography Depicts Cultural Terrain

By Eunice P.



This NGA map visually depicts areas of Baghdad by religious affiliation. Knowing which areas of the city are predominately Sunni and which are Shia help coalition forces better understand their environment.

The Intelligence Community has always been focused on capturing, understanding and graphically depicting feature data like roads, buildings, hilltops and rivers, but now the nonfeature data of human geography is also recognized and valued.

Formerly known as regional analysis, human geography studies human activity, with particular reference to the location, causes and consequences of that activity.

"By bringing information traditionally used by academia, cultural experts, social scientists, archaeologists, anthropologists … we see the battlefield in a much different light. Much more so than just the enemy—it includes so much more," said Maj. Gen. Michael T. Flynn, Deputy Chief of Staff for Intelligence, International Security Assistance Force, Afghanistan.

Human geography includes studying international boundaries, tribal boundaries, nomadic movement, religious affiliations, political ideology, birth and death rates, populous places and proximity to health facilities, principal market commodities, ethnicity and associated languages, and other cultural data layers.

Studying these layers has been part of geospatial intelligence tradecraft at NGA and its predecessor agencies for more than 30 years, but as NGA's focus shifted towards intelligence issues and quick-turnaround imagery reporting, the need for regional cultural analysis had been deemphasized. Operations in Iraq and Afghanistan have shown the need to understand religious, linguistic, ethnic and other divisions in those countries and the need for the regionally focused cultural expertise of human geography.

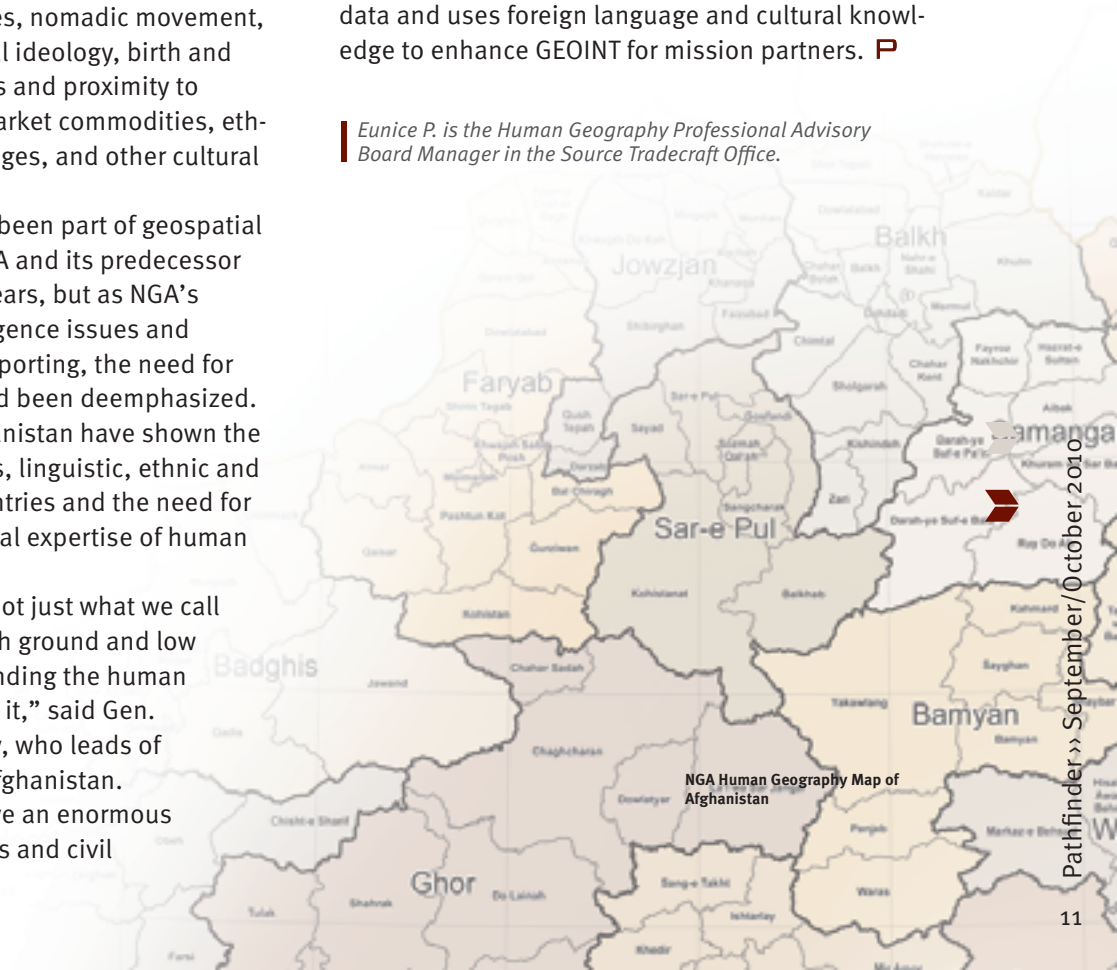
"You have to understand not just what we call the military terrain … the high ground and low ground. It is about understanding the human terrain, really understanding it," said Gen. David H. Petraeus, U.S. Army, who leads of U.S. military operations in Afghanistan.

The human terrain can have an enormous impact on military operations and civil engagement. For example, Iraqi village elders are more likely to cooperate with provincial reconstruction teams if U.S. forces are respectful of the culture, social norms, religious customs and language nuances of the country they are working in.

Human geography analysts find, evaluate and manage this information. They have the geographic and cultural training to analyze relevant data for usefulness and applicability. These analysts command foreign linguistic skills that enhance their depth of understanding in a foreign culture and provide the ability to conduct research in the native language. Human geographers possess the skills to research nontraditional data and develop it geospatially for its application in GEOINT production.

The future of human geography appears bright as NGA takes advantage of nonfeature, human terrain data and uses foreign language and cultural knowledge to enhance GEOINT for mission partners. P

Eunice P. is the Human Geography Professional Advisory Board Manager in the Source Tradecraft Office.



NGA Human Geography Map of Afghanistan

NGA Supports World Cup Security

By Jeff U., Richard B. and Rick B.

Working with mission partners, the National Geospatial-Intelligence Agency provided geospatial intelligence data and products for the 19th FIFA World Cup that were instrumental in security planning for the games.

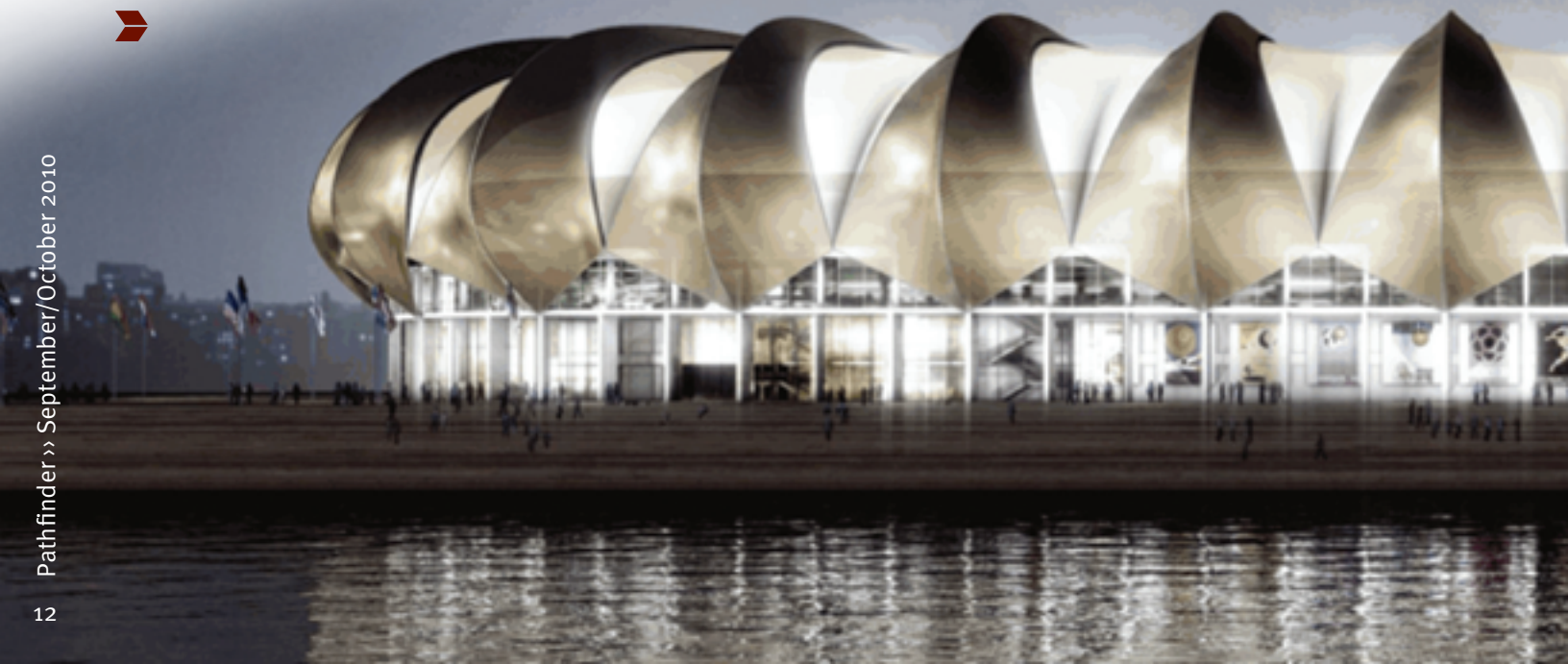
While the soccer matches occurred over a two week period in late June and early July 2010, NGA's preparation took place over the course of the preceding year to ensure the GEOINT products used would be the best possible to help with security at the tournament's many events and venues.

The 2010 World Cup took place in nine cities and ten stadiums throughout South Africa, had 32 international teams participating and included numerous heads of state and foreign dignitaries attending. There were also thousands of media and corporate sponsor representatives and nearly 400,000 visitors who entered the country specifically for the games.

NGA relies on a wide range of GEOINT technologies—from maps and models to animation and scene visualization—to help with securing events like the World Cup. NGA analysts deployed to South Africa and personnel in the United States contributed to the safety and security of U.S. athletes, dignitaries, government facilities and those who attended the matches.

To support this massive undertaking, NGA officers deployed to the U.S. Embassy in Pretoria, South Africa, working closely with other agencies to prepare maps and large-format graphics of World Cup match locations, including cities, training facilities, stadiums, airports, hotels and other points of interest.

Products produced included graphics depicting daily events, stadium vulnerabilities, risk analysis and crime or other incidents, motorcade route and road closure maps, and scene visualization mod-



els. NGA also provided stereo airfield collection, hazardous facilities assessments and counterterrorism analysis.

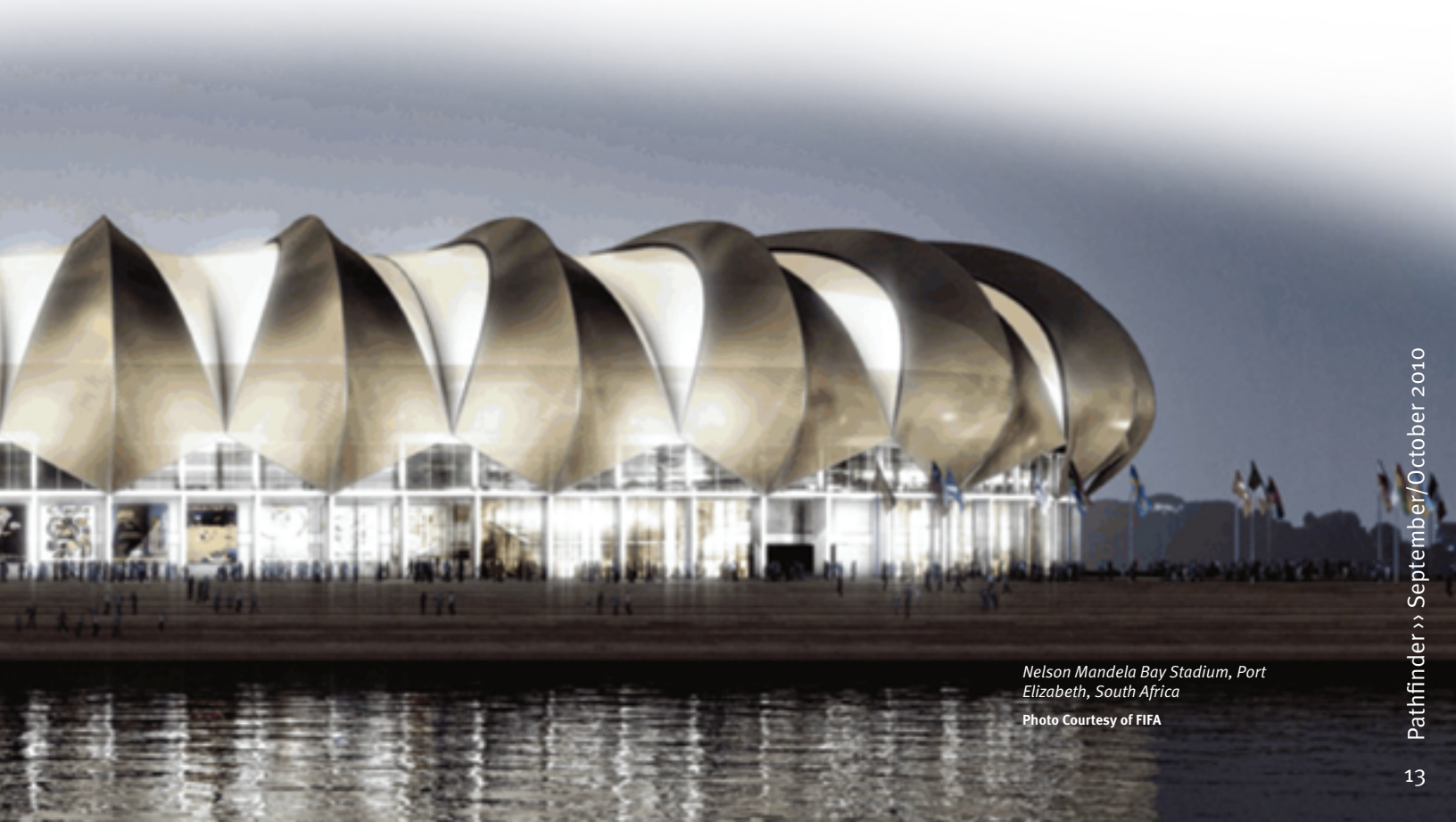
With matches played throughout the country, threats of terrorism and South Africa's kept analysts busy providing up-to-the minute GEOINT for the Intelligence Community, law enforcement and diplomatic protection services. NGA regional and antiterrorism analysts in St. Louis, Mo., and Washington, D.C., provided 24/7 reachback to the analysts in Pretoria.

Many of the products were used to help security personnel at the games ensure the security of Vice President Joseph Biden and former President Bill Clinton as they attended matches in Rustenburg and Pretoria.

Among its initiatives, NGA partnered with the European Union Satellite Centre, which analyzes imagery and related data for the EU, to jointly produce unclassified geospatial products for the event. Additionally, Intelligence Community open source analysts provided significant unclassified information critical to the GEOINT production.

By completion of the final match, NGA had produced more than 330 GEOINT products. The agency's successful World Cup participation strengthened partnerships and demonstrated the importance of collaboration to the safe and successful conclusion of large international special events. P

Jeff U. and Richard B. are geospatial analysts who directly participated in NGA's support to the World Cup.
Rick B. is a geospatial analyst in the Central and Southern Africa Branch.



Nelson Mandela Bay Stadium, Port Elizabeth, South Africa

Photo Courtesy of FIFA

NGA Scene Visualization Scores Big at World Cup

By Jay D. Krasnow

A year before 3 million fans arrived in South Africa from across the globe to attend one of the largest international sporting events in the world, the 19th FIFA World Cup soccer tournament, the National Geospatial-Intelligence Agency began providing critical geospatial intelligence to support the massive effort.

One GEOINT technology played a crucial role. Digital scene visualization can be used to enable event planners and security officials to prepare for a variety of threat scenarios and conduct vulnerability assessments that can help prevent disaster. Analysts merge imagery with geospatial data sources to generate 3-D fly- and walk-throughs, line-of-site and view-shed analyses and other interactive models. Carefully crafted scene visualization proves especially useful to event planners by enabling them to view a site from multiple perspectives, including overhead, even when miles away from the location.

Creating a scene visualization for an event such as the World Cup is no easy task. It can take from several days to several months to develop a single product, according to an advanced scene visualization specialist who worked on NGA's World Cup products.

"It all depends on the level of detail required," said the NGA scene visualization specialist.

Bringing the pieces together in time for the soccer competition presented many challenges, said NGA's World Cup team lead. "Acquiring the data at the unclassified level for both U.S. government personnel and our foreign partners is challenging at times.

This image is a screen capture from NGA's 3-D scene visualization of the Soccer City stadium in Johannesburg, South Africa. The scene visualization is not static, it is an animation run from a database, giving the user the ability to zoom in and out, change the look angle and fly or drive around the structure.

This is an aerial photograph of the actual Soccer City Stadium in Johannesburg, South Africa.

Usually we coordinate at least a year in advance—sometimes two years in advance—so that we can support the event effectively," said the team lead.

NGA scene visualization can assist event planners in several important ways. For example, these powerful 3-D tools can help event security officials determine the location and length of security perimeters around a stadium and the most suitable locations for stadium gateways. These NGA products can also assist event officials in managing crowds by providing the situational awareness needed to direct resources towards areas of greatest concern.

"The scene at the World Cup was dynamic, so we provided dynamic products to assist our partners when they needed our support in making decisions about road closures, motorcade routes and other operational requirements," said an NGA GEOINT officer who supported the tournament.

When the scene visualizations were ready, agency partners could view unclassified versions using GoogleEarth™, a common Internet geospatial tool. NGA developed about a dozen visualization products for World Cup event planners.

"When I create a product, I'm happy if it's helpful. But once it's done, I'm on to the next one," said the advanced scene visualization specialist who helped develop NGA products for the World Cup.

The safe completion of the soccer competition suggests just how helpful the products proved to be. P

Jay D. Krasnow is the communications officer in NGA's Office of Analytical Visualization and Operations Research.

Imagery Aids Antarctic Census

By Leslie Kay

The National Geospatial-Intelligence Agency is playing an instrumental role in the first-ever census of emperor penguins by the University of Minnesota's Antarctic Geospatial Information Center.

With commercial imagery acquired by NGA, scientists have been able to accurately document the emperor penguin population. The imagery's resolution is high enough that they can now count individual birds—at about 4 feet and 60-90 pounds, an emperor penguin is just large enough to be discerned in a single pixel.

Dr. Paul Morin, AGIC's director, said that without the NGA data, "science of this type could not be accomplished."

Emperor penguins inhabit the coldest, driest and windiest environment on the planet. As depicted in the documentary March of the Penguins, emperor penguins breed on the 5.4 million square miles of frozen Antarctic ice during winter when temperatures drop to more than 80 degrees Fahrenheit below zero and winds in excess of 100 miles per hour are routine.

The penguins are a good indicator to assess environmental changes in Antarctica because they live in areas that are relatively free from direct human impact. This makes it easier to distinguish impacts on the population resulting from climate change.

Previous studies relied on low-resolution imagery to locate colonies, for example, by discerning large areas of penguin guano. However, the commercial imagery now available allows them to actually see

the penguins.

Furthermore, prior counting techniques to determine colony size—such as using cameras aboard helium-filled balloons, tagging penguins with radio transmitters and shadowing them with airborne infrared sensors—proved costly, unreliable and intrusive to the penguin colonies. The commercial imagery allows researchers to study the birds without disturbing the penguins during the arduous and fragile breeding season.

In addition to studying the penguin population, the data provided by NGA is also used in research and recovery of AGIC teams if lost in remote areas in Antarctica while performing their scientific studies.

"The images really increase the safety of our guys [AGIC teams] out there," said Morin.

To date, NGA has processed and disseminated more than 44,700 commercial images to AGIC. Those approximately 60 terabytes of data are equivalent in volume to the contents of three Libraries of Congress.

Commercial imagery is unclassified and can be shared with partners who are not in the national security or military sectors. NGA procures imagery from commercial satellite operators every month in support of national security and foreign policy requirements. This role is codified in the U.S. Commercial Remote Sensing Policy of 2003, also known as National Security Presidential Directive 27.

Leslie Kay is a communications officer in the Enterprise Operations Directorate.

Colony of Emperor Penguins

Photo Courtesy of ThundaFunda

GEOINT Illuminates International Justice

By Greg A.

Although much U.S. attention remains focused on international terrorism, geospatial intelligence continues to play an indispensable role in advancing U.S. humanitarian goals, international justice among them. These battles aren't fought on distant deserts or remote mountain tops, but in the judicial arena where they have just as lasting an impact on national security objectives.

Two recent cases illuminate how the National Geospatial-Intelligence Agency has answered the cause of global justice by providing unclassified GEOINT to assist with the prosecution of those accused of genocide and torture. These encounters feature not the usual battle gear, but business suits and judicial robes; yet just as on a traditional battlefield, GEOINT often provides the optimal solution.

The Trial of Charles Taylor Jr.

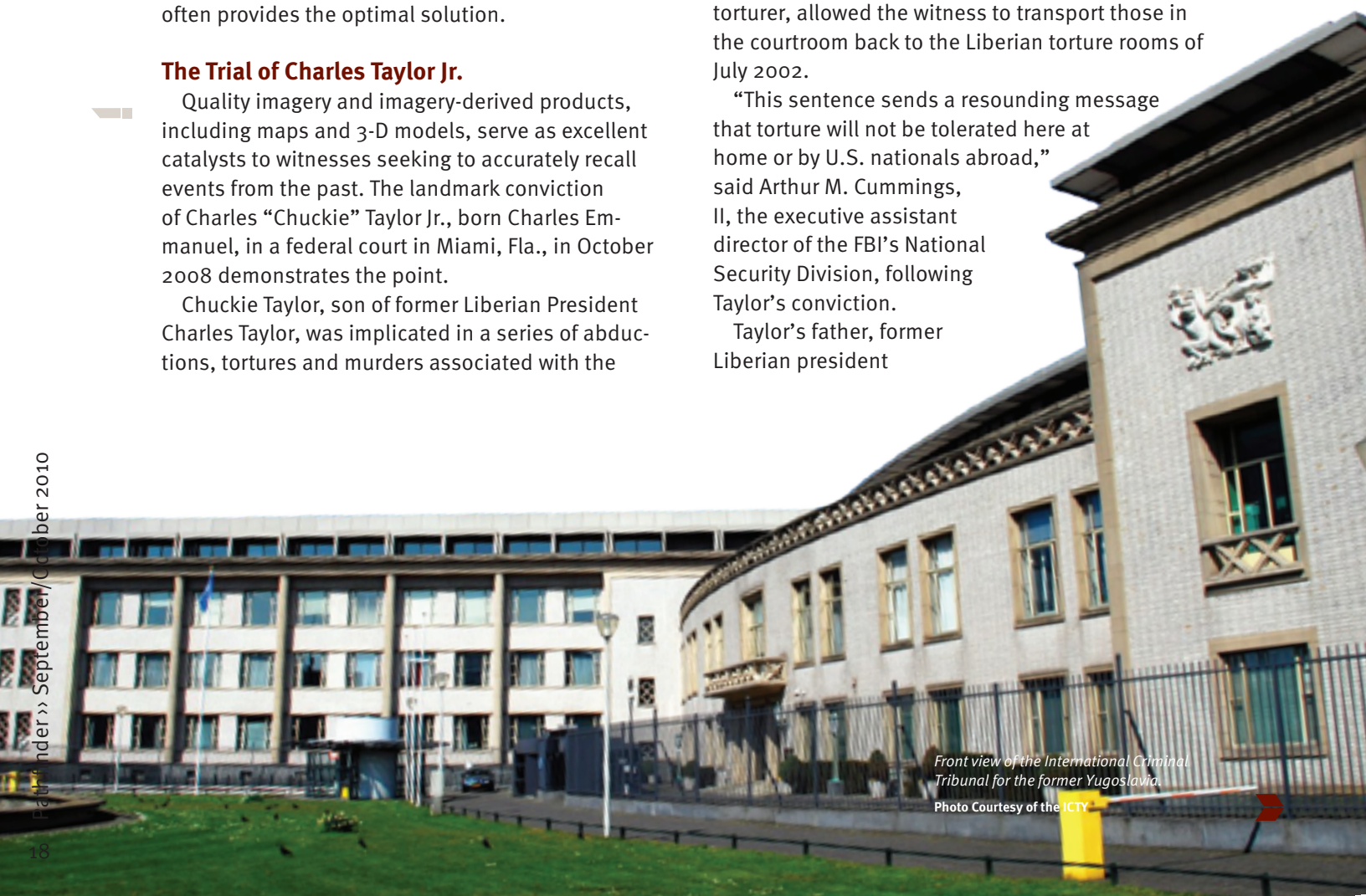
Quality imagery and imagery-derived products, including maps and 3-D models, serve as excellent catalysts to witnesses seeking to accurately recall events from the past. The landmark conviction of Charles "Chuckie" Taylor Jr., born Charles Emmanuel, in a federal court in Miami, Fla., in October 2008 demonstrates the point.

Chuckie Taylor, son of former Liberian President Charles Taylor, was implicated in a series of abductions, tortures and murders associated with the chaos that raged across Liberia from 1999 to 2003. A team of NGA GEOINT professionals produced four large 3-D models of locations in Liberia requested by the Department of Justice, with the caveat that the maps would also be released to the defense and used in open court. The products allowed the DOJ to convict Taylor with eight counts of conspiracy to commit torture.

In one example of how prosecutors made good use of the NGA products during the trial, a victim of abduction and a witness for the prosecution pointed out on one of the models the various locations where he had been taken. The blending of terrain, geospatial and imagery intelligence in the 3-D medium, coupled with the scars inflicted by his torturer, allowed the witness to transport those in the courtroom back to the Liberian torture rooms of July 2002.

"This sentence sends a resounding message that torture will not be tolerated here at home or by U.S. nationals abroad," said Arthur M. Cummings, II, the executive assistant director of the FBI's National Security Division, following Taylor's conviction.

Taylor's father, former Liberian president



Front view of the International Criminal Tribunal for the former Yugoslavia.

Photo Courtesy of the ICTY

Gravestones at the Potocari genocide memorial near Srebrenica, Bosnia an Herzegovina .

Photo Courtesy Wikipedia

Charles Taylor, is being tried in The Hague, Netherlands, by the Special Court for Sierra Leone. The court was established by the government of Sierra Leone and the United Nations to try those who bear the greatest responsibility for serious violations of international and Sierra Leonean law committed in Sierra Leone since Nov. 30, 1996.

Prosecuting the Srebrenica Massacre

Recently, NGA supplied a series of imagery-based products for use in the prosecution of members of Bosnian Serb forces for war crimes and crimes against humanity in the killing of more than 8,000 Bosnian Muslims in the Srebrenica area in July 1995—the largest mass murder in Europe since World War II.

As in the Chuckie Taylor case, imagery and maps provided a geospatial context that helped 22 witnesses recall and communicate their experiences in Srebrenica, Bosnia, 15 years ago.

In June 2010, Vujadin Popovic, former Serbian army chief of security, and six other former Bosnian Serb military leaders were found guilty of genocide, extermination, murder and persecution by the International Criminal Tribunal for the former Yugoslavia. NGA provided imagery-based products to the ICTY prosecution team supporting their case that the men were involved in the 1995 Srebrenica massacre and the forcible removal of Bosnian Muslims from the United Nations enclave in Zepa.

Remaining Vigilant

NGA works to continually expand the availability and timeliness of GEOINT to promote U.S. humanitarian goals. Imagery-derived products have proven their value toward realizing the goal of international justice. While decision makers and warfighters use GEOINT to help prevent or mitigate atrocities, prosecutors and jurists have embraced GEOINT to help convict those guilty of such horrors. P

Greg A. is a special issues manager for the Precision Engagement Division.

NSG Integrates METOC Data

By Glenn T.

"Know the ground, know the weather; your victory will then be total."
— Sun Tzu, The Art of War (c. 500 B.C.)

Meteorological and oceanographic informa-tion, or METOC, forms a critical part of geospatial intelligence. Clouds, storms, varying temperatures and volcanic ash can all affect remote sensors and operations.

Members of the National System for Geospatial Intelligence have applied METOC data in components of the tasking, collection, processing, exploitation and dissemination intelligence cycle for decades, but past efforts were fragmented and lacked a comprehensive approach toward anticipating and exploiting the information.

Addressing this, Vice Adm. Robert B. Murrett, the former director of NGA and GEOINT functional manager, designated a senior METOC officer to the NSG. The SMO and his staff, embedded in NGA's Source Integration Office, are tasked to achieve full integration of METOC into GEOINT activities. They provide centralized coordination for areas that benefit from integration, including the development and oversight of plans, strategies and resources.

Despite its recent establishment, the Office of the NSG SMO has already finalized the NSG Strategic Implementation Plan, developed the Joint Requirements Oversight Council and approved the METOC Initial Capabilities Document.

The office has also created the NSG METOC Integration Council, an authoritative forum to coordinate and resolve NSG METOC issues, and drafted the METOC and Environmental Pathways Intelligence Community Advisory Group Terms of Reference, which provides technical science-based advice to the integration council and other NSG elements.

A permanent advisor to the Joint Staff's METOC board, the NSG SMO is partnered with the Department of Defense METOC providers, the Air Force Weather Agency and the Naval METOC Command.

The NSG SMO is working with the NGA Office of GEOINT Management to institutionalize the NSG METOC program director role and NSG METOC associations within the NSG governance process. Looking toward future needs, the NSG SMO office is also involved in the development process for the future DOD weather satellite system program.

METOC forces not only support planning and decision-making, they turn METOC data into exploitable knowledge by embedding personnel with the analysts and operators. A GEOINT METOC specialty team was integrated into a key intelligence operations center in February 2010 to provide METOC knowledge on a practical, real-time level. Using this information, analysts have been able to enhance NSG products, improving intelligence and providing decision makers with the most complete and accurate products possible.

Members of the specialty team working side by side with analysts provided continuous support related to intelligence and environmental events such as the Icelandic Eyjafjallajokul Volcano eruption and the Deepwater Horizon oil spill. The team forecasted the eruption's impacts and in collaboration with analysts created products to provide to the White House. In addition, the team's impact analyses of the Deepwater Horizon situation combined DOD and civilian METOC information with NSG intelligence data to assist in predicting the currents and tracking the oil spill.

The motto of the NSG METOC team, "Mother Nature Gets a Vote," is meant to highlight the importance of METOC integration. Partnering with analysts and warfighters, the SMO is making sure weather and oceanographic data are part of the timely, relevant and accurate GEOINT support to the national security of the United States. P

Glenn T. is the strategic analyst with the NSG Meteorological and Oceanographic Program Secretariat Office of the Senior METOC Officer.

TOPS CRADA Seeks Advanced Open Source GEOINT

By Melissa D. and Edward P.

National Geospatial-Intelligence Agency research analysts work collaboratively with the National Open Source Enterprise to provide Geospatial Open Source data and products to the National System for Geospatial Intelligence because a significant portion of all geospatial intelligence products require and include open source GEOINT information.

In response to Assistant Deputy Director of National Intelligence for Open Source, Dan Butler's recent call for the Intelligence Community to do even more with open source intelligence, NGA's GEOINT Research Center has applied a cooperative research and development agreement, or CRADA, to an open source project designed to examine tools and services that could help propel the center's mission.

"Open source intelligence is intelligence produced from publicly available information that is collected, exploited and disseminated in a timely manner to an appropriate audience for the purpose of addressing a specific intelligence requirement," according to Intelligence Community Directive 301, titled National Open Source Enterprise.

The Transforming Operations and Production to Services, or TOPS CRADA, between NGA and defense contractor BAE Systems promises to transform open source GEOINT support to the NSG.

The TOPS CRADA is a unique effort to examine ways NGA can transform NSG GEOINT workflows and business processes to use services. Use of open source is just one of the workflows that TOPS CRADA is examining with emphasis on the geospatial challenges of many open source resources being textual based.

GEOINT open source research analysts also support open source by providing representatives to the Open Source Subcommittees. The project findings will be shared with the National Open Source Enterprise.

The open source project is comparing the suitability of technologies to determine possibilities for automating manual processes within the NSG.

The project is examining three functional areas:

- Web interfaces for analysts to develop and share queries against Web sites and online databases.
- Enhancements to existing Web search tools to support complex keyword searches, geospatial searches using graphical user interfaces, and queries that can be used and refined by other analysts. The project also focused on harvesting data from specific sites using deep Web search techniques.
- Processing for entity extraction, cluster analsis, automated subject classification and facet extraction as well as location-based indexing to allow geotagging.

The NGA Research Center successfully demonstrated its project goals in June 2010 through a highly collaborative effort with the CRADA industry partners and NGA open source experts. Harvesting open-source and "crowd-sourced" data, these experts investigated how services and visual displays could augment the gathering and processing of open source GEOINT to support analysts' requests for information on sample points of interest, such as schools in a given area.

Through its hard work and the cooperation of industry partners, NGA's GEOINT Research Center is expanding the scope of that research for the entire NSG. P

Melissa D. is a GOS research analyst in the National Geospatial-Intelligence Agency's GEOINT Research Center. Edward P. is a program manager in the eGEOINT Management Office. The eGEOINT outreach team contributed to this article.

NGA Campus East

Constructing a Purpose-Built Facility

By Kemisola Lofinmakin

More than a new workspace for the 8,500 National Geospatial-Intelligence Agency employees who will begin working there in 2011, NGA Campus East will improve the agency's ability to accomplish its complex and diverse geospatial intelligence mission.

Specifically designed, developed and constructed for the production of GEOINT, NCE will serve as NGA's headquarters while supporting a unified organization and culture by integrating employees from several sites around the Washington, D.C., metropolitan area into a single facility.

"A significant aspect of our GEOINT transition is NGA's consolidation of our East Coast operations to the state-of-the-art facility in Springfield, Va. NCE marks a special time in the agency's history. We have [already] begun to deploy personnel and transfer operations and data to NCE," said NGA Director Letitia A. Long.

The facility's design incorporated five deliberate, guiding principles: enable mission success, inspire the agency's work force and partners, facilitate organizational change and transition, meet the needs of NGA's future high-tech work force, and unify the work force to achieve better collaboration and cooperation.

The design will deliver numerous advantages for NGA's mission, such as data accessibility that allows for integrated workstations. Allowing different kinds of analysts to be collocated will improve internal collaboration and increase synergy across the agency.

NCE will also provide workspace for members of the Intelligence Community and NGA's international partners to improve collaboration and information sharing.

The facility will house state-of-the-art information technology, which supports the Director of National Intelligence document Vision 2015 for adaptability, alignment and agility. Infrastructure upgrades will allow the download of imagery on production workstations approximately three times faster than the rate for the current Integrated Exploitation Capability system.

The new Time Dominant Operations Center will increase the quality and timeliness of support to the warfighter by consolidating NGA's geographically and functionally dispersed time-dominant operations on the East Coast. The NCE TDOC will provide a stream of situational awareness data to operations directors, analysts and mission partners across the National System for Geospatial Intelligence. This consolidation will form the fulcrum of NGA's time-dominant support units.

NCE will provide the NGA work force with enhanced space and amenities, increasing the agency's ability to attract and retain qualified personnel. The campus will also enable integrated operations, increase force protection, enhance mission assurance and reduce facility operations and maintenance costs.

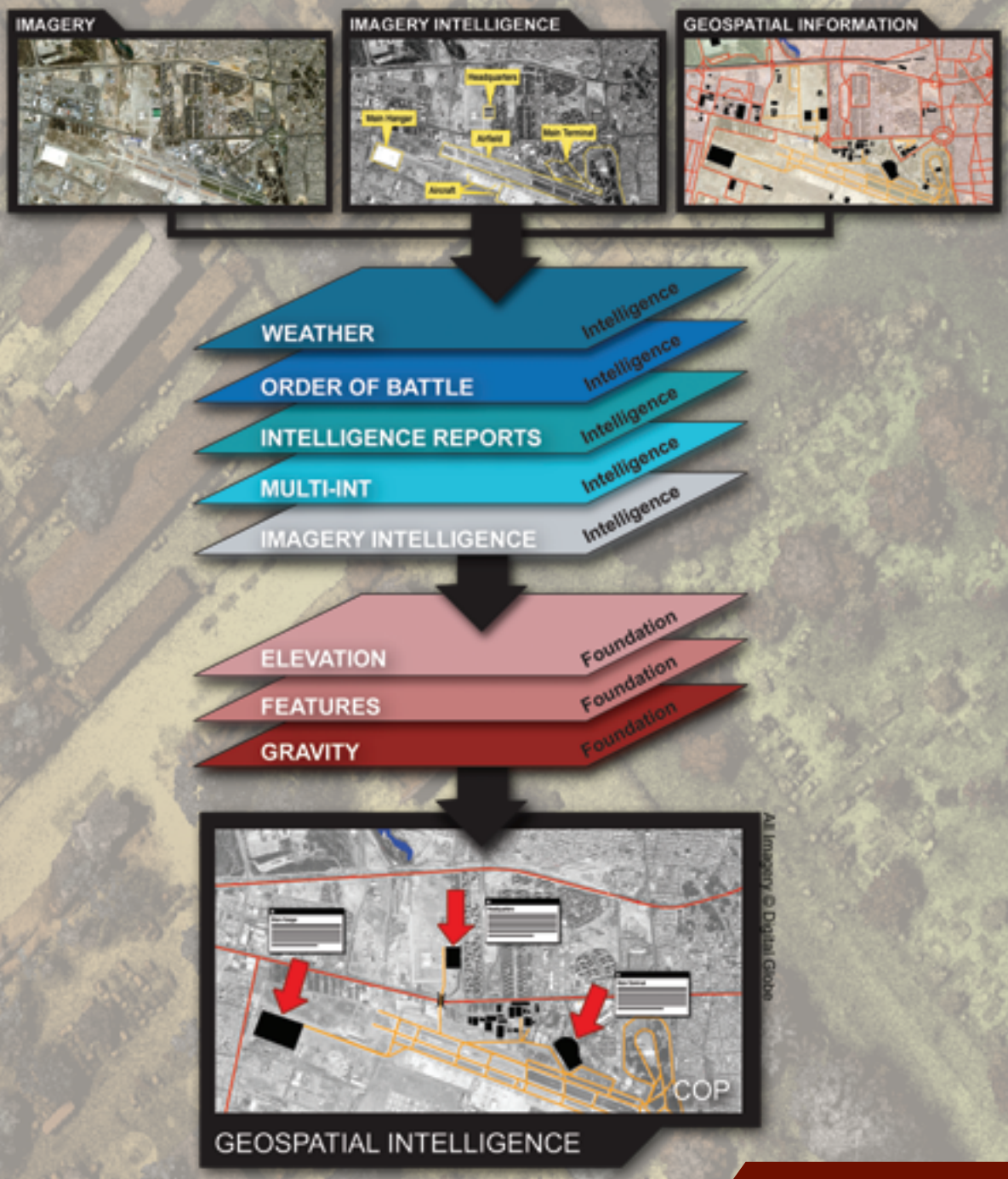
Base Realignment and Closure, or BRAC, legislation in 2005 mandated NGA's consolidation, which led to the creation of NCE. NGA's move to NCE will be completed by September 2011. P

Kemisola Lofinmakin is a contract employee on the communication staff of the NCE Program Advocacy Team.

A construction team working on a ceiling and room partitioning at NCE.

NCE Photo

The Power of GEOINT



Everyone and everything are somewhere. The visual context GEOINT provides shows where someone or something is located, who or what it is and why it's important, giving mission partners the actionable vantage point they need. To graphically depict locations, NGA focuses on a point on the Earth and then uses all applicable data layers to describe that point. Whether it is the geographical positioning of enemy forces, road location or information collected by other intelligence disciplines, it's the "layers"—the spatial depiction of that fused data—that makes it easily understandable. That is the power of GEOINT.

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