

NIMA

SEPTEMBER/OCTOBER 2003

PATHFINDER

Know the Earth ... Show the Way

State of the Agency

NATIONAL IMAGERY AND MAPPING AGENCY

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On the Cover

NIMA Director retired Air Force Lt. Gen. James R. Clapper Jr. addresses the work force. In his expanded column, "On My Mind," beginning on page 3, he discusses how far the Agency has come during the past two years and where he sees the Agency going. Rob Cox took the Director's photo. Jason Collins designed the cover.

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On My Mind ... State of the Agency

In the two years since I became NIMA's Director, I have seen astounding change in the world, in our country and in our Agency. The feelings and emotions are mixed—considerable tragedy and frustration, as well as great excitement and pride. But this two-year milestone provides an opportunity for both reflection *and analysis*—by looking back and reviewing NIMA's notable accomplishments as well as our remaining challenges.

When I first arrived at NIMA, I thought it was essential that all members of the work force knew why they were here, what they were doing and why they were important. The standup of NIMA, integrating dissimilar imagery and mapping cultures and functions, made employees question whether their unique contributions would be properly appreciated. So we codified our **core values**: our commitment to our *customers, people, culture and excellence* in our "Statement of Strategic Intent." We defined our **mission**: *to provide timely, relevant and accurate geospatial intelligence (GEOINT)—in support of national security* in a way that is clear, focused and speaks to everyone. Our **vision statement**—*Know the Earth, Show the Way*—captures both the expertise, analytical ability and body of knowledge that resides in this tremendous institution (*Know the Earth*) and the activist, operationally focused piece (*Show the Way*).

NIMA is a transformational Agency. When I joined NIMA, I worked to realign our organization to meet the priorities, needs and demands of the new century. I believe that **Now, Next, After-Next** continues to be the appropriate organizing principle. We are continuing to respond to our current analysis and production demands (**Now**), championing and completing a complex set of major investments to move to the **Next** level of the National System for Geospatial Intelligence (NSGI) and forging the **After-Next** environment by

driving the technology and inserting it rapidly. Despite some fine-tuning—we recently stood up the Source and Strategic Transformation Directorates—our organizational structure has stood the test of time.

How Far We've Come

It is easy to dwell on the warts. We are far from 100 percent of where I believe NIMA can and should be. We must acknowledge our shortfalls and work even harder to overcome them. But by standing back and measuring how far we have come, we can have a better idea of where we have yet to go. When we look at the totality of our work, NIMA can be proud of our many accomplishments.

"Geospatial intelligence" has entered the lexicon. Some of our progress cannot be measured in empirical terms. By working together and communicating with one voice, we have helped to make the buzz words and slogans surrounding the term *geospatial intelligence* more common and, therefore, more widely recognized, understood and accepted:

- *"Geospatial intelligence is the exploitation and analysis of imagery and geospatial information to describe, assess and visually depict physical features and geographically referenced activities on Earth."*
- *"Geospatial intelligence is information about any object—natural or manmade—that can be observed or referenced to the earth."*



- *"Geospatial intelligence provides the foundational 'Knowledge Map.'"*
- And my personal favorite:
"Without GEOINT, you're lost!"

These catchy phrases have helped to elucidate what we do—this layering business, the intelligence preparation of the battlefield and our ability to provide the ubiquitous knowledge base over which other forms of information and intelligence can be overlaid. This emerging concept of geospatial intelligence is catching on within our own Agency as well as within the wider Intelligence Community (IC).

NIMA's Customer Focus

The monumental events of the last two years have served to accelerate our transformational trends, most prominently, our focus on our customers. We participated in the immediate response to the attacks on the World Trade Center and Pentagon. We continue to provide unique geospatial support in protecting our homeland. Our products and services have proven invaluable to the war fighter during Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF).

I continue to receive calls, letters and e-mails from customers thanking NIMA for our crucial support during OIF. I accept that gratitude and praise on behalf of every member of the NIMA work

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force—military and civilian, government and contractor—including our NIMA Support Teams deployed around Washington, D.C., the nation and the world. Air Force Brig. Gen. Mike Lee, our former Military Executive, should be placed in NIMA's hall of heroes for leading NIMA's whole approach of forward deploying our representatives out into the desert, doing their thing—moving into Baghdad with the 3rd Infantry Division, for example.

OIF demonstrated that commercial imagery is growing as a major source for NIMA's provision of geospatial intelligence. When the 12th Air Defense Artillery needed to know the soil and moisture content so it could deploy heavy equipment in the An Nasiriyah area, commercial multispectral imagery was used to discern the wet areas.

Our airborne cells went operational just before the onset of hostilities and proved that National Technical Means (NTM) and airborne are better together than separately. Our Airborne Analysis Cell (AAC) integrated real-time imagery from theater with NIMA's knowledge base and our Airborne Target Cell (ATC) provided precision coordinates for targets.

NIMA is also supporting Iraq's post-war recovery and reconstruction by providing geospatial intelligence for mapping minefields, supporting humanitarian relief operations and identifying infrastructure damage.

Where We Are Going

The superb job NIMA has performed during OIF has established a benchmark we will have to at least match in any future such contingency. I am confident that we are up to the task:

- We must continue to confront our start-up challenges from the mundane (eg. outdated infrastructure) to the more intangible. For example, we must demonstrate to our work force that we can simultaneously nurture and advance their distinct

trecraft and skill sets while promoting GEOINT as a separate intelligence discipline. Our strength is our diversity.

- We must continue to work with our industry partners, through the GeoScout and Enterprise Engineering contracts, to ensure that we can deliver the next-generation NSGI architecture.
- We must continue to show real leadership in executing the Future Imagery Architecture (FIA) effort so we can continue to improve our imaging capabilities for our customers.
- We must continue to exploit *all* forms of imagery. The money we are now putting into commercial imagery attests to our progress in becoming more holistic about the multiplicity of our sources.
- We must continue to champion multi-intelligence collaboration.
- We must continue to take care of our deployed people, especially the increasing number overseas.

Some of the challenges NIMA faces we share with the rest of the IC, which now—metaphorically speaking—has not one but two “elephants in its living room.” The Defense Department is the elephant we have always had. The second and new elephant, the Department of Homeland Security, has not fully come to life. But once it does and gets organized, galvanizes itself and begins to understand its real information needs, we will all have to watch out.

NGA: Testament to GEOINT's Compelling Power

Assuming Congress approves the Defense Authorization Bill this fall, which includes the language for our name change, and the President signs the bill, we will become the National Geospatial-Intelligence Agency (NGA). I have carefully considered all aspects of this step, including the facts that we have achieved considerable name recognition as NIMA and some expense will be involved in making the change. How-

ever, I strongly believe the advantages outweigh the disadvantages. We have a new discipline—geospatial intelligence—to promote. Changing our name will be an important part of the process to help educate our many customers and publics as to who we are and what we do. This change also lies to rest our legacy names and missions, further enabling our transformation and our future. Nothing is more transformational than the congruence of our mission and our name. I believe it to be in the best interest of the Agency.

People Are Our Number One Treasure

Throughout my 40-year career in the IC, it has always been my conviction that my responsibility as a leader is to motivate people's intellects—to care about their brains. That is why our “Statement of Strategic Intent” stipulates our commitment to our people: “their personal integrity, professionalism, growth, leadership and accountability.” As Director of NIMA, my ultimate challenge is to figure out how to motivate each and every member of the work force. What is their professional interest? What will get them up every morning to brave the traffic and come to work? Taking care of people, motivating them, making their professional lives the best they can be, and doing right by them—that is my commitment.

I am given new reasons every day to be inordinately proud of the men and women who make up the NIMA work force and the extraordinary contribution they make to their country. I am excited to be part of this amazing Agency and of these extraordinary times.



JAMES R. CLAPPER, JR.
Lieutenant General, USAF (Ret.)
Director

Agency Comes of Age as NGA

By Tom Cooke

With the signing of the fiscal 2004 Defense Authorization Bill, NIMA will officially change its name to the National Geospatial-Intelligence Agency (NGA). This name change is more than cosmetic; it represents the latest in a series of major steps to provide the nation's war fighters and senior policy-makers with the best intelligence available to support decision making.

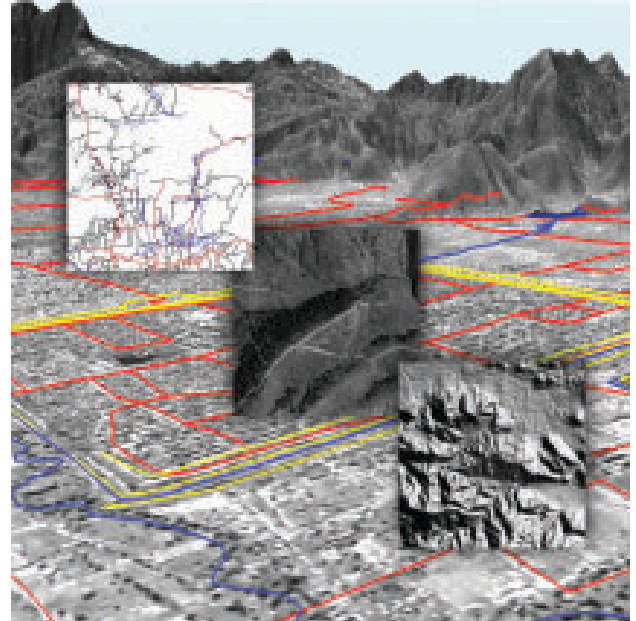
NIMA was created in 1996 to address challenges identified within the Intelligence Community (IC) following the demise of the Soviet Union and the 1991 Persian Gulf War. Specifically, the IC recognized the value of bringing together the geospatial and imagery analysis disciplines within one agency. By merging the various inherent tradecrafts, NIMA would be able to produce a totally new intelligence product—geospatial intelligence, or GEOINT—to provide customers a more complete visualization of geographically referenced areas on the Earth.

Integrating NIMA's diverse analytic tradecrafts (cartography, geospatial analysis, imagery analysis, marine analysis, aeronautical analysis, regional analysis and geodesy), however, has proved to be a complex undertaking. Part of the challenge has been residual ties to NIMA's former legacy organizations. As the 2000 NIMA Commission Report clearly recognized, NIMA continues to grapple with merging two disparate cultures: imagery analysis and the traditional mapping, charting and geodesy processes. These groups remain concerned that merging their areas of expertise might somehow result in limiting the superlative support their customers have come to expect. As a consequence, these cultures have remained protective of their traditional production capabilities and customer base. Indeed, even the name of the Agency—the National Imagery and Mapping Agency—maintained a distinction between the two cultures, implying their functions remain separate.

The tragic events of Sept. 11, 2001, followed by the requirement to support impending military operations in Afghanistan and Iraq, provided NIMA the impetus to overcome these challenges. With NIMA providing assistance to homeland security requirements and supporting combat operations during both Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), innovation and thinking "outside the box" were the order of the day. Analysts collaborated in unique ways, using emerging technology to develop specialized geospatial intelligence products for a diverse and growing customer base. NIMA capitalized on this opportunity to jump-start its transformation effort; senior leadership completely reassessed the Agency's internal and external coordination practices and developed totally new business processes—all within an environment of national emergency and combat operational support.

The accolades NIMA has received for its homeland security, OEF and OIF support confirm that its transformation is on track. With new capabilities, from specialized three-dimensional city graphics to animated "fly-throughs," NIMA was a force multiplier that helped shorten military operations and save lives.

Our customers understand, and more importantly, now demand geospatial intelligence as a critical part of their intelligence preparation of the battle space. The fusing of our respective



Geospatial intelligence provides an integrated view that customers now demand as a critical part of their intelligence preparation of the battle space.

tradecrafts, each offering its unique strengths, is part of a continuing transformation process. Changing our name to NGA reflects the ongoing transformation of our core capability to support the nation's war fighters and senior policy-makers with geospatial intelligence.

About the Author

Deputy Chief of Public Affairs Tom Cooke is a retired Army intelligence officer who served as a strategic analyst in several major U.S. and NATO commands. During Operation Desert Storm, he was a plans officer with the XVIII Airborne Corps.



Source Directorate Inaugurated

NIMA's new Source Operations and Management Directorate (S) is responsible for acquiring, managing and delivering imagery and other source data and information to the National System for Geospatial Intelligence (NSGI).

Two main challenges prompted the transformation to "NIMA Source" from the Central Imagery Tasking Office (CITO). First, the information needs of NIMA customers grow more sophisticated even as the time needed to make decisions continues to shrink. Second, the increasingly complex and capable array of collection assets requires new management approaches.

NIMA Source's response to those challenges is to integrate the available government and commercial (space-based and airborne) assets into the NSGI while aggressively leveraging the entire imaging frequency spectrum. As the functional manager for source operations, NIMA Source will ensure a common vision and set priorities to provide integrated multi-source management. NIMA Source strategies and services are designed to support the geospatial intelligence analytical process.

The new directorate builds on a rich legacy of successful predecessors: the Committee for Imagery Requirements

and Exploitation (COMIREX), Central Imagery Office (CIO) and Central Imagery Tasking Office (CITO).

At a ribbon cutting in July, Source Director Robert Cardillo welcomed former CITO veterans as well as NIMA Source employees, thanking them for their hard work and dedication. NIMA Director retired Air Force Lt. Gen. James R. Clapper Jr. called the change a "profound and important signal" and spoke of NIMA's critical role during Operation Iraqi Freedom and its ability to test the concepts of integrating reconnaissance assets.

Guest speaker Charlie Allen, Assistant Director of Central Intelligence/Collection, attributed NIMA's successful operations in Iraq to its collaborative environment. He also focused on the need for horizontal integration, with systems "beyond anything we have today" that will help avoid war by enabling NIMA and its partners to "give the warning and send it early." Establishing Source as a line directorate "is great testimony for what NIMA is and where NIMA is going with its mission partners

in the future," he said. "You have a great legacy, but you also have a great future."

—STEFANIE AARTHUN



Photo by Doug Allen

Cutting the ribbon for the Source Operations and Management Directorate (S), from left, are NIMA Director retired Air Force Lt. Gen. James R. Clapper, Jr., Assistant Director of Central Intelligence/Collection Charlie Allen and S Director Robert Cardillo.

NIMA Has Five Line Organizations

With the standup of the Source Management and Operations Directorate, NIMA now has five line organizations. The others are the Acquisition (A), Analysis and Production (P) and InnoVision (I) Directorates, and the Strategic Transformation Office (T). The Director established T in March 2003 to provide single-point accountability for Agency-wide activities involving strategic objectives. The office manages performance against strategy at the corporate level by leading planning efforts, enterprise architecture and engineering, and program analysis, evaluation and integration.

New Military Executive Appointed

Air Force Brig. Gen. Dale C. Waters was appointed Military Executive (MX) of NIMA, effective Sept. 2. He succeeds retiring MX Air Force Brig. Gen. Mike Lee. MX provides executive leadership for NIMA's military operations and support to the services and unified commands. It also manages NIMA's active and reserve duty military personnel.

A command pilot with over 3,400 hours in the F-111A/F, F-15E, F-15C, T-37 and T-38, Waters commanded the 363rd Air Expeditionary Wing, Prince

Sultan Air Base, Saudi Arabia, before coming to NIMA. Before that he was vice commander, Headquarters 5th Air Force, Yokota Air Base, Japan.

Waters has served as a squadron weapons officer, flight commander, operations officer and instructor pilot in fighter units within the United States and United Kingdom. He commanded the F-111 Fighter Weapons School and has served as deputy commandant of the U.S. Air Force Weapons School. He was also the senior military advisor to the

Assistant Secretary of State for European and Canadian Affairs.

Waters earned his Bachelor of Science degree from the Air Force Academy in 1975. He earned a master's in political science from Auburn University in 1987 and a master's in national security studies from the National War College in 1995.



Brig. Gen. Waters

Precision Engagement Relies on Geospatial Intelligence

By Robert S. Zitz

Courtesy of 24-hour news channels, information about world events now flows into our living rooms as it happens. When you see satellite and airborne imagery of hot spots in near real time, think “geospatial intelligence.”

A combination of geospatial information and imagery intelligence, geospatial intelligence allows decision makers to view the geographical context of their situation, visualize national security events as they unfold, and “see” possible outcomes as a situation develops.

The world is witnessing the use of an impressive array of American war-fighting techniques and tools: precision-guided munitions, persistent surveillance provided by unmanned aerial vehicles (UAVs), high-resolution images of denied areas, a robust Global Positioning System (GPS) and advanced digital visualization tools.

In the aftermath of the attacks of Sept. 11, 2001, the Department of Defense and Intelligence Community are re-thinking the tenets of national security. To address the myriad national security challenges of today and tomorrow, NIMA is transforming. The heart of this transformation is the concept of geospatial intelligence: the exploitation and analysis of imagery and geospatial information to describe, assess and visually depict physical features and geographically referenced activities on Earth.

NIMA has re-evaluated its approach to business, re-doubled its efforts toward collaboration with partners, and accelerated efforts to improve its capabilities. Geospatial intelligence is integral to, and in some cases leads, the broader transformation and advance of our partners and customers toward full information dominance.



U.S. Air Force photo by Staff Sgt. Jessica Kochman

A weapons loader prepares a GBU-31 joint direct attack munition (JDAM) for a mission at a forward-deployed location during Operation Iraqi Freedom. The war’s success depended on the use of smart bombs like the JDAM, which coincided with deployed targeting and accuracy improvements enabled by NIMA.

NIMA Support Is Expanding

NIMA has a core responsibility to deliver precise coordinates that enable munitions to strike effectively. Commanders, intelligence officers and targeteers require timely and accurate knowledge of their targets, predictive assessments of the adversary’s intentions, and the ability to visualize the battle space in detail. Aircrews, munitions and fuel handlers, mission planners—even weapon developers and builders—all rely on NIMA products and services.

Beyond current applications, the revolution in military affairs continues to rage in the domain of precise “geopositioning.” The military services and weapon developers design and base their future capabilities on levels of precision that are increasingly demanding and resource intensive. As the guidance and control of future munitions becomes more sophisticated, the accuracy of NIMA products and services

must keep pace. How is NIMA stepping up to the future challenges? NIMA is aggressively examining a variety of new data sources: multi and hyperspectral imagery, multi-intelligence (multi-INT), new applications of traditional imagery and radar-based High-Resolution Terrain Information (HRTI).

NIMA leads in the horizontal integration of intelligence disciplines, developing new concepts of operation and working with customers to meet future challenges. NIMA is embracing new collection platforms, leveraging technology and partnering with the military services and commands, intelligence agencies and commercial vendors to expand horizons and capabilities.

Strike Dynamics Have Changed

Operation Iraqi Freedom showed that targeting has improved substantially since Operation Desert Storm—the first military operation to employ a large

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quantity of precision-guided munitions. Laser-guided munitions, which require a human in the loop (and at risk), provided the greatest precision in 1991. Aircrews relied on precision coordinates to find targets quickly while flying in a hostile environment. The Defense Mapping Agency, a predecessor of today's NIMA, provided nearly 100 percent of the target coordinates for Desert Storm.

Twelve years later, NIMA continues to provide the foundation for precision engagement but in a very different way and for a greatly improved family of precision weapons. The Agency still provides "reach-back" support to combatant commanders for target mensuration (geolocation), but in the intervening decade, technology and accompanying concepts of operation have changed the face of the precision strike. Deployed forces now have the capability to derive coordinates with much greater accuracy in their own target shops. During Iraqi Freedom, the U.S. Central Command (CENTCOM) and its federated producers provided nearly 80 percent of the coordinates for precision weapons.

NIMA enabled deployed targeting with simultaneous accuracy improvements, which have coincided with the advent of a revolutionary new family of Coordinate Seeking Weapons (CSWs). These advancements changed the dynamics of the precision strike.

CENTCOM is one of the first combatant commands to become a "certified" producer of mensurated data for CSWs. NIMA provides this geospatial assurance as part of its targeting role. The Agency also provides a validation process for mensuration tools to insure that the tools the commands and services use perform as intended and can support modern precision-strike weapons. In direct support to commanders, NIMA has established an Air Targeting Cell (ATC) that works with theater assets to derive coordinates for targets of opportunity. To generate these coordinates, the ATC quickly registers tactical imagery, received via live feed, to positioning databases.

Integrated Information Is Coming

On the future battlefield, thousands of CSWs will be employed in a single day. Providing precise positioning information for each of these weapons will far exceed NIMA's current capabilities. It will require the integration of all manner of commercial, airborne/UAV and national satellite-imagery collection capabilities.

The first phase in NIMA's long-term strategy is to support the increasing demands of fielded targeting systems for accuracy, quantity and timeliness. The development and integration of image processing and correlation technologies is under way to fully realize the potential of organic sensors. These technologies include automating the registration (alignment) of images to one another or to a digital elevation model, automating triangulation (positioning) processes, generating synthetic images from HRTI, and developing mathematical models and registration capabilities for tactical sensor video.

NIMA is also improving the accuracy of products and services that support CSW employment. Research has demonstrated that modifying techniques used in imagery triangulation significantly improves the accuracy of targeting support data. NIMA has initiated studies designed to re-triangulate legacy imagery as new imagery collection

occurs. This research will significantly reduce production and dissemination timelines by updating support data immediately, thus allowing legacy targeting products to become as accurate as the most recent collection.

With the expansion of UAV missions to include situational awareness and targeting on demand, it has become necessary to exploit still and video imagery quickly and accurately. Intelligence, Surveillance and Reconnaissance (ISR) systems in theater now do not provide metadata (data sets) that allow mensuration of precise location directly from their imagery. The best accuracy that can be achieved on operational, stand-alone systems equates to an error for some weapons.

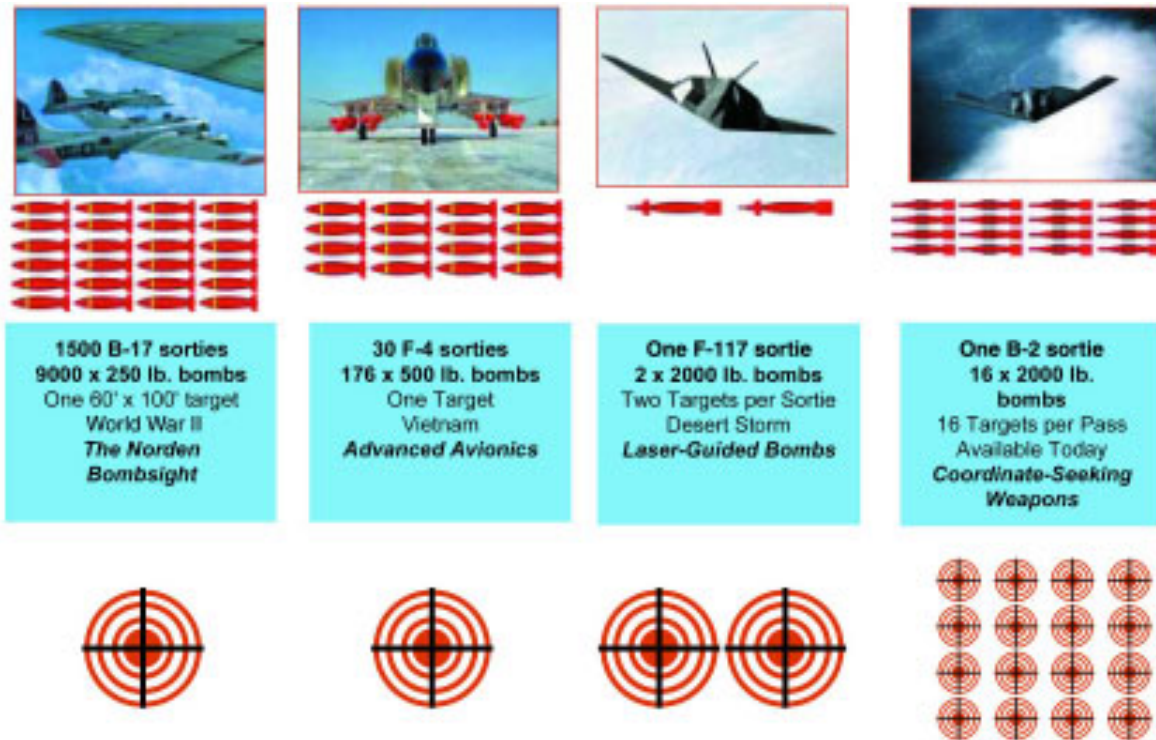
NIMA is actively exploring two possible solutions to this problem. The first involves the direct improvement of the UAV navigational parameters. This solution would allow UAV imagery to be exploited independently by improving its supporting metadata. The second involves the registration of UAV imagery to a highly accurate base of existing imagery, NIMA's Digital Point Positioning Database (DPPDB). The NIMA-sponsored Gridlock Advanced Concept Technology Demonstration (ACTD) employs registration techniques that allow the most recent tactical imagery to have the same intrinsic positional accuracy as DPPDB.

Why Geospatial Intelligence Is Key

Superior, timely knowledge of the environment and the adversary is key to giving U.S. decision makers and military forces the home-field advantage, even in distant foreign lands. Because geospatial intelligence is primarily about obtaining knowledge of the physical and cultural aspects of the global security environment—as well as discerning the capabilities and intentions of potential adversaries—it is at the heart of intelligence analysis. This form of analysis is key to Intelligence Preparation of the Battle space (IPB) activities that commanders and their staffs use for operations planning and execution. Geospatial intelligence provides the foundation upon which all other intelligence rests.

It reduces uncertainty by providing a knowledge advantage in time for a decision to be made or an action to be taken to advance or protect national interests.

NIMA, along with its partners, is responsible for creating and delivering geospatial intelligence that empowers decision makers to think visually as they quickly size up a situation and act decisively.



Targeting has improved over the decades, from World War II, when 1,500 sorties were flown to hit one target, to Operation Iraqi Freedom, when one sortie was flown to hit 16 targets. Despite this dramatic improvement in efficiency and precision, future requirements far exceed NIMA's current capabilities.

Moving Targets Pose Challenges

The capability to detect, identify, track, precisely locate and attack moving targets in all environments (e.g. desert, rain forest or urban area) may be the toughest problem of the future. It involves identifying the target type, past locations and current activities leading to a predictive analysis of operations. Such dynamic target characterization will depend on seamlessly registered imagery, including multi-spectral imagery (MSI) collected by manned and unmanned airborne systems and commercial satellites. However, MSI alone is not sufficient because it lacks the resolution for precise geopositioning.

Integrating sensor data that spans the electromagnetic spectrum provides a potential solution to this difficult

challenge. NIMA continues to develop synthetic and interferometric airborne radar exploitation technologies to create HRTI. In several demonstrations under way the HRTI created is of a higher quality than traditional Digital Terrain Elevation Data (DTED®) for both bare land and reflective surfaces. The improved absolute accuracy of HRTI supports the precise geopositioning of targets detected, identified and tracked through spectral sensors. Data fusion capitalizes on the inherent strengths of multiple phenomena and enables detection, identification and determining precise target locations.

Sensor-to-Shooter Timeline To Be Cut

In addition to accuracy improvements, NIMA has partnered with the Assistant

Secretary of Defense for Command, Control, Communications and Intelligence (ASD C3I) to shorten the sensor-to-shooter timeline. Global Net-Centric Surveillance and Targeting (GNCST or "Guncoast") is a key initiative funded by ASD C3I and NIMA to provide a proof of concept for shortening the sensor-to-shooter timeline through "upstream" agent-based identification, registration and fusion of multi-INT data streams. GNCST automates the ability to mine multiple intelligence, surveillance and reconnaissance sources in near real-time, saving analysts and targeteers valuable time and delivering increased target confidence and positive target identification. GNCST is a federated effort, with NIMA serving as the community program manager, in close coordination with ASD C3I, the Intelligence Community and Defense Department.

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NIMA Involved in Acquisitions

NIMA is actively involved in the acquisition process to ensure end-to-end coordination and support for emerging systems of the military services. NIMA investigates all major defense acquisition programs and assists with the definition and articulation of their geospatial intelligence dependencies—to include precision engagement. Early and continuous involvement in the defense acquisition process allows NIMA to assess targeting system dependencies and plan the research, development and production that will be needed. NIMA's interaction with the acquisition community includes liaison with the Deputy Under Secretary of Defense for Acquisition Technology and Logistics (AT&L), service program managers, program executive officers and warfare labs. NIMA has deployed personnel at key locations where weapons are developed to work with the system developers.

At the highest level, NIMA's InnoVision Director is a member of and special advisor to the Defense Acquisition Board (DAB) for all systems with geospatial information requirements. Leading up to each DAB meeting, NIMA representatives work with system developers across the Defense Department and military services in developing intelligence support plans. NIMA Support Team (NST) personnel are also deployed at customer sites to assist in the development of future system needs as well as provide support in using today's products.

As standard products evolve to a concept of geospatial intelligence online, NIMA's data types and services are changing. Raster products such as scanned maps are giving way to "smart" vector products that contain relevant information about each feature. NIMA's support to targeting in the future will likewise evolve to provide an ever-expanding set of information. It is no longer enough to provide a precise location. Information about a target in the context of planned or ongoing operations is essential. A complete understanding of *what* a target is, *why* it is there, and *how* it came to be is essential to situational awareness. Information about target properties is equally important for weaponeering.

Conclusion

Precision engagement is key to our nation's war-fighting capabilities and requires a multitude of capabilities to work together to be successful. NIMA provides the geospatial intelligence framework and knowledge map that enables multiple organizations to successfully employ advanced weapons. Precision engagement, like many war-fighting concepts, is a complex problem that is greatly aided by the visualization inherent in geospatial intelligence. War-fighting capabilities today represent quantum improvements achieved in the last decade because NIMA and its partners have improved geopositioning products and processes that support the navigation technologies of the munitions.



About the Author

Robert Zitz is Director of NIMA's InnoVision Directorate (I). The directorate forecasts future needs and develops comprehensive technology initiatives based on intelligence trends, technology advances and emerging customer and partner concepts. Zitz also contributed an article to the July-August ISR Journal, "Precision Weapons on Target: Geospatial Intelligence from NIMA Helps War Fighters Take Aim."

As a result of these improvements, our aircrews now employ CSWs that put them at less risk.

The future of precision engagement requires that we continue to invest in technology and concepts that address greater accuracy, a more difficult target set and compressed timelines. This research will involve fusing multiple sensors and techniques to allow precise targeting of increasingly difficult challenges on the battlefield—detecting, identifying, precisely locating and attacking targets in all environments. NIMA has risen to these challenges through research, systems development and the development of operational concepts. Further, NIMA has established crucial partnerships with current users, the acquisition community and developers. Precision engagement will continue to rely on geospatial intelligence as this exciting new discipline evolves from what it is now to what it will become next to what it will become "after next." Stay tuned!

Geospatial Intelligence Is Revolutionary

Revolutionary developments in three key areas enabled the convergence of the imagery and geospatial tradecrafts: advanced remote sensing, precision geopositioning and digital information processing. These leap-ahead technologies allow data to be moved and manipulated interchangeably between imagery products and maps and charts, blurring the distinctions between the two product categories. Geospatial vector data sets, consisting of points, lines and polygons that portray such things as roads and jurisdictional borders, can be orthorectified (placed in context) to update maps rapidly. Similarly, digital imagery "chips" may be inset on a digital map to provide additional detail of highly localized events or recent changes. With the advent of geographic information systems, digital databases, rather than venerable paper maps and charts, are becoming the key medium for recording, organizing and visualizing geospatially referenced information, whether derived from imagery or other source data. These digital technologies provide the common currency that makes possible the convergence of imagery and geospatial processes and tool sets within the discipline of geospatial intelligence. By combining these critical pieces, NIMA creates unique knowledge that is not available by any other means.

Mission Expands for National Geospatial Intelligence School

By Maj. Keith Krueger

With its mission to facilitate NIMA's work-force transformation, the National Geospatial Intelligence School (NGS) is a critical sub-component of the Agency's transformation.

In the fiscal year just ending, the School trained 6,619 civilian and military personnel in residence, while 1,900 received training from a mobile team.

Part of NIMA's Training and Doctrine Directorate (TD), NGS has transformed its curriculum to teach geospatial intelligence, which replaces separate programs in imagery and geospatial analysis. The School has also initiated training in support of homeland security.

NGS introduced the all-digital classroom for its new Geospatial Intelligence Training Program at Fort Belvoir, Va. in July. Training in St. Louis is scheduled to begin in September. Eventually, NGS will transform eight classrooms in the Washington, D.C. area to an all-digital environment and two in St. Louis. Each class will have 20 students for the 22-week course.

The program uses the new SIRIUS system, which replicates the Integrated Exploitation Capability (IEC), NIMA's first acquisition of a large information system that relies on current and emerging commercial off-the-shelf (COTS) technology. However, SIRIUS is a self-contained network, which lends itself to a training environment.

SIRIUS is also the backbone for the new Community Imagery Analysis Course (CIAC) for military imagery analysts. An 11-week mid-level course, CIAC will be offered four times per year until 2005 when it doubles to eight offerings annually.

Transformation initiatives in the School's Department of Military Training (DMT) reflect requirements from Operations Iraqi Freedom and Enduring Freedom. Changes include new

systems and software, but of greater note, a marked increase in personnel throughput. The Army terrain analyst specialty baseline will increase threefold from current levels in the next two years. DMT is moving to a remodeled, state-of-the-art facility at Fort Belvoir next April to comply with the projected course load.

Mobile training surpassed previous record training opportunities by the end of the third quarter of fiscal 2003. In the last quarter, NGS teams concentrated efforts across the U.S. European Command, where they spent four weeks in England and Germany training military and civilian personnel from the Army, Air Force and joint commands and conducted direct liaison with allied nations. In many cases, this was deferred training, because many commands were fully occupied and could not host training during combat operations. In other cases, NGS personnel pushed forward to provide critical just-in-time training. These efforts both supported operational commands and allowed lessons learned to be captured and incorporated in lesson plans and written doctrine. NGS personnel also prepared civil affairs units for long-term deployments in support of the war on terrorism. Upcoming training missions will be to the Pacific and Southern Commands and to Army topographic battalions in Hawaii and Fort Bragg, N.C.

Although the smallest department in NGS, Homeland Security (HLS) has uncovered a critical customer base that will likely expand significantly in the near term. On a daily basis NGS gets inquiries from different federal, state and local agencies for support and direction,



The retiring commander of the National Geospatial Intelligence School, Army Col. Robert T. Slusar (left) greets his successor, Army Col. Jeffrey LaMoc, and his wife, Kathi.

as they become aware of the benefits of geospatial intelligence. HLS has also provided training to members of the U.S. Northern Command (NORTHCOM) through courses offered at NGS or on location.

In July Army Col. Jeffrey LaMoc assumed command of NGS, arriving from Fort Leonard Wood, Mo., where he was Director of Military Training. The NGS work force is evenly split between military, government and contract employees. This cohesive, customer-based group is fully focused on providing quality technical training in geospatial intelligence and will continue to lead the charge towards transformation at all of its campuses and through mobile training. To learn more, visit NIMA's Web page at www.nima.mil/td/ngs.

About the Author

An Army engineer, Maj. Keith Krueger joined NIMA's Training and Doctrine Directorate last year. He is the operations and budgeting officer for the National Geospatial Intelligence School.



A Look at Saddam's Mapping Facilities

By Lt. Col. John Kedar and Stacy Jackson

Mapping and surveying operations have resumed in Baghdad. The situation was anything but normal last April 30, however. On that day, NIMA and the United Kingdom Defence Geographic and Imagery Intelligence Agency (DGIA) sent us on a joint patrol to assess the state of Iraq's two main survey organizations. Our agencies wanted to see what would need to be done to get either of them back to work. To our knowledge, this was the first joint patrol by DGIA and NIMA personnel.

The intent was simple—to visit the sites, meet anyone still working there, and make a written assessment.

We first went to the Iraqi Survey Commission, responsible for civilian mapping in Iraq. Located in an old police barracks, the Commission had been the

subject of looting and arson, with much of its equipment missing or destroyed. We met with the Commission's director general and toured the site—a veritable museum of pre-digital equipment and practices. Employees had sensibly removed records to their homes for the duration of the war. Staff had begun cleaning up without pay, but with determination and pride.

Next we visited the Ministry of Defence Survey Department. No one was at work there, which was hardly surprising, as the military had gone home. Fires there had been severe, and the destruction was complete, again caused by arson, not bombs. The map depot was knee-deep in warm ash and the roofs perilously close to collapse. Little was to be gained there, until, on walking out into the open, we found a

large ammunition dump. Over 1,000 shells lay against an inhabited building, with worried adults concerned about explosion. Children were playing among the shells.

We spent a long four hours waiting until the local U.S. headquarters decided what to do, passing the time talking with Iraqis about life under Saddam Hussein. We met a man who had spent 13 years in an Iranian prisoner-of-war camp and returned to Iraq in 2000 only to be tortured and left unemployable and without fingernails. Then there was an Iraqi colonel who had been to the British Army Officer Academy at Sandhurst and proudly produced his graduation booklet. There was a Shiite cleric promising peace, a man whose two uncles had been executed under the regime and many men and women looking for work. Most movingly we met the young children who now have a chance of growing up in a better Iraq. We are glad to report that, two days later, a U.S. military convoy removed the shells, with the assistance of locals.

NIMA and DGIA work well alongside each other, with staff in the field often working closely as we have proved worked during Operation Iraqi Freedom. Both agencies are learning the importance of deploying forward to support the war fighter—we hope we can exchange our experiences to improve this still further.

Since our visit, the Office of Reconstruction and Humanitarian Assistance (ORHA) has been working to get funding or donated equipment and arrange training to give the Iraqi Survey Commission a limited capability to start again. Surveyors are preparing to start work on projects to help rebuild Iraq, and efforts are also under way to catalogue the information that personnel retained in their homes. Also, the dedicated staff is getting paid again.



Photos by Lt. Col. John Kedar

The joint patrol sets out to assess the state of Iraq's survey organizations. Standing (center) is Stacy Jackson.



Perhaps too heavy to carry away, a printing press remains in the gutted quarters of the Iraqi Survey Commission.



Looters carry away printing plates from the Iraqi Military Survey Department.

Flying along Route 66

Aeronautical publications, while demanding, are not without humor, and the aviators and those who support them often find humor in odd places. This was certainly the case when NIMA assisted the Air Force in setting up airspace and airway routing within a former enemy's borders.

Airways are usually designated by letter; for example, A14 ("Alpha 14"), B10 ("Bravo 10") and so on. High-level airways take on a U for "upper" so A14 becomes UA14. This was not to be the case in Iraq, where the newest airway crossing the country from Iran to Syria is not a letter but a designation from American folklore: Route 66.

RTE66 is a footnote to an effort in which NIMA aeronautical analysts worked long hours with Air Force commanders in the U.S. Central Command (CENTCOM) to implement a new airspace structure over Iraq. Iraq had released NIMA's most recent aeronautical information publication in 1990.

To meet the needs of American military and civilian aviators, not to mention international civilian airline and relief organizations, the International Civil Aviation Organization (ICAO) allowed promulgation of a new aeronautical information publication (AIP) for Iraq by CENTCOM on an interim basis. The new airways and related aeronautical information and procedures contained in the AIP are now available to the public in NIMA Flight Information Publications (FLIP) and their digital counterpart, the Digital Aeronautical Flight Information File (DAFIF).

Establishing rules of the air, airways and procedures for approaches and landing for an entire country in a matter of months was no small undertaking. Already the effort is having a direct impact on the restoration of Iraq's economy. For example, in August, NIMA's shipping office learned that FedEx was beginning service to Baghdad, with feeder flights from Dubai three times a week.

—DARRYL PITCHFORD

About the Authors

British Army Lt. Col. John Kedar has returned to England, where he commands DGIA's 42nd Engineer Regiment (Geographic), based in Hermitage. The regiment had a significant proportion of its capability deployed forward in the Gulf region during Operation Iraqi Freedom, supporting U.K. forces and working alongside U.S. forces in several headquarters and map depots.

Stacy Jackson works in the NIMA Liaison Office to the Defence Imagery and Geospatial Organization (DIGO) in Australia. She supported the Combined Force Land Component Headquarters in Kuwait and later the Office of Reconstruction and Humanitarian Assistance (ORHA) in Baghdad. On an earlier deployment, she supported Operation Enduring Freedom in Afghanistan.

FACE TO FACE

Focusing on Image Quality

NIMA's annual Image Quality Users Conference focused on current crisis-related activities and how NIMA and its customers can work together to ensure imagery quality. The event in Chantilly, Va. July 9-13 drew some 200 participants from military and civilian imagery organizations. The first two days were dedicated to training, with three days devoted to presentations.

In his third appearance at the conference, Dr. John Stopher, professional staff member of the House Permanent Select Committee on Intelligence (HPSCI),

said the Bush administration is putting more emphasis on intelligence. The new fiscal year is NIMA's first chance "to experience the plus-up of funds devoted to intelligence," he said. Other speakers included NIMA Deputy Director Joanne Isham and NIMA Acquisition Director Jaan Loger. Presenting organizations included the U.S. Strategic and Pacific Commands.

A Commercial and Civil Imagery Panel convened to discuss use of commercial and civil imagery within the national security community. Panel members

representing NASA, NIMA and academic interests led the discussion.

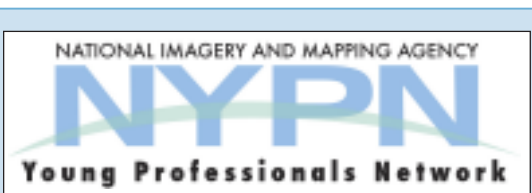
The nine training courses covered multiple sensors and products, as well as introductions to image quality fundamentals and applications. In all, 64 students were trained from various parts of the Intelligence Community, unified and specified Commands, and military service intelligence centers. The Synthetic Aperture Radar Technical Applications Center (SARTAC) and National Geospatial Intelligence College joined NIMA's Image Quality and

Utility Program Office in conducting the training.

NIMA exhibited its Image Quality Certification Program (IQCP) and the newly revised Softcopy Quality Assurance Process (SQAP). These are specific programs designed to ensure that quality is maintained at user sites that work with NIMA-supplied imagery and systems. Participation in these programs is open to all imagery users.

Participants also browsed through eight demonstrations during a vendor's social, including the latest software for NIMA's Integrated Exploitation Capability.

—DAWN GERMAN



Young Professionals Build Bridges

The NIMA Young Professionals Network (NYPN) was born from an off-site, where senior leaders discussed characteristics of each generation and training to bridge the generation gap.

Conceived by a young training manager as a way to address generational issues within the Agency, NYPN has become a grassroots effort of both government and contractor employees in the Washington, D.C. area.

NYPN is intended to help bring the work force together, create an interface between NIMA's management and its young professionals, exchange ideas and reinforce NIMA culture.

A unique dynamic of this group is there is no one leader, or rather, every individual contributes to the leadership of NYPN. The Network is comprised of committees that address communications, events planning, volunteerism and liaison opportunities within the Agency. These collaborations foster a spirit

of teamwork and give every member an opportunity to shine.

Speakers discuss Agency initiatives at NYPN meetings. In this informal setting members find it easier to ask questions and gain a better understanding of issues important to the Agency.

"I think it's great that folks from management take the time to help us understand what's going on at the Agency and how it's relevant to us," one of the members remarked.

General body meetings are open to all NIMA employees. NYPN events also include networking lunches, after-work socials and desktop discussions. The NYPN newsletter welcomes articles.

NYPN members participate in a variety of Agency programs including the NIMA transformation council and the orientation program for new employees. The Network is a diverse group, with members representing nearly every facet of NIMA culture.

—KOBEN JOHNSON

Looking Below the Surface

The subsurface frontier was the subject of a meeting Aug. 21 between NIMA and the Center for Subsurface Sensing and Imaging Systems (CenSSIS). A National Science Foundation Engineering Research Center, CenSSIS is dedicated to revolutionizing existing science and technology for detecting and imaging biomedical processes and objects or conditions that are underground, underwater or embedded in the human body. Pamela Krause of NIMA's Frontiers Office is a member of the CenSSIS Scientific Advisory Board.

In opening remarks, NIMA Office of Corporate Relations Director Mark Schultz discussed the evolving meaning of geospatial intelligence and the many barriers and obstacles for NIMA to overcome in fulfilling its responsibilities to both the Defense Department and Intelligence Community.

CenSSIS Director Dr. Michael Silevitch led a CenSSIS multidisciplinary team in presentations on enduring hard problems and challenges, and research the Center is conducting that aligns



Photo by Tony Boone

Mark Schultz addresses a meeting on the subsurface frontier.

with NIMA's needs. Topics ranged from hyperspectral imagery analysis, imagery-guided therapy for precision surgery within the human body, characterization of deeply buried objects and progress in visually understanding underground features and processes.

CenSSIS uses a unified, multidisciplinary approach that combines expertise in wave physics, sensor engineering, image processing and inverse scattering with rigorous performance testing to create new sensing system prototypes that are transitioned to 14 industry partners for further development.

—ROBERT BRIDGES

NOW IT Consolidation Streamlines Services

NIMA's consolidation of information technology and information services (IT/IS) contracts will improve delivery and lower costs, once a multi-phase transition is completed. It will also "provide tremendous opportunities for NIMA and our customers," says Dr. Roy J. Combs, Director of the Geospatial-Intelligence Technical Service Directorate (GT).

Consolidation of NIMA's Operations and Sustainment (O&S) contracts under NJVC is "an important advance in NIMA's relationship with its IT/IS contractors," says NJVC general manager Peter G. O'Neill. "It represents an integrated partnership of contractors and government that will significantly improve communication, management and, most of all, services to NIMA and its customers."

Recognizing the importance of the achievement, NIMA Director retired Lt. Gen. James R. Clapper Jr. presented the Meritorious Unit award to the O&S contract consolidation team, which is comprised of both government and contractor personnel.

The consolidation of IT/IS contracts—the Multi-Systems Maintenance Services (MSMS), Lightyear II and Intelligence Information Processing and Production (I2P2) contracts—into the NJVC IT/IS contract pulls

together on one team BAE Systems, General Dynamics, Lockheed Martin and Raytheon.

"The effort is three years ahead of schedule and already paying dividends," Combs said. "The consolidation has created a single team to better coordinate and staff our demanding and growing IT infrastructure needs."

Team NJVC's expanded responsibilities include systems operations, enterprise services, software administration, hardware maintenance, and license and inventory management. According to O'Neill, the move will greatly improve O&S accountability, provide greater technical depth of contractor resources and lower total O&S costs to NIMA by reducing staffing redundancies and taking advantage of other efficiencies.

The NJVC consolidation "promotes migration to common tools, processes and procedures, and we have a greater degree of flexibility in the organization and the contract structure to deal with challenges as we move forward," O'Neill said.

At the heart of the consolidation decision was NIMA's desire to transform the enterprise infrastructure and move to the "most efficient organization" outlined in previous studies.

—DAVID BANKS



Photo by Chuck Cooper

Tom Sapienza observes performance test results for Ring 1 of the St. Louis Metropolitan Area Network while a contractor phones an off-site counterpart to make equipment adjustments. The new network supports the needs of imagery analysts for more bandwidth.

IAs Gain Bandwidth

Bandwidth increased 16 times with the activation of a telecommunications network that supports the increasing needs of imagery analysts for more bandwidth. (More bandwidth—the range of consecutive frequencies comprising a band—allows more data to be transmitted simultaneously.)

The new St. Louis Metropolitan Area Network (MAN) provides high-speed, high-volume communications between NIMA libraries in the Washington, D.C. area.

Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6211.02A, issued in 1996, mandated that the Defense Information Systems Network (DISN) be "robust, adaptive and reliable by employing network and configuration management, diverse routing and automatic rerouting features." DISN is the Defense Department's consolidated

worldwide network for supporting military operations.

In implementing the St. Louis MAN, the Defense Information Systems Agency (DISA) chose to leverage light-wave (fiber optic) technology to provide users with high reliability and survivability and diminish single points of failure for critical communications.

The St. Louis MAN is the first Synchronous Optical Network (SONET)-based ring implementation for DISA. SONET is the preferred long-haul telecommunications transport of major carriers in the United States and elsewhere.

The St. Louis MAN is comprised of two rings with a combined bandwidth capacity to support an additional 300-450 imagery analysts.

NIMA engineers are currently working with DISA counterparts to broaden the capacity even more.

—TOM SAPIENZA AND RANDY MORENO

Band 3 Employees Are Leaders, Too

NIMA believes every employee can lead and influence," say officials of NIMA's School of Leadership and Professional Studies (SLPS). Backing up these words, the School completed its inaugural offering of "Preparing for the Challenge (PFC)," a two-week leadership course for Band 3 employees, in July. Band 3 is equivalent to GS 11-12 in the civil service. Twenty employees from

throughout the Agency completed the course.

One of a series of courses designed to foster and develop a NIMA-wide leadership culture, PFC teaches the same leadership behaviors NIMA expects from senior leaders. The course introduces James Kouzes' and Barry Posner's "leadership challenge" principles as the NIMA model. In another segment,

presented by the Tom Peters Co., the class studies leadership practices of America's best, including Abraham Lincoln, Martin Luther King Jr. and chief executive officers who created thriving companies. Team building is also part of the course.

One participant said the PFC not only gave her tools to become a better leader, but a better person.

In closing remarks at graduation, NIMA Deputy Director Joanne Isham encouraged the class to exercise its leadership skills and become part of the NIMA "momentum." NIMA no longer has to "reach out to the Intelligence Community," she said. "Now the Intelligence Community reaches out to us."

St. Louis is hosting the second offering of PFC in September.

—LIZ SHERMAN

GEOINTEL 2003

Geospatial Intelligence & Information for the Nation

October 14-17,
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Come see NIMA's Operations Center of the Future combining visualization and understanding of Geospatial-Intelligence with advanced technologies to make actionable information intuitively accessible to decision-makers. All on display in the exhibit hall.

NIMA Seniors will participate in the first annual industry-sponsored Geospatial Intelligence Symposium.

NIMA leaders discuss the future of Geospatial Intelligence and how the agency will transform over the next 10

• **Meet with industry leaders responsible for programs, systems, organizations and initiatives that are transforming military strategy and national policy**

• **Hear National leaders discuss their views on homeland security issues, including:**

- Mr. Charlie Allen, CIA
- Lt. Gen Edward Anderson (US NORTHCOM)
- The Honorable Steve Cambone
- Lt Gen James R. Clapper, Jr., USAF (Ret.), NIMA
- Chairman Porter Goss
- Mr. Rich Haver
- Senator J. Robert Kerrey
- Mr. Mark Lowenthal, CIA
- The Honorable Tom Ridge (Invited)

This symposium will help foster cooperation and openness between government, military, and the private sector. It will also encourage the development and advancement

For more information go to www.geointel.org

NIMA will announce contract awards for the Innovation Initiative, a program that awards up to \$1M in contracts for innovative Geospatial Intelligence products and concepts. Attend the Hall of Fame Luncheon,