

trajectory

THE OFFICIAL MAGAZINE

OF THE UNITED STATES GEOSPATIAL INTELLIGENCE FOUNDATION

2015
USGIF
MEMBERSHIP
DIRECTORY

DARK SKIES, BRIGHT FUTURE

THE NEXT GENERATION OF COMMERCIAL REMOTE SENSING HAS ARRIVED—
AND GEOINT WILL NEVER BE THE SAME.



Manage your data.
Discover answers.
Make decisions.



HARRIS
assuredcommunications®

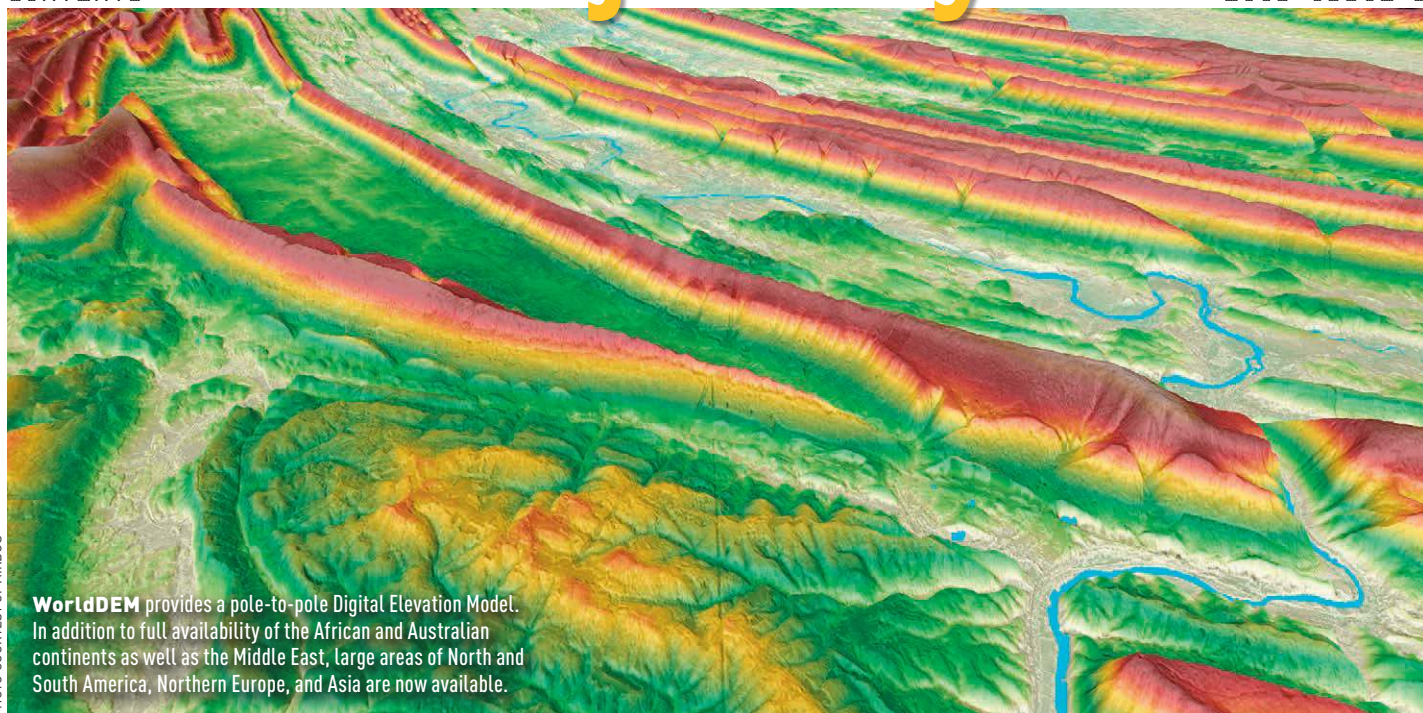
Analysts in today's world are expected to have the right information at their fingertips to answer urgent questions at a moment's notice. **Jagwire**® allows analysts to spend less time searching for the right data and more time providing answers for time-critical operations. For more information visit exelisvis.com/Jagwire

#IngenuitySquared

harris.com

©2015 Exelis Visual Information Solutions, Inc., a subsidiary of Harris Corporation. All rights reserved. All other marks are the property of their respective owners. Use of DoD imagery does not constitute or imply DoD endorsement.

PHOTO COURTESY OF AIRBUS



WorldDEM provides a pole-to-pole Digital Elevation Model. In addition to full availability of the African and Australian continents as well as the Middle East, large areas of North and South America, Northern Europe, and Asia are now available.

02 | VANTAGE POINT

GEOINT 2015 attracted the largest and most diverse audience to date.

04 | INSIDER

NGA's new strategy; rethinking leadership hierarchies; DoD seeks GEOINT upgrade.

06 | IN MOTION

2015 USGIF Award winners announced; the first GEOINT Hackathon; and more.

10 | ELEVATE

Fayetteville State University hosts event to promote GEOINT programs at HBCUs.

Features

14 | DARK SKIES, BRIGHT FUTURE

The future of commercial remote sensing has arrived—and GEOINT will never be the same.

By Matt Alderton

22 | A SIGNAL FROM THE NOISE

Understanding climate change through the lens of national security.

By Melanie D.G. Kaplan

SPECIAL SECTION

28 | 2015 USGIF MEMBERSHIP DIRECTORY

12 | COMMON GROUND

USGIF launches NRO Application Service Provider Working Group.

20 | MEMBERSHIP PULSE

The story behind TerraGo's mobile mapping software.

22 | HORIZONS

Reading List; Peer Intel; USGIF Events Calendar.

24 | APERTURE

GEOINT 2015 Family Day.

ON THE COVER: The satellites and debris depicted are an illustration based on actual density data. However, the objects are shown at an exaggerated size to make them visible at this scale.

Illustration courtesy of the European Space Agency and NASA

TRAJECTORYMAGAZINE.COM



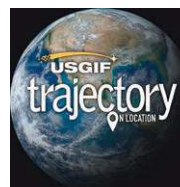
EXPANDED COVERAGE

Read more on the next generation of commercial remote sensing.



NGA PANEL

Check out web exclusive Q&As not answered during the NGA panel discussion at GEOINT 2015.



TRAJECTORY ON LOCATION

Visit GEOINTv.com's new home for Symposium videos and more: vimeo.com/trajectoryonlocation.

OPEN FOR COMMENT

It's been an interesting summer here at USGIF. Hosting the GEOINT 2015 Symposium in D.C. this June was yet another departure from our normal "battle rhythm," though admittedly not as challenging as last year's GEOINT 2013* gymnastics.

Anecdotal feedback regarding GEOINT 2015 has been almost universally positive. We are tabulating the results of our attendee and exhibitor surveys now, and we appreciate the fantastic return rate we always receive. That so many people make the time to provide this very important insight is a testament to the dedicated engagement of our community and our collective commitment to being part of an agile, learning enterprise.

I took a quick peek at early returns and clearly placed among the all-stars of the event were the three Vapor Wake K9 teams we had on site. They were an important part of our overall security plan, with sloppy dog kisses and photo ops as an added bonus. We will report out the collective survey results when they are complete, and we'll take action to be responsive to the concerns and suggestions expressed where appropriate, feasible, and affordable.



Based on raw numbers, the GEOINT 2015 stats are exciting. We had a record number of confirmed attendees at 5,498, eclipsing the previous record by just about 1,000. There were about 1,500 government attendees from more than 250 federal, state, and local agencies, organizations, and offices, as well as 28 countries represented. Attendees were able to avail themselves of more than 80 hours of professional development training, a record 294 exhibitors, and about 100 government speakers between the general session, Government Pavilion Stage, and other venues such as GEOINT Foreword, which has grown from a small, precursor event to a sizable and remarkably dynamic program in its own right.

Being in D.C. allowed us to offer Family Day in the exhibit hall, which was very well received. At the end of the week, we hosted a vibrant classified session at NGA Campus East on the cyber-location nexus, with a first-ever dual Q&A session with NGA Director Robert Cardillo and NSA Director/Commander USCYBERCOM Adm. Mike Rogers. We're eagerly looking forward to returning to Orlando in May for GEOINT 2016, and we're also exploring options to bring the Symposium back to D.C. some time in the future.

In the event you missed some or all of the Symposium, be sure to check out PDF versions of the *GEOINT Symposium Show Daily* at trajectorymagazine.com, brought to you by the *trajectory* staff, as well as HD video of keynotes, panels, breakouts, lightning talks, interviews, booth tours, and more via our *trajectory* On Location (formerly GEOINTv) Vimeo page: vimeo.com/trajectoryonlocation.

I hope you'll enjoy this edition of *trajectory*, which includes a great piece exploring the current state of commercial remote sensing from space, touching on space resiliency, SmallSats, and diverse phenomenology. Additionally, there's a look at the evolving understanding of climate change as a national security issue and how GEOINT uniquely contributes to that important discussion.

As we plan *trajectory*'s 2016 editorial calendar, there's another opportunity for your feedback. This is the perfect time to let us know which topics you'd like to see in the magazine, which government, industry, and/or academic leaders you'd like to see interviewed, and other content you'd find valuable. Just like everything we do at USGIF, this magazine is for you, the GEOINT Community, produced by our professional association. I look forward to seeing you at our working group and committee meetings as well as our myriad fall events, including a jam-packed GEOINT Community Week in November.


KEITH J. MASBACK | CEO, USGIF
 @geointer

trajectory

USGIF CHAIRMAN OF THE BOARD
 The Honorable Jeffrey K. Harris

USGIF CEO AND PUBLISHER
 Keith J. Masback

EXECUTIVE EDITOR
 Jordan Fuhr
jordan.fuhr@usgif.org

MANAGING EDITOR
 Kristin Quinn
kristin.quinn@usgif.org

EDITOR
 Brad Causey
bcausey@glcdelivers.com

ART DIRECTOR
 Gretchen Kirchner Rund
grund@glcdelivers.com

ASSISTANT EDITOR
 Lindsay Tilton Mitchell
lindsay.mitchell@usgif.org

AD SALES
 Jeff Ley
jeff.ley@usgif.org



Trajectory is the official magazine of the United States Geospatial Intelligence Foundation (USGIF).

HOW TO REACH US

LETTERS AND COMMENTS

For comments on *trajectory*, contact trajectory@usgif.org.

SUBSCRIPTIONS

For information on subscribing to *trajectory*, sign up for free at trajectorymagazine.com.

USGIF MEMBERSHIP

For more information on USGIF or becoming a USGIF member, contact 888-MY-USGIF (888-698-7443).

TWITTER
 @trajectorymag

PUBLICATION MANAGEMENT



847-205-3000 | GLCDELIVERS.COM



A new path to the future

**DELIVERING AWARENESS, INSIGHT
AND UNDERSTANDING FROM A
NEW PERSPECTIVE**

Leidos provides the next generation of Multi-Int, open source intelligence solutions preparing you for an increasingly complex and dynamic world.

leidos.com/newpath



NEWS UPDATES AND HIGHLIGHTS



NGA'S NEW POWER

During his GEOINT 2015 keynote address, National Geospatial-Intelligence Agency (NGA) Director Robert Cardillo touted the principles of openness and inquisitiveness.

"For decades intelligence was like a regulated currency. We guarded it jealously; we controlled it tightly," said Cardillo, quoting a December 2014 *Harvard Business Review* article by Jeremy Heimans and Henry Timms, who referred to this currency as "old power." "They called [old power] 'closed, inaccessible, and leader-driven. It downloads and it captures.' As a currency, hoarding is a good thing ... But in today's world our enterprise must operate differently—less like a currency and more like a current."

Instead of old power, Cardillo said, NGA needs new power.

Replacing old power with new—at NGA and across the GEOINT Community—demands not only new ideas, but also new objectives, according to Cardillo, who used his keynote as an opportunity to introduce four new strategic goals for his agency: People, Partners, Profession, and Value.

Behind NGA's new strategy—which the agency test-drove during the Nepal earthquakes in spring 2015—is a revised mission statement: "We strengthen the nation through our command of geospatial intelligence."

Cardillo pledged that under his leadership NGA would succeed not by providing all the answers but rather by asking all the questions and by being open and accessible enough to receive answers from others.

HUDDLING WITH NGA SENIOR LEADERSHIP

During the GEOINT 2015 general session, the GEOINT Community was able to figuratively sit at the table for nearly an hour with National Geospatial-Intelligence Agency (NGA) senior leaders as they engaged in one of their leadership meetings, which they call "huddles." The conversation, moderated by USGIF CEO Keith Masback, offered a unique glimpse into the inner workings of NGA.

The huddle included NGA Director Robert Cardillo, NGA Deputy Director Susan Gordon, Chief of Staff Ed Mornston, Director of Plans and Programs Misty Tullar, and Deputy Director of Operations James Griffith.

Gordon emphasized the need to put mission needs up front. "There is nothing good that is going to happen ... if we're not sure of what we need to achieve," she said. Gordon also offered a status update on the Intelligence Community Information Technology Enterprise (IC ITE).

Mornston emphasized the importance of workforce training and development.

"We know that the workforce that we have today isn't exactly the workforce that we need going forward, so we have to pay extra special attention to training, development, and education," Mornston said, highlighting in particular the need for an influx of data scientists who can help NGA tackle the challenges and opportunities of Big Data. "There are ... a handful of new skill sets that haven't been that important to us in the past that we clearly see as [useful going forward]."



THE GEOINT 2015 AUDIENCE had so many questions for the NGA senior leadership panel there wasn't enough time to answer them all onsite. Visit trajectorymagazine.com for an exclusive continuation of the Symposium Q&A session.



NGA SENIOR LEADERSHIP listen to Deputy Director Sue Gordon discuss the Intelligence Community Information Technology Enterprise.

got geoint? got geoint? got geoint? got geoint? got geoint? got geoint? got geoint? got geoint?

5,400

individuals from government, military, academia, and industry attended GEOINT 2015, the most ever.



SHIFTING CULTURE FOR A COMPLEX WORLD

When Gen. Stanley McChrystal first took the helm of Joint Special Operations Command (JSOC), he approved every operation in Iraq—about four a month. Two years later, “We were doing 300 a month, and I was approving none of them,” McChrystal said during his keynote address at GEOINT 2015.

McChrystal, a retired, four-star general, as well as former commander of JSOC and U.S. and International Security Assistance Forces Afghanistan, said culture changed so much while he was at JSOC that approving operations was no longer his job.

Rather, he said his job was to create an environment in which decisions could be made at lower echelons, and “to help put people and things in a mindset and position to create something that operated with the kind of synergy you have to have in today’s world.”

Speaking just after the release of his new book, *Team of Teams: New Rules of Engagement for a Complex World*, McChrystal challenged the audience to rethink decision-making policies, referencing historical examples of how the traditional hierarchy embraced for centuries doesn’t always work. Within traditional organizations, information starts at the bottom and works its way to the top, where decisions are made, and then it’s communicated back down for execution.

McChrystal shared how his own view of leadership has changed.

“I started to think about leaders as gardeners,” he said. “When you think about what a gardener does, a gardener doesn’t grow flowers or vegetables. A gardener creates the opportunity, shapes the ecosystem so plants have the opportunity to do what they do well. You’ve got to prepare the ground, you’ve got to do all the things that make it work, but you’re not growing anything.”

PENTAGON EYES GEOINT UPGRADE

Deputy Defense Secretary Robert Work called for dramatic improvements in the GEOINT products available to the Department of Defense during his GEOINT 2015 keynote.

“When we discuss and debate what space capabilities we need to improve on, GEOINT is going to remain at the top of the list,” he said.

Work acknowledged the GEOINT Community already provides vital products to warfighters, such as exquisite imagery, detailed maps and charts, data for high-fidelity mission planning systems, change detection, targeting support, and three-dimensional renderings of buildings and compounds. But he said the DoD needs even better intelligence to maintain its technological edge on the battlefield.

“We’re going to double down on GEOINT in the future,” he said. “We want to be able to establish patterns of life from space. We want to know what the unusual looks like.”

The DoD also needs to make its space systems more resilient, Work said. “If we fail to do so, the implications for our national security will be quite profound. Our command and control will be significantly degraded. Our ability to detect and track adversary ballistic missile launches will be put into question. Satellite links that connect our unmanned aerial systems will be denied.”



“HOW CAN YOU HELP NRO?”

In her GEOINT 2015 keynote, National Reconnaissance Office (NRO) Director Betty Sapp challenged those working in the commercial sector to rethink conventional wisdom about NRO and help the agency in its mission to provide innovative overhead intelligence systems for national security.

“For all of you in industry, I want you to tell me how you can help with our intelligence challenges—not why I should buy the system you’ve got ready to sell me,” she said.

Sapp addressed some traditional notions of NRO, namely that the organization has lost its innovative spirit, repeatedly builds the same things, and only does one size (big) and one speed (slow).

Rather, she emphasized, the organization builds satellites of various sizes and can keep up with the pace of technology, putting mission payloads on a vehicle at the last minute. She added NRO is also misunderstood because its innovation is not entirely in space. The ability to adapt spacecraft for flying new missions, for instance, happens on the ground.

Sapp reiterated that moving forward depends largely on the performance of industry partners.

“We want partners who are as committed to our national security mission as we are,” she said. “We have a direct call line to users in the field. We do a lot to combine our imagery with that available from the commercial providers ... It also lets us distribute things we might not be able to otherwise.”

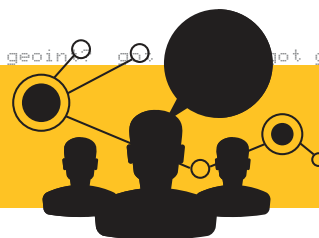


got geoint? got geoint? got geoint? got geoint? got geoint? got geoint? got geoint? got geoint?

A record

294

organizations exhibited at GEOINT 2015.



A LIFETIME OF DEDICATION TO TRADECRAFT

Air Chief Marshal Sir Stuart Peach, Vice Chief of the Defence Staff for the U.K. Royal Air Force, was named the 2015 recipient of the USGIF Arthur C. Lundahl–Thomas C. Finnie Lifetime Achievement Award.

Peach was unable to attend the Symposium, where the award is annually announced and presented, and instead sent a video of his acceptance speech to be played for the audience:

“Thank you so much for honoring me with this award,” said Peach. “It is of course not for me, it is for all of the members of the United Kingdom intelligence services past, present, and hopefully future who worked so closely in partnership with you for so many years. ... I’m proud to be part of the reconnaissance gang, I’m very proud to be part of the Intelligence Community. I see in so many of my predecessors on this hall of fame great friends and

particularly great mentors. I would just simply highlight two—the great intelligence Johnny Allen and my lifelong friend and mentor Jim Clapper. Both mean a lot to me and both mean a lot to their friends in the United Kingdom. To join them makes me humble.”

Peach commanded the Air Warfare Center at RAF Waddington from 2000 to 2003, was Director of General Intelligence Collection with the Ministry of Defence from 2003 to 2006, and served as Chief of Defence Intelligence and Deputy Chairman of the Joint Intelligence Committee from 2006 to 2009. Peach held the appointment of Chief of Joint Operations at The Permanent Joint Headquarters in the U.K. from March 2009 to December 2011 before becoming the first Commander of the U.K. Joint Forces Command from December 2011 to April 2013. He was appointed Vice Chief of the Defence Staff in May 2013.

The Lundahl-Finnie award recipient is nominated and voted on by the USGIF



AIR CHIEF MARSHAL SIR STUART PEACH— pictured here giving a keynote at GEOINT 2008—is the 2015 recipient of the USGIF Arthur C. Lundahl–Thomas C. Finnie Lifetime Achievement Award.

Board of Directors. This distinguished award is named after Arthur C. Lundahl and Thomas C. Finnie, celebrating their accomplishments in imagery analysis and mapping, respectively.

EXCEPTIONAL COMMUNITY CONTRIBUTIONS



FROM LEFT TO RIGHT: Dr. Todd Bacastow, Penn State; Geoffrey Krassy, 2015 Lt. Michael P. Murphy Award Winner; David Alexander, DHS; Jim Stokes, DigitalGlobe.

The 2015 Lt. Michael P. Murphy Award in Geospatial Intelligence was presented to Geoffrey D. Krassy, an air interdiction agent for the U.S. Department of Homeland Security’s Customs and Border Protection (DHS CBP). David Alexander, director of the DHS Geospatial Management Office, presented the award to Krassy on the GEOINT 2015 Government Pavilion Stage.

The Murphy Award is named for Navy SEAL Lt. Michael P. Murphy, a distinguished Penn State alumnus. Murphy was

killed June 28, 2005, by enemy forces during a reconnaissance mission in Afghanistan and posthumously awarded the Medal of Honor. The Murphy Award recognizes achievement by a Penn State graduate who is serving or has served in the U.S. Armed Forces or Intelligence Community.

“Geoff’s experience as a special operations pilot combined with his education achievements in geospatial science resulted in a uniquely insightful and practical study addressing the optimal placement of radar to detect low-altitude, ultralight aircraft crossing the U.S. border,” said Dr. Todd Bacastow, professor of practice for geospatial intelligence at Pennsylvania State University. “Geoff’s work offers invaluable lessons into how automated geospatial analysis might be used by the defensive planner.”

Since 2007, Krassy has served as a CBP air interdiction agent along the U.S. southern border. He also served on the project team that integrates fixed-wing patrol aircraft remote sensing capabilities into a common geospatial picture, maximizing the seamless transfer of data between, and interoperability of, DHS air, marine, and ground forces.

The generosity of USGIF, the DigitalGlobe Foundation, and faculty, staff, and friends of Penn State fund the Murphy Award.

2015 USGIF AWARD WINNERS ANNOUNCED

The annual USGIF Awards program recognizes the exceptional work and bright minds from all areas of the GEOINT Community. Award winners are nominated by colleagues and selected by the USGIF Awards Subcommittee. The 2015 USGIF award winners have demonstrated great achievements in advancing GEOINT tradecraft.

“Each year as the nominations come in, we are always amazed by the exceptional work of the individuals and teams from government, military, industry, and academia being submitted for consideration,” said Kevin Jackson, chair of the USGIF Awards Subcommittee. “The opportunity to review the dozens of nominations and to understand the significance of your accomplishments and the impact of your contributions to the community, our country, and the world—which most likely never make the news—is truly humbling. The 2015 USGIF Award winners represent a community that we should be very proud to be a part of.”

The 2015 USGIF Award winners are:

1. **Military Achievement Award:** Air Force/Director for Intelligence, Surveillance, and Reconnaissance Interoperability (AF/A2I); Surveillance Intelligence Reconnaissance Information System (SIRIS) Team
2. **Government Achievement Award:** U.S. Army Geospatial Center
3. **Industry Achievement Award:** George Guy Thomas, Collaboration in Space for International Global Maritime Awareness (C-SIGMA)
4. **Academic Research Award:** George Stanley Bosarge, University of South Alabama
5. **Outstanding Administrative/Support Award:** Donna L. Pelle, National Geospatial-Intelligence Agency

Not Pictured: Academic Achievement Award:
Professor Dorota A. Grejner-Brzezinska & Dr. Charles Toth,
Ohio State University



STUDENT INTERNS WIN USGIF'S FIRST GEOINT HACKATHON

Developers challenged to produce predictive analysis of disease in West Africa



A TEAM OF FOUR student interns won \$15,000 and free GEOINT Symposium registration at USGIF's first GEOINT Hackathon.

Nearly 30 developers and data scientists turned out for the first USGIF GEOINT Hackathon June 12–14. Participants were tasked to determine why certain areas of West Africa were unaffected by the Ebola outbreak as well as predict where additional outbreaks might occur. However, this was their secondary goal—the primary goal was to expose their team's thinking and build in hooks so another team working with another geography or outbreak could modify the solution to a new set of conditions.

The first-place team included four student interns and was aptly named “Team Intern.” Their solution focused on travel and revealed an “Ebola superhighway” along the coast of West Africa. They were awarded the \$15,000 grand prize as well as complimentary registration to GEOINT 2015. Team Intern members are:

- R. Blair Mason, a member of the U.S. Naval Academy class of 2016 and a double major in computer science and aerospace engineering. Mason is currently interning with the Naval Research Laboratory.
- Briana Neuberger, a senior at Rochester Institute of Technology (RIT) double majoring in imaging science and industrial systems engineering. Neuberger is a SMART scholar and intern with the National Geospatial-Intelligence Agency (NGA).
- Dan Simon, a senior at RIT and intern at OGSystems.
- Paul Warren, a junior at Stanford University majoring in computer science as well as an OGSystems intern.

“We developed an open-source python library to model the spread of disease as it's carried by contagious people through a network of nodes and edges using network theory,” Warren said.

The second-place team produced what it calls “non-historic” predictive analysis and was awarded complimentary GEOINT 2015 registration. “Team Flo Hacks” members are:

- Boris Polania of Hollywood, Fla., a software engineer with post-graduate studies in economics who moved to the U.S. from Venezuela six years ago. Polania recently helped found small software consulting firm V/F.
- Armando Umerez of Boca Raton, Fla., who recently moved back to the U.S. from Venezuela and is also a partner with V/F. Umerez is an electronic engineer with post-graduate studies in marketing,

management, and sustainable development.

The third-place team developed an easy-to-use graphical user interface based on sanitation data such as access to water. They were awarded complimentary registration to GEOINT Foreword, the pre-GEOINT symposium science and technology day. “Team Agile” members are:

- Nathan Currier, a senior at Colorado State University, Fort Collins, majoring in computer science as well as an intern with Stinger Ghaffarian Technologies (SGT).
- Jesse Pai, a sophomore majoring in computer engineering at the University of Maryland, College Park. Pai is also an SGT intern.

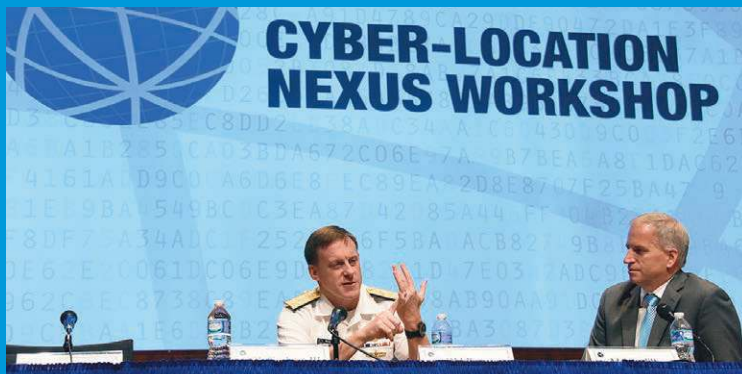
The GEOINT Hackathon was sponsored by DigitalGlobe, Esri, and OGSystems, and included judges from USGIF, NGA, DigitalGlobe, Esri, and OGSystems.



DURING THE GEOINT 2015 USGIF Chairman's reception, USGIF Chairman of the Board Jeffrey Harris and NGA Director Robert Cardillo talked with two of the four members of the winning team from the first USGIF GEOINT Hackathon. From left to right: Harris, Dan Simon, Paul Warren, Cardillo, and Keith Barber of OGSystems.

USGIF HOSTS CYBER-LOCATION NEXUS WORKSHOP

USGIF hosted its first Cyber-Location Nexus Workshop June 26 following the GEOINT 2015 Symposium. The classified, daylong session held at the National Geospatial-Intelligence Agency (NGA) in Springfield, Va., focused on critical cyber-location challenges and business opportunities. In this photo, National Security Agency Director Adm. Michael Rogers (left) and NGA Director Robert Cardillo jointly address the audience.



The Power Behind Efficient Government Solutions



With 30 years of experience in location and mobility data, HERE provides intelligence that helps power critical government programs. Today, HERE partners with federal, state and local agencies to deliver essential programs, services and resources to the public – from managing city traffic, to preparing for emergency evacuations to planning for future development. Our maps and traffic power key government entities such as the Department of Homeland Security, NGA, FHWA, USDOT and Health & Human Services.

For more information about HERE products and solutions, visit www.company.here.com or email sales@here.com.



GEOINT & HBCUs

Fayetteville State University hosts event to encourage more GEOINT Community involvement among historically black colleges and universities

By Lindsay Tilton Mitchell



PHOTO COURTESY OF NORTH CAROLINA CENTRAL UNIVERSITY

AS THE DEMAND FOR GEOINT professionals continues to rise, academic institutions are following suit to ensure students achieve the knowledge and skills necessary to succeed upon graduation. One group of academic institutions beginning to make its footprint in the GEOINT Community is historically black colleges and universities (HBCUs).

There are 106 HBCUs in the United States, most of which do not

have GEOINT programs. In April, the USGIF-accredited geospatial intelligence certificate program at Fayetteville State University (FSU) hosted a two-day “GEOINT at HBCUs” meeting to provide HBCUs with more insight into the GEOINT Community and geospatial sciences curricula. About 20 individuals representing both HBCUs and non-HBCUs across the Southeastern U.S. attended to discuss the state of their respective GEOINT programs and offerings.

As the first HBCU to gain USGIF accreditation in 2014, Fayetteville shared its experience in building a GEOINT certificate program and encouraged other HBCUs to consider doing the same.

“Hosting this event was important because we started something and we didn’t want to stop at just one HBCU,” said Dr. Rakesh Malhotra, assistant professor and program coordinator of FSU’s geography

curriculum. “We wanted other HBCUs to participate. It should not just be one university—this is much bigger than that. Workforce development is important and we want to get the students to a point where they can find employment based on the skills they learn from us.”

USGIF, the National Geospatial-Intelligence Agency (NGA), and the U.S. Geological Survey sent representatives to the event, which also provided an opportunity for the three organizations to learn how to better help HBCUs advance GEOINT programs. NGA shared information on its science, technology, engineering, and mathematics (STEM) initiative as well as the grants the agency offers HBCUs under its Academic Research Program.

USGIF CEO Keith Masback discussed USGIF’s Collegiate Academic Accreditation Program, and he shared how GEOINT plays a significant role in the Intelligence Community as well as how academia can make a difference by collaborating with the Intelligence Community.

“I firmly believe we have an obligation to build an increasingly diverse national security community, which is more reflective of the globally connected

“HOSTING THIS EVENT WAS IMPORTANT BECAUSE WE STARTED SOMETHING AND WE DIDN’T WANT TO STOP AT JUST ONE HBCU.”

—Dr. Rakesh Malhotra, assistant professor and program coordinator, FSU’s geography curriculum

FAYETTEVILLE STATE UNIVERSITY hosted a meeting in April with other historically black college and university (HBCU) representatives to discuss the importance of HBCU GEOINT programs.



PHOTO COURTESY OF FAYETTEVILLE STATE UNIVERSITY

world we inhabit,” Masback said.

Participant Wubishet Tadesse, associate professor in remote sensing and GIS at Alabama A&M University, aims to take to the next level the school’s minors in remote sensing and GIS.

“The best thing that came out of the event was knowing we weren’t the only program seeking help, and there was great collaboration from everyone,” Tadesse said. “NGA and USGIF gave us firsthand experience in what we should do and what direction we need to go. Having the meeting was nice, but it’s the continuation of the conversation and keeping in touch with the other universities that will help get the ball rolling for us.”

Dr. Gordana Vlahovic, associate

professor of earth and geospatial sciences at North Carolina Central University, said the event helped her understand the next steps for growing a GEOINT program at her university.

“Sometimes it’s hard to take new programs and initiatives off the ground, due to lack of understanding on the part of administration and even colleagues that do not share the same interests,” Vlahovic said. “Thus, it was encouraging to even be in the same room with faculty from several HBCUs that have similar goals and face similar challenges.”

FAYETTEVILLE STATE UNIVERSITY and **NORTH CAROLINA CENTRAL UNIVERSITY** participated as a team (left) in the 2014 North Carolina Geography Bowl at the University of North Carolina at Greensboro.



PHOTO COURTESY OF NORTH CAROLINA CENTRAL UNIVERSITY

FSU hopes to make the “GEOINT at HBCUs” gathering an annual event to further the dialogue of HBCU involvement in the GEOINT Community. ■■



Purpose-Built Storage for Defense and Intelligence

The industry’s only scale-out storage parallel file system for Multi-Level Security (MLS) specifically designed to meet the needs of Intelligence Community Directive 503 and Cross Domain Solution (CDS) requirements.

Increase data security

Reduce threats, complexity and expense

Enable activity tracing, audit trails, diagnostics and monitoring

To learn more please contact
Mike Moritzkat
Director, Seagate Federal
703-400-2228

Or visit
www.seagate.com/hpc

HELPING NRO REACH FOR THE CLOUD

USGIF's NRO Application Service Provider Working Group provides recommendations

By Marc Selinger



NICK BUCK, co-chair of USGIF's new NRO Application Service Provider Industry Advisory Working Group, addresses group members during a meeting at USGIF headquarters in late July.

THE NATIONAL RECONNAISSANCE OFFICE (NRO) has traditionally acquired new computing infrastructure by hiring a prime systems integrator to build and maintain an entire system. Though this approach met the agency's needs for many years, it can no longer keep up with rapid advances in information technology and cybersecurity threats.

The NRO is shifting toward cloud-based computing to become more nimble and introduce upgrades more quickly, which the commercial world has done for years. However, NRO perceived resistance from industry partners that feared losing revenue as it replaced a few large, system-level contracts with many small ones providing computer-based services over a network.

"One hundred percent of the industry base believes this is the right thing to do,

but a new business model is needed to show industry and government how to acquire and sustain capability in the new environment," said Nick Buck, president and CEO of Buck Consulting Group and a retired Navy defense acquisition program manager. "The challenge is that defining a new business model requires industry partners to put their heads together and make realistic, executable recommendations."

With NRO's support, USGIF launched the NRO Application Service

Provider (NASP) Industry Advisory Working Group (IAWG) in September 2014 to help create this new business model, identify potential pitfalls, and suggest ways to address them. Buck serves as one of the co-chairs.

"The group is off to a busy start," said Keith Barber, associate partner for strategic planning at OGSys, who co-chairs the NASP IAWG with Buck. About 70 people have joined so far, representing a wide range of small, mid-size, and large companies involved mostly in software and systems integration. The working group prioritized a host of topics and has already completed its first round of reports designed to brief both government and industry on selected issues. It also received positive feedback during peer reviews and in a briefing to senior leaders of NRO's Ground Enterprise Directorate.

During the presentations to government and industry, "we heard comments like 'superb,' 'outstanding,' and 'they told us things we didn't realize,'" Buck said. "It was a great shot in the arm for the group. There's a lot of momentum and a lot of increased interest from industry because they see that their voices are being heard."

One NASP IAWG report delves into pay-per-use software licensing options. It suggests that "not one size fits all" and NRO "must fit the licensing model to the program." The report describes how pay-for-use may make sense if requirements or workloads are unpredictable but that paying by the hour could be inappropriate if a program is "steady state for five years."

"THERE'S A LOT OF MOMENTUM AND A LOT OF INCREASED INTEREST FROM INDUSTRY BECAUSE THEY SEE THAT THEIR VOICES ARE BEING HEARD."

—Nick Buck, president and CEO of Buck Consulting Group

Another report examines how to encourage government and industry to adopt an ASP approach. For example, the report recommends offering incentives to industry to perform “hard” tasks and reuse existing software. It also suggests the government celebrate early wins and hone accountability models to encourage program manager adoption.

In late May, the group was selecting topics for its next batch of reports, which it aims to complete by September. But continuing to have regular meetings with NRO will be just as important, Buck said.

The interaction has to be more than “throwing documents back and forth,” he explained. “You have to have a conversation.”

To ensure broad industry support, the group strives to not favor any one supplier over another. Offering NRO a range of options is considered acceptable but providing “the answer” is not.

“Objectivity and supplier neutrality is essential,” the group’s charter states. “Discussions must be vendor, supplier, and integrator agnostic, not just by product/company but also by architecture. Working group membership is responsible for ‘self-policing’ on this front.”

Buck said USGIF is ideally suited to be the group’s convening authority because of the Foundation’s focus on promoting the GEOINT Community as a whole.

“It can’t be any one company,” Buck said. “It has to be someone who doesn’t have a dog in the fight.”

The ASP IAWG is expected to continue its work until industry and government achieve a workable business model to realize NRO’s vision.

“The rule of thumb on working groups is that they should last six to 12 months but normally go as long as they are useful,” Barber said. “I believe we’ll keep going at least through the end of this year—and beyond as new topics emerge—but the focus could shift.” ■■

**THE NRO IS
SHIFTING
TOWARD
CLOUD-
BASED
COMPUTING
TO BECOME
MORE
NIMBLE AND
INTRODUCE
UPGRADES
MORE
QUICKLY.**



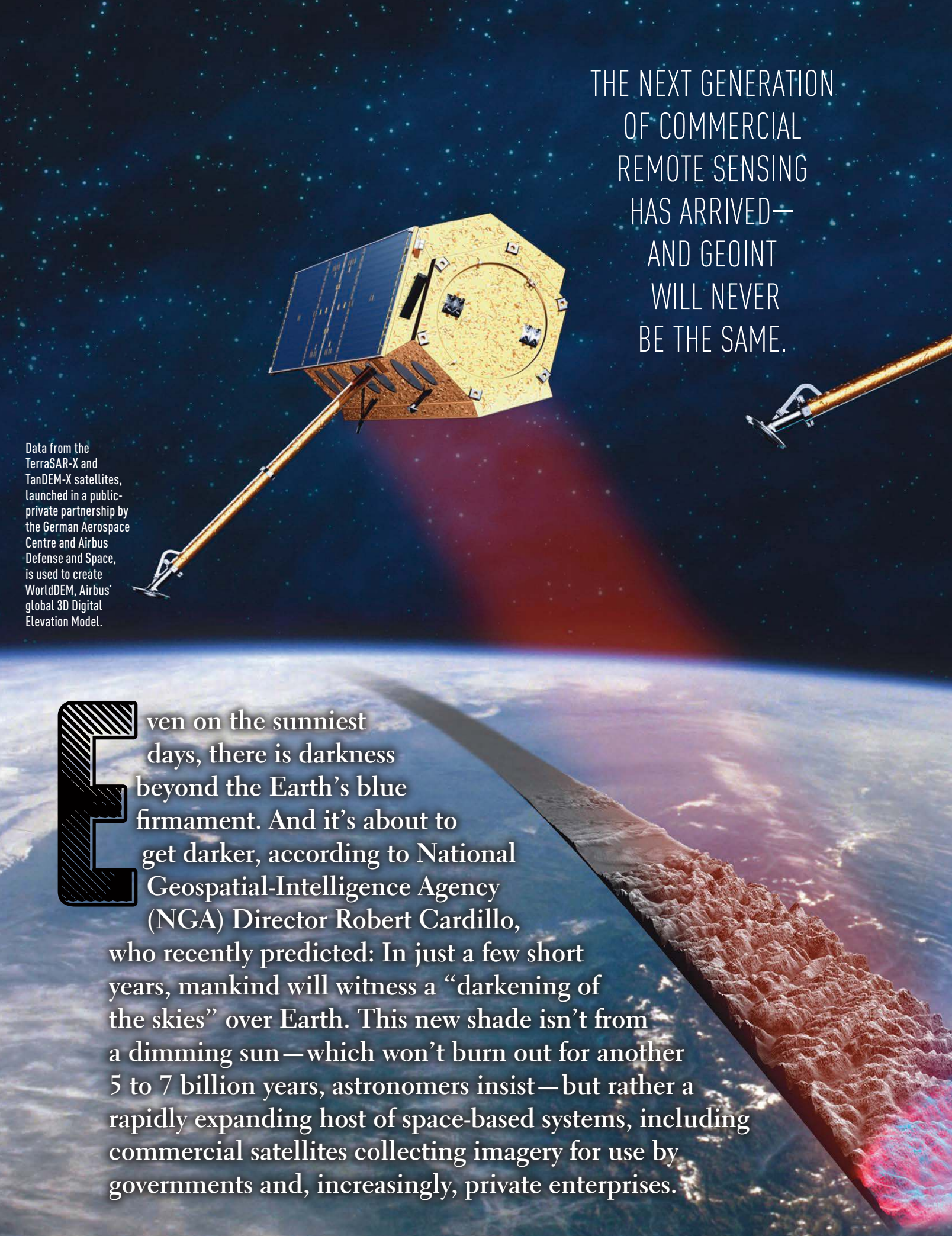
Collegiate Accreditation Program



Northeastern University
College of Professional Studies



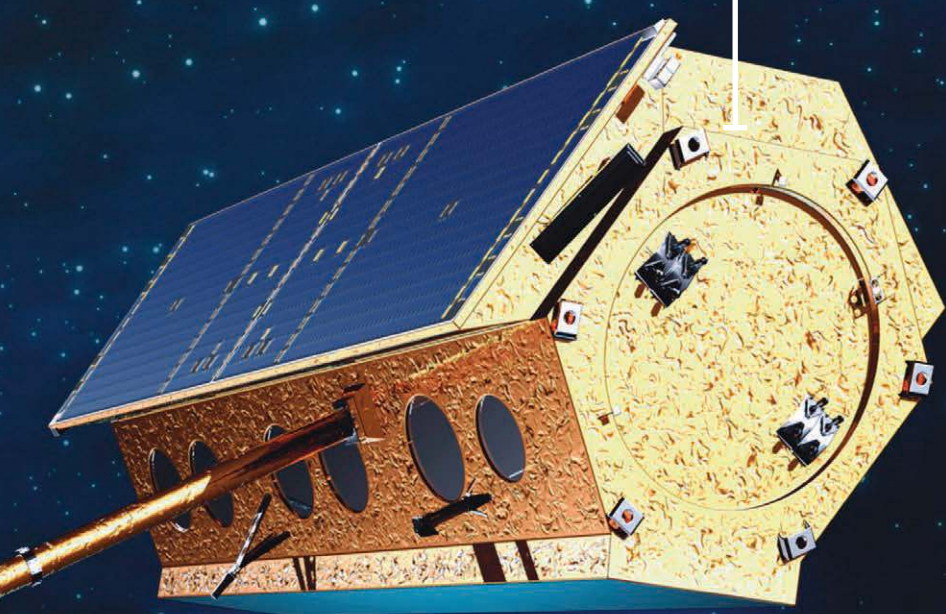
Visit usgif.org/education/accreditation for more information.

The background of the entire page is a deep blue space filled with stars. In the upper center, a satellite is shown in a three-quarter view. It has a yellowish-gold hexagonal body with various instruments and antennas. A long, thin, gold-colored boom extends from the satellite towards the bottom left. In the bottom right corner, a 3D topographic map of a mountain range is visible, rendered in shades of orange, red, and pink, appearing to be a data visualization. The Earth's horizon is visible as a thin blue line across the middle of the image.

THE NEXT GENERATION
OF COMMERCIAL
REMOTE SENSING
HAS ARRIVED—
AND GEOINT
WILL NEVER
BE THE SAME.

Data from the TerraSAR-X and TanDEM-X satellites, launched in a public-private partnership by the German Aerospace Centre and Airbus Defense and Space, is used to create WorldDEM, Airbus' global 3D Digital Elevation Model.

Even on the sunniest days, there is darkness beyond the Earth's blue firmament. And it's about to get darker, according to National Geospatial-Intelligence Agency (NGA) Director Robert Cardillo, who recently predicted: In just a few short years, mankind will witness a "darkening of the skies" over Earth. This new shade isn't from a dimming sun—which won't burn out for another 5 to 7 billion years, astronomers insist—but rather a rapidly expanding host of space-based systems, including commercial satellites collecting imagery for use by governments and, increasingly, private enterprises.



BY MATT ALDERTON

ORARK SKIES. BRIGHT FUTURE

Currently, there are more than 300 active Earth observation satellites orbiting the planet, 42 of which are wholly or partially commercially owned and operated, according to the Union of Concerned Scientists. By 2023, governments and commercial enterprises collectively will launch 353 more Earth observation satellites—many of which will be small and affordable enough to constitute constellations capable of imaging every inch of the Earth every day—predicts global space consultancy Euroconsult.

“I’m energized and enthused about this development ... It means our analysis of world events is going to be holistic and persistent,” Cardillo said in June at the GEOINT 2015 Symposium. “The democratization of GEOINT and the darkening of the skies is the opportunity of our time.”

Indeed, the “darkening of the skies” isn’t dark at all. For the GEOINT Community, especially, it’s the opposite—bright—according to Rob Zitz, co-chair of USGIF’s Small Satellite Working Group and senior vice president and chief systems architect for the national security sector at Leidos. “We’re right on the cusp of having geospatial information become a commodity; we’re going to be awash in pixels and geospatial data collection,” he said. “The questions are: How do you combine that data with other data sources? How do you derive meaning from it? And how do you automate processes around it?”

GEOINT is the glue that will hold all these loose ends together for decision-making and action-taking.”

As the Internet fueled the information age, the next generation of commercial remote sensing will drive the ubiquity and utility of GEOINT.

“The ability to image the Earth from space has revolutionized life on this planet,” said SmallSat champion Rep. Jim Bridenstine (R-Okla.), a member of the House Science, Space, and Technology Subcommittee. “We can find better routes to where we’re going. We can see when storms are coming. Our warfighters can know where the enemy is located. The implications of seeing the big picture are enormous and extend to nearly all aspects of the human experience. As the needs for remote sensing have grown over the decades, the responsibilities for providing this service have expanded to the private sector and today we are seeing a boom in this industry.”

Although it’s been decades in the making, the boom in commercial remote sensing is owed, in particular, to events of the last three years, which have increased the pace of change so much, so fast, that the next generation of commercial remote sensing isn’t on the way anymore. It’s here.

RESOLUTION SOLUTION

A major milestone in the recent history of commercial remote sensing was the August 2014 launch of DigitalGlobe’s

WorldView-3 satellite, the first commercial imaging satellite to offer 30-centimeter resolution imagery and 16 spectral bands.

“WorldView-3 is the most capable commercial satellite ever launched in terms of its ability to see the earth clearly and in new ways,” said Tony Frazier, senior vice president for U.S. Government Solutions at DigitalGlobe. “From an analytic perspective, a 30-centimeter pixel—especially when you consider that it’s 16 bands of spectral information—allows you to collect an enormous amount of content that can be unleashed to address a problem.”

Until recently, DigitalGlobe could collect high-resolution imagery but couldn’t sell it commercially. That changed in June 2014, when the U.S. Department of Commerce granted DigitalGlobe’s request to sell 0.25-meter resolution imagery to its commercial customers. Because of national security concerns, the company could previously sell only 0.5-meter resolution imagery.

“I can remember a time when there was what we called the ‘10-meter rule’; a company could not commercially launch a satellite that would collect better quality than 10 meters resolution,” Zitz said. “We went from 10 meters down to 50 centimeters, and now we’re down to 25 centimeters, which is about a foot. Think about that. That’s better than seeing home plate on a baseball field. That’s discerning windshields on a car and understanding which direction the car is moving. It’s very, very high quality.”

The emergence of better supply has driven increased demand, according to Frazier, who said looser resolution restrictions allow space-based systems to compete for business in segments served primarily by the aerial market, such as agriculture, disaster relief, and land surveying.

These opportunities represent a major win not only for DigitalGlobe, but also for the U.S. government, which in recent years has become increasingly reliant on commercial imagery for its low cost and unclassified nature.

“Folks looked at [the cons] from a national security perspective,” said John Charles, NGA’s national geospatial intelligence officer for commercial imagery.

EACH PAIR of satellites in the UrtheCast constellation will include a SAR satellite and an optical satellite flying in tandem.

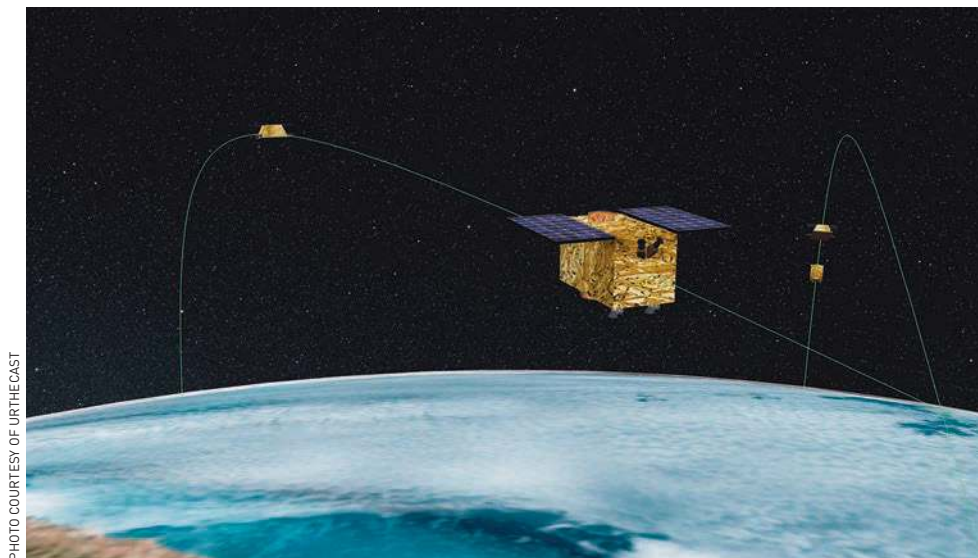


PHOTO COURTESY OF URTHECAST

"But we also looked at the pros in terms of what the commercial industry can bring to us as a partner, both in our DoD and our intelligence missions. We believe the pros outweigh the cons. ... [Lower resolution limits] allowed our strategic partners to position themselves to be more competitive and therefore to go off and take some risks ... in order to realize new and better capabilities. We believe this helps strengthen the industry and that we in the intelligence and defense communities can leverage that to our benefit."

In addition to DigitalGlobe, many commercial imagery providers are nurturing increased demand and innovation, according to Kevin O'Connell, president and CEO of Innovative Analytics & Training and co-author of "U.S. Commercial Remote Sensing Satellite Industry: An Analysis of Risks." "There has been a proliferation of people who are interested in and now participating at some level in this market," he said. "In that, we're seeing new kinds of partnerships and different kinds of demand for the data that's out there."

Case in point: Airbus Defense and Space has in the last year formed three significant partnerships—with Esri, Harris Corp. (formerly Exelis), and Hexagon Geospatial—allowing commercial access to Airbus satellite imagery.

"The commercial remote sensing industry has collectively made positive strides over the last decade," said Bernhard Brenner, head of the Geo-Intelligence Programme Line at Airbus Defense and Space. "The key challenge for now is to make the transition into the mainstream and extend our customer client base."

LESS IS MORE

Lower-resolution limits aren't the only catalyst for the rise of commercial remote sensing.

"The resolution of a satellite image is an important consideration to the GEOINT Community," Brenner said. "However, it is worth emphasizing that this is not the only consideration when choosing the optimal solution."

Consider, for example, Airbus' twin high-resolution optical data satellites, known as Pléiades. Although they travel in the same orbit, they're far enough

BY 2019, BLACKSKY GLOBAL plans to have six satellites on orbit—Pathfinder-1 and Pathfinder-2 as well as Global-1 through Global-4.



PHOTO COURTESY OF BLACKSKY GLOBAL

"THE ABILITY TO IMAGE the Earth from space has revolutionized life on this planet."

— Rep. Jim Bridenstine (R-Okla.), a member of the House Science, Space, and Technology Subcommittee

apart that at any given moment each is imaging an opposite side of the planet, giving extensive collection opportunities and a high temporal resolution.

"This constellation, especially when allied to the capabilities of [our] SPOT [wide-area optical imagery] constellation, allows for both greater change detection capabilities and improved map information updating capacity," Brenner continued.

Customer appetite for change detection and updated maps has helped spark the advent of SmallSats, which reached fever pitch this year following Google's \$500 million acquisition of SmallSat pioneer Skybox Imaging in 2014.

"Based on Google's acquisition of Skybox, the introduction of venture capital into the market is a really important development," O'Connell said. "What venture capital seeks, of course, is something that's going to make a lot of money. It often does that on the basis of taking risks. What that means in the United States, at least, is that we're going

to see proposals for systems that are potentially more innovative, potentially riskier, and for which there is the potential for a larger-scale return."

Added Adam Keith, managing director of Euroconsult Canada, "In the last four years, we've seen in the region of \$400–\$450 million of venture capital coming into the commercial remote sensing business. Prior to that, there were very few examples of venture capital coming into this world."

Planet Labs and UrtheCast are two companies that embody the SmallSat value proposition. Established in 2010, Planet Labs so far has launched 84 CubeSats, which it calls "doves." Totaling just 12 inches long, 4 inches wide, and 4 inches tall, each dove costs less than \$1 million to build; by contrast, DigitalGlobe's WorldView-3 is 23 feet long, 8 feet wide, and 18.7 feet tall, and cost \$650 million to build. The latter launched five years after its predecessor, WorldView-2; the former went through 12 iterations in less than two years.



READ MORE
about the next generation of commercial remote sensing at [trajectory magazine.com](http://trajectorymagazine.com).

A GLOBAL GAME

IN THE PAST DECADE, the commercial remote sensing landscape hasn't just changed. It's also expanded, according to global space consultancy Euroconsult, which reports a four-fold increase in the number of countries with space activities, up from 20 in 2000 to more than 80 today. According to its 2014 report, "Satellite-Based Earth Observation: Market Prospects to 2023," 33 countries launched Earth observation satellites during the last decade, and 41 countries are expected to do so during the next.

"There has clearly been a proliferation in demand across the globe," said Bernhard Brenner, head of the Geo-Intelligence Programme Line at Airbus Defense and Space.

Europe, where Airbus is based, has made especially large strides in commercial remote sensing. In a public-private partnership with Airbus, for example, the German Aerospace Centre launched TerraSAR-X and TanDEM-X—twin satellites constituting the world's first spaceborne radar interferometer, which uses microwave imaging to create high-resolution all-weather terrain maps, otherwise known as digital elevation models (DEMs). Subsequently, in April 2014, Airbus introduced WorldDEM, a global 3D DEM constructed using TerraSAR-X and TanDEM-X data.

"The accuracy of the base DEM is key to reliable information and merging of data from different sensors and sources," Brenner explained. "Thanks to WorldDEM, operators of civil and military Earth observation satellites now have a standardized elevation model at their disposal for high-quality image orthorectification—no matter where their acquisition area is located on the planet."

In April, Airbus launched the WorldDEM Digital Terrain Model, which provides a standardized representation of bare Earth elevation for any point on the globe.

"This addition completes the WorldDEM portfolio, enabling Airbus Defense and Space to provide both surface and terrain elevation information," Brenner said.

The Germans aren't alone. The French, for example, launched the seventh iteration of their SPOT electro-optical (EO) satellite (built by Airbus) in 2014, and the Italians will launch the second generation of their COSMOS-SkyMed (built by e-GEOS) synthetic aperture radar (SAR) satellites beginning in 2016. All three nations are collaborators in the European Commission's Copernicus program, which leverages unclassified data from shared EO and SAR satellites across missions of mutual interest, such as environmental protection, emergency management, and

"At Planet Labs we have what we call 'Mission 1,' which is to make change on the Earth visible, accessible, and actionable," explained Director of Government Affairs Dr. Richard Leshner, who said Planet Labs expects to have its first fully operational "flock of doves" orbiting Earth in 2016. "Our end goal is to have a satellite constellation in excess of 100 spacecraft that can image the entire surface of the Earth every day ... We want decision-makers in all spheres of [society] to be able to make intelligent and informed decisions based on changes they're seeing in the conditions around them."

Planet Labs has joined the acquisition game as well. At press time in mid-July, the company announced its intent to purchase Canadian commercial

imagery provider BlackBridge, including its five-system RapidEye constellation. The acquisition of RapidEye's six billion square kilometers of imagery at 5-meter resolution will allow Planet Labs to bring to the web one of the largest commercial satellite imagery data sets.

"It's not final, but our acquisition of BlackBridge and the RapidEye assets is a strategic business decision to get a historical data set and expand our access to a global network of customers and distributors," Leshner said. "The more data we have, the stronger we can make our data platform, which increases the speed that we're able to deliver data to our customers."

Vancouver-based UrtheCast plans to build, launch, and operate what it

claims will be the first fully integrated, multispectral optical and synthetic aperture radar commercial earth observation constellation, scheduled to be deployed over multiple launches in 2019 and 2020. Although UrtheCast's satellites will be larger than conventional Small-Sats—600 to 1,100 kilograms compared to less than 500 kilograms—they will have similar capabilities.

"Having all these sensors in space will help us realize our vision of democratizing Earth observation data, making these powerful resources more accessible and user-friendly," said Wade Larson, co-founder, president, and COO of UrtheCast, whose constellation will total 16 satellites deployed in pairs across two orbital planes, with four equally spaced pairs in each plane. "This number of

"OUR SWEET SPOT is a different kind of data set that doesn't exist anywhere else: an everywhere, everyday data set that's enabled by a platform that's affordable." — Dr. Richard Leshner, director of Government Affairs, Planet Labs

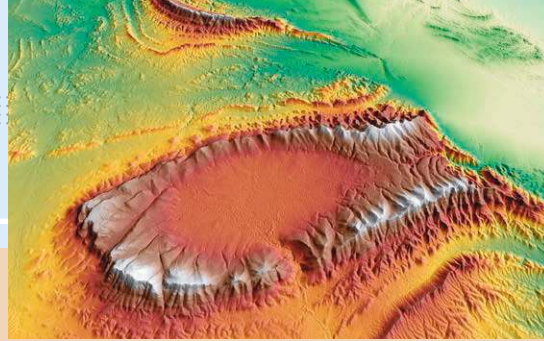
national security. The intergovernmental European Space Agency (ESA) launched the first of these shared satellites, Sentinel-1A, in April 2014, and the second, Sentinel-2A, in June.

"The data from the whole [Copernicus] program is going to be given to industry for free," said analyst David Germroth, principal of international government affairs and business development firm PACE Government Services. "It's only 5- and 8-meter resolution, but that's good enough for a lot of things users want to do with geospatial data."

According to Germroth, commercial remote sensing knows no boundaries.

"The Argentinians are putting up an L-band satellite with the Italians," he continued. "And the Japanese are throwing a ton of money into laser communications with EO and radar capabilities. They're really determined and they're moving really quickly, so we're going to see them catch up to a lot of our own capabilities within 10 years or less."

Even small nations are getting in on the action, according to Kevin O'Connell, president and CEO of Innovative Analytics & Training and co-author of *U.S. Commercial Remote Sensing Satellite Industry: An Analysis of Risks*.



"Countries like Vietnam and Egypt are both experimenting with SmallSat systems and constellations, and others—like the United Arab Emirates—are being pioneers by saying, 'We're not going to build space systems, but we're going to buy what's commercially available from everyone else,'" O'Connell said.

For the United States GEOINT community, the globalization of commercial remote sensing creates both opportunity and challenge.

"It means the GEOINT Community is going to have to do a couple things," O'Connell said. "One, it's going to have to innovate on its own in order to stay ahead of the curve. And two, it's going to have to improve its ability to leverage capabilities from the outside."

Added Orrin Mills, director of the Source Operations Group at the National Geospatial-Intelligence Agency (NGA), "The genie's out of the bottle. There's no going back [to when the United States and Russia were the only players in space], so we have to look at this as an opportunity to embrace new technologies and new capabilities, and to use them to our advantage against our adversaries."

WorldDEM

provides a pole-to-pole Digital Elevation Model. In addition to full availability of the African and Australian continents as well as the Middle East, large areas of North and South America, Northern Europe, and Asia are now available.

satellites and this configuration will enable the best revisit in the industry—not the best coverage, to be clear, but the best revisit."

Although resolution of their satellite imagery—3 to 5 meters—doesn't match that of a larger system such as WorldView-3, Planet Labs, UrtheCast, and their commercial SmallSat peers dangle a different carrot in the form of persistence and better access to specific tasking.

"Our sweet spot is a different kind of data set that doesn't exist anywhere else: an everywhere, everyday data set that's enabled by a platform that's affordable," Leshner said.

The data doesn't have to be perfect; for some customers, "quick" and "current" are more important than "clear" and "precise."

"[SmallSats] might not be defense-grade satellite systems, but if you can guarantee daily or weekly revisits regardless of weather, that can have a lot of value in the area of change detection, which has applications across multiple sectors," Keith said. "With those capabilities, these companies have the potential to open up existing markets

and even develop new ones."

The possibilities are staggering, according to Jason Andrews, president of SmallSat startup BlackSky Global and president and CEO of Spaceflight Systems, a space logistics company providing "rideshare" launch services for commercial satellites.

"Ten years ago we didn't even have Google Maps. We went down to the local map store, and that was our view of the world," Andrews said. "For the last decade we've been able to go on the Internet and look at Google Earth, but it's a very static environment. The future we're working toward is 'Google Earth Live.' If you want to see how many cars in a Wal-Mart parking lot in Duluth at 4:30 in the afternoon, these new constellations will be able to tell you."

In 2016, BlackSky Global will launch the first six satellites in what will eventually be a constellation of 60.

"Moore's Law has advanced the size, weight, and power of modern electronics into something that can be packaged cost effectively in a small form factor," said Andrews. "You have to live with the fact that it's only going to last in space for a couple of years, but because it's

cheap enough, that's OK; you can afford to replace it. On top of that, the availability of launch services like Spaceflight means there's much more ready access to space. That supports everybody in this industry."

NURTURING INNOVATION

SmallSat operators face just as many challenges as opportunities, acknowledges Andrews.

"The number of satellites being launched is very exciting. But at the same time, a lot of promises so far have gone unfulfilled," he said. "As an industry, we have to be really careful about overhyping the potential. Our customers are receptive to these new capabilities, but we have to deliver. That requires management of expectations, realistic timelines, and focusing on the end product."

It also requires government support, according to Leshner.

"As more companies try to get into commercial remote sensing, it will put added pressure on NOAA (the National Ocean and Atmospheric Administration) to respond efficiently and rapidly to provide licenses for operation, and



READ MORE
about the future
of forecasting at
[trajectory
magazine.com](http://trajectorymagazine.com).

on the national security community to become comfortable with the explosion of data providers.”

To that effect, Bridenstine in May introduced the Commercial Remote Sensing Act of 2015, proposing regulatory reform to encourage growth in the U.S. commercial remote sensing industry.

“I have been focusing on these issues for the past two years [and] have seen constant innovation within industry. Every few months, companies come to tell me about new products or capabilities they’ve developed ... I think it is crucial that government not stamp out this momentum.”

A second bill Bridenstine co-sponsored that was introduced in March—the Weather Research and Forecasting Innovation Act—would authorize \$9 million for a pilot program under which NOAA would be required to purchase space-based weather data from commercial providers and test it against NOAA proprietary data.

“While this is a small amount, it serves as a necessary first step,” Bridenstine said. “The pilot program signals to the private sector and potential investors that Congress and NOAA are interested in buying data, and it allows NOAA to verify that forecasts can be enhanced with commercial providers.”

The weather bill, which passed the House in May and is awaiting action in the Senate, could be a major boon to commercial remote sensing, according to Dan Stillman, senior manager of corporate marketing and communications at PlanetiQ, a SmallSat company aiming to launch the world’s first commercial weather satellite constellation by 2017. “If it’s passed, it will send a clear signal to those who would invest in companies like ours that there is going to be a buyer for our data,” Stillman said.

NOAA isn’t the only government agency looking to leverage emerging commercial capabilities. NGA is also taking steps to fortify industry.

“In the last few years we’ve made some architectural changes on our side, as well as process changes, so that we’re better positioned to take advantage of the abilities that commercial imagery has brought to bear,” Charles said. “The biggest thing, though, is that commercial imagery has changed from being a

one-off, unusual piece of source material to being something that our team ... and our customers are more accustomed to using on a regular basis. We include it in our everyday workflows and processes. That, combined with the greater facilitation with our architecture and our processes, has really made it a continuing and important piece of where we are going forward.”

In May, NGA issued a request for information targeting the SmallSat sector. The “NextGen Commercial Imagery Strategy and Architecture to Acquire Imagery Products and Services” RFI indicates NGA’s intent to acquire commercial imagery from “one or more” SmallSat vendors beginning as early as FY 17.

“The SmallSat providers have certainly caught our attention,” said Charles. “Often, an RFI is nothing more than an RFP with the word ‘RFI’ stamped on top of it. In this case, it is really an RFI. We’re trying to understand the business plans, business desires, and goals of emerging providers ... so we can position ourselves to best take advantage of [their data] as these capabilities mature.”

NGA is particularly interested in the revisit rates—ranging from multiple times a day to multiple times an hour—promised by SmallSat constellations.

“We think there’s opportunities there for analytics that simply aren’t possible when your revisit rate is every three days,” Charles added.

NGA support is not just welcome, but essential, according to Zitz.

“There is rationale for NGA and the rest of the national security community to take a hard look at investments stimulating this industry so small satellites ... can realize what I honestly think they can achieve,” Zitz said. “That’s how GeoEye and DigitalGlobe came about—from early investments by the government to stimulate that class of capability.”

PIVOTING TOWARD ANALYTICS

The GeoEye-DigitalGlobe merger in January 2013 was a seminal event for commercial remote sensing. The product of federal budget constraints, which in 2012 led NGA to abandon its 10-year EnhancedView contract with GeoEye after only one year, the merger

has ushered in a new era for the combined companies, according to Frazier, who said DigitalGlobe is moving from a focus on data collection to a focus on data analysis.

In addition to merging with GeoEye, which previously had an analytics business run by Frazier, DigitalGlobe acquired Tomnod in 2013 and Spatial Energy in 2014. Tomnod enables crowd-sourced image analysis, while Spatial Energy provides aggregation and dissemination of multiple sources of remote sensing data for the oil and gas industry. The company is also developing new products and partnerships to integrate data from social media and SmallSats into its base maps.

“If you have the ability on the ground to ingest myriad sources of information, you could bring in very coarse imagery at 3- or 5-meters [from SmallSats], but then real-time correlate that with higher-quality imagery that has been shot in the recent past and tie it to video and other geo-referenced data sources,” Zitz explained.

Which is exactly what customers like NGA covet.

“We cannot allow ourselves to become inundated with all the data that’s out there,” said NGA’s director of persistent GEOINT Jennifer Daniel. “We have to be able to create coherence. We have to be able to take data, and we have to be able to connect it and understand it ... to maximize the capabilities of all our [data] sources.”

The fusion of the new variety of commercial data sources represents the future of the GEOINT Community, which through automation and integration will be able to turn geospatial information into a commodity that’s searchable, shareable, and actionable.

“[We’re entering] a revolutionary period that’s going to change the way people can view where they are in context and what they’re doing in context with data sources that are multiple and varied and can be combined to provide a lot of rich information content in a way that wasn’t really feasible just a handful of years ago,” Leshner said.

The skies may be darkening, but the next generation of commercial remote sensing promises to shed more light on Earth than ever before. ■■

**Advertise in
the Q4 Issue**

trajectory

THE OFFICIAL MAGAZINE OF THE UNITED STATES GEOSPATIAL INTELLIGENCE FOUNDATION

FEATURES:

**The GEOINT
Revolution**

**DC-Based
Innovation**

**2015 USGIF
Scholarship
Winners**

**AD CLOSE AUG 27
ART DUE SEP 17**

CONTACT Jeff Ley
jeff.ley@usgif.org
571.392.7202

**SPECIAL Distribution at
2015 GEOINT Community Week**

The official publication of  **USGIF**



a SIGNAL FR

GEOINT HOLDS PROMISE FOR UNDERSTANDING CLIMATE

BY MELANIE D.G. KAPLAN



OM THE

NOISE

CHANGE THROUGH THE LENS OF NATIONAL SECURITY.



n a sunny afternoon in May, President Barack Obama stood before a class of U.S. Coast Guard graduates and unequivocally made the case for climate change as a national security issue.

“I’m here today to say that climate change constitutes a serious threat to global security, an immediate risk to our national security, and make no mistake, it will impact how our military defends our country,” he said.

The same day, the White House released a new report, “The National Security Implications of a Changing Climate,” which chronicles the national security implications of climate change and stresses that its impacts increase the “frequency, scale, and complexity of future defense missions.”

For days, the Internet was abuzz with reactions. Some applauded President Obama's strategy; some questioned whether national security is the best lens through which to frame climate change. In short order, headlines returned to crises that demanded immediate attention: torrential downpours in Texas, record-breaking heat in Alaska, drought in California, a deadly heat wave in India.

In his speech, President Obama said terrorist group Boko Haram exploited the instability partially created by severe drought in Nigeria, and that drought and crop failures helped fuel the early unrest in Syria. Regardless of the causes of climate change, the U.S. now faces increasingly volatile environmental conditions on American soil as well as in politically fragile parts of the world that can't be ignored. The resounding call is to arm our defense, intelligence, and homeland security communities with environmental intelligence in order to better anticipate climate-related security threats.

The GEOINT Community plays a critical role in leading the effort to better

understand climate change and mitigate damage. From imaging and measuring the Earth to mapping environmental and human risks, GEOINT can provide increasingly accurate and timely information about a changing planet to yield better decision-making.

Yet there are many uncertainties: How can the dots be better connected with current data? How can warnings be improved? What is the best way to graphically represent the second and third order national security effects such as changes to growing seasons and water security? How is a changing climate tied to extreme weather events?

"The question that many policy-makers have is, when an extreme event happens, can it be scientifically tied to the fact that we've changed the climate?" said Rear Adm. (ret.) David Titley professor of practice at Pennsylvania State University's Department of Meteorology and director of the Center for Solutions to Weather and Climate Risk. "For millennia we've had storms and droughts, but the data shows that we're having more severe heat waves. When it rains,

it rains harder." Connecting these events with climate change, he said, requires adequate monitoring. "Having long-term time series is very important. 'If you can do that long enough, the signal comes out of the noise.'"

Retired Air Force Maj. Gen. Richard Engel, director of the National Intelligence Council's (NIC) Environment and Natural Resources Program, said he's not surprised certain weather phenomena, such as an increase in the number of extreme weather events, are occurring as a result of climate change; however, the rate at which this is happening is disconcerting.

"If these really are fundamental changes we're seeing, and not just the normal statistical variation in weather," he said, "we're in for one whale of a rough ride."

A 2013 Harvard report, "Climate Extremes: Recent Trends with Implications for National Security" details the security risks of extreme weather and climate change, finding that higher temperatures, stronger tropical cyclones, wider areas of drought, increased precipitation, Arctic warming, and continued sea level rise will affect water and food availability, energy decisions, and the design of critical infrastructure. The report stressed the U.S. government is not prepared for the "new climate normal" and must better observe key indicators, monitor unfolding events, and forewarn of impending security threats.

The biggest environmental threats to national security are threefold: changes in the Arctic, sea level rise, and extreme weather, which includes dangerous heat, drought, and flooding.

WHEN WEATHER FUELS THE FIRE

The United Nations Intergovernmental Panel on Climate Change (IPCC) projects sea level could increase up to 23 inches this century. Satellite data collected over a 23-year period beginning with the TOPEX/Poseidon launch in 1992 shows a steady global sea level rise of about three millimeters per year, nearly 50 percent faster than the rate in the previous century.

Although the Arctic is changing faster than anywhere else on Earth thus far, nations have been working together



STATE DEPARTMENT PHOTO/PUBLIC DOMAIN

EXPERTS BELIEVE CLIMATE CHANGE can lead to political unrest and civil wars. In July 2013, the Za'atari refugee camp in Jordan had grown to the country's fourth largest city in the aftermath of the Syrian Civil War.

GEOINT & Forecasting

to keep the region peaceful. Russia and the U.S., for example, recently agreed to regulate trawling in newly melted waters. However, rising temperatures and melting permafrost means reduced military vehicle access, degraded infrastructure, and uncharted waters for commercial activity. Most significantly, the melting Arctic is a major factor in sea level rise around the globe.

Sea level rise has led to more frequent “nuisance flooding”—whether at the Tidal Basin a mile south of the White House or in the streets of Miami—but the potential for greater flooding has prompted the U.S. Navy to carefully examine its coastal bases in conjunction with geospatial data such as tidal gauges and LiDAR to ensure the service is prepared for long-term operations.

Bordering India’s east coast, Bangladesh—a country the size of Iowa with a population of 157 million—is often cited in sea-level rise scenarios. As heights increase, millions of people will be dislocated from the country’s coastal flood plains. A flood may drive the people of Bangladesh to move into areas or across borders where they’re not wanted, causing food and water shortages, or worse—violence.

Christine Parthemore, a senior research and policy fellow at the Center for Climate and Security, who previously worked at the Department of Defense (DoD) and teaches a class on climate change and national security at Johns Hopkins University, said her biggest worry is we’re too focused on the Arctic, where it’s easy to see ice melting. According to her, the most serious geopolitical hotspots lie between 20 degrees north and south of the equator.

“We need to look at North Africa and a lot of places in Southeast Asia that are both important to U.S. security interests and strategy,” she said. “I think climate change is going to wreak havoc in these parts of the world, and we have the knowledge to put these pieces together and mitigate the potential security risks.”

The unknown destabilizing potential of extreme weather is what defense experts are calling a “threat multiplier”—weather events are not causing wars, infectious disease, or terrorism, but they are a contributing factor.

Marc Levy, deputy director of

Columbia University’s Center for International Earth Science Information Network and an author of the IPCC report, said he’s never seen anything more serious in security terms than climate change. Levy added it’s easy to imagine how a political hotspot layered with a climate hotspot could result in disaster, citing examples of regions where preexisting grievances coupled with an unprecedented drought or flood has led to unrest.

The Syrian Civil War is the latest candidate for what Levy calls a “climate war,” given the unprecedented, widespread drought, massive relocation, and violence, leading to 3.3 million refugees and a death toll of 220,000.

“I think the easiest thing the Pentagon deals with is the operations stuff—trucking in water because local supplies have run out,” Levy said. “Harder to handle are the effects from a climate shock that trigger a breakdown of order—political events like the Arab Spring, a severe food crisis, or refugee camps in Europe with people crossing the Mediterranean.”

FROM THEORY TO APPLICATION

In addition to the IPCC and White House reports, the climate change-national security connection is the subject of numerous reports from a number of organizations, including the NIC, G7, National Research Council (NRC), and CNA Military Advisory Board. Climate change has also been addressed in the DoD’s Quadrennial Defense Review and the Director of National Intelligence’s Worldwide Threat Assessment.

While the DoD and Intelligence Community have said publically climate is a threat to be taken seriously, the question remains: What are they doing about it?

“It’s one thing to mention in a report, another to take action,” Levy said.

Lt. Gen. (ret.) Mike Flynn, former director of the Defense Intelligence Agency, said thinking about chronic, long-term threats such as climate change is difficult for Americans, versus threats in front of us today, such as extreme weather or ISIS.

For starters, the government needs a clear message and plan, and neither has

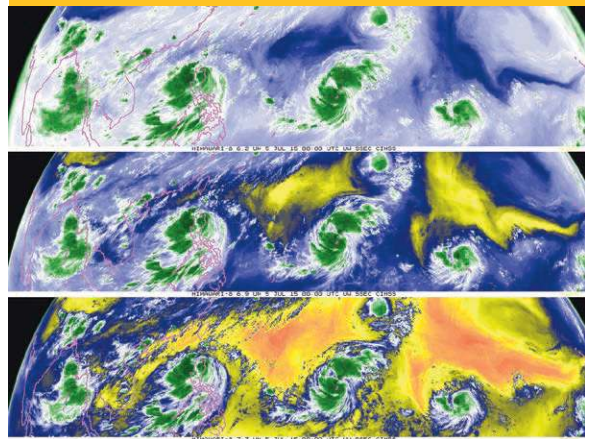
The defense and intelligence communities have an increasing need for the timeliest and most accurate information on cloud characterization, soil moisture, snow depth, cyclone intensity, and ocean winds.

Throughout history, weather information has been sourced from balloons, ships, airplanes, and radar. Today, satellites provide the backbone for global coverage and weather models, and the new generation of satellites will help us better understand storms and weather patterns. Their effectiveness depends on each satellite’s orbit, instruments, and technologies, as well as the time lag between data capture and availability.

The National Oceanic and Atmospheric Administration (NOAA) operates two types of satellites: polar operational environmental satellites (POES), which fly 540 miles above Earth’s surface and provide full global coverage and weather predictions for up to a week in the future; and geostationary operational environmental satellites (GOES), which remain stationary above the equator at an altitude of 22,300 miles and provide near-continuous observation of a fixed region. POES help predict the intensity and location of severe weather events several days in advance, such as in the case of the infamous “left hook” track of Hurricane Sandy.

NOAA is working with NASA to develop the next generation of POES, called the Joint Polar Satellite System (JPSS), which is planned for

CONTINUES TO PAGE 26 >



THE IMAGES ABOVE show two days of water vapor imagery from Himawari-8 over the tropical Pacific, revealing a train of three tropical cyclones moving westward toward Asia.

IMAGE COURTESY OF HARRIS

launch in 2017. Offering full global coverage twice a day, the system will increase timeliness and accuracy of public warnings. JPSS includes a Cross-track Infrared Sounder to measure atmospheric temperature and water vapor, which will improve both short-term weather “nowcasting,” long-term forecasting, and our understanding of major shifts like El Niño.

The GOES-R Series, also a collaboration between NOAA and NASA, is the next generation of geostationary systems. It is expected to launch in 2016 with Harris’ Advanced Baseline Imager and Lockheed Martin’s lightning mapper, both of which will provide more advanced imaging of environmental phenomena that directly affect public safety.

NASA’s ISS-RapidScat, which launched in 2014 and sits outside the International Space Station, provides data about wind speed and direction over the ocean. The scatterometer plays a critical role in producing weather forecasts that inform ship deployments and rerouting. NASA’s Soil Moisture Active Passive (SMAP) satellite was launched into a polar orbit this year and uses a radiometer and spinning antenna to measure the water in the top two inches of soil, offering high-resolution data for local weather forecasts, drought early warnings, and flood warnings. Further, SMAP provides operational benefits for DoD with its ability to assess terrain and ice characteristics as well as forecast dust and fog.

The U.S. also uses satellite data from other countries. For example, data from Japan’s new Himawari-8 weather satellite may be factored into U.S. weather models.

However, not every country that shares weather information is a U.S. ally, and recent discussions have brought to the forefront the question of how much the U.S. should depend on certain nations for this data. As some satellites retire, specifically, Meteosat-7—a European satellite that provides Indian Ocean and Middle East coverage—the U.S. may find a gap in weather coverage in a critical area of the world.



been communicated well to Americans, Flynn said. Those having a hard time putting bread on the table need a “crystal clear explanation” as to why climate change matters.

“I don’t think the Intelligence Community has done it well, I don’t think the administration has done it well, I don’t think the international community has done it well, and the presidential candidates aren’t talking about it,” Flynn said.

Muddying the White House’s message, the CIA shut down Medea, its decades-old, off-and-on climate study program in May, just days after the administration released its “National Security Implications of a Changing Climate” report. The program had provided civilian scientists with environmental data collected by submarines and satellites to help study the connection between security and climate change.

Meanwhile, the U.S. Geological Survey’s Civil Applications Committee (CAC) allows civilian agencies access to classified satellite imagery for non-military, non-classified purposes such as monitoring climate change. CAC activities include remote sensing applications such as monitoring sea ice, glaciers, and volcanoes; detecting and tracking wildfires; coordinating emergency response to natural disasters; and monitoring ecosystems.

The consensus among experts is a lack of information sharing and no central authority hinders analytic capabilities.

Rear Adm. Jonathan White, director of the Navy’s Task Force on Climate Change, said the U.S. needs to better fuse and synchronize observations of what’s happening at ground level with the ability to predict what is coming in terms of a changing climate.

For example, we can zoom into Google Maps to see a restaurant, but in the future, White said, could we pull up a map and see what a flash flood would do to the same block?

“Then we could start making decisions,” White said. “That granularity is something we should be striving for. We’re not there yet, but it starts with GEOINT.”

The National Geospatial-Intelligence Agency (NGA) has taken a large step in this direction, recently awarding

Arizona State University a \$20 million, multi-year grant to fund the Foresight Initiative. The initiative examines how to anticipate and visualize global environmental change, specifically as it relates to national security.

Ted Cope, NGA’s director for Basic and Applied Research, described climate change as a “wicked problem with no solution,” but with a set of continual tradeoffs. For example, he described the tradeoff of increasing the amount of water released from a hydroelectric dam during an extended drought to sustain agricultural needs while diminishing the electrical production of the dam, which would cause widespread economic impacts. He said Foresight, when fully realized, will allow multi-discipline government experts, planners, and decision-makers to collectively “see projected outcomes of their decisions and policies” leveraging models, simulations, and supercomputer power to formulate mitigation and adaption strategies.

Cope said Foresight will also demonstrate how GEOINT can contribute authoritative data to serve as a credible “game board” to establish a foundation for launching anticipatory conjectures.

In June, NGA and the National Center for Atmospheric Research held a first of its kind Climate and Human Security–Geospatial Data and Mapping symposium at the University of Colorado at Boulder. The goal of the symposium was that it serve as a catalyst for a “broad community of purpose across the government,” Cope said, “to explore how we collectively could get better synergy for tackling the complexities of climate change effects on national security-related issues.” A conference paper published late this summer will capture the proceedings and recommended actions.

The European Space Agency (ESA) is taking steps to study climate change as well. Satellite data can be used to capture wavelengths of fluorescent light from vegetation and determine the level of photosynthetic activity in that vegetation. This practice has already been done using data from systems such as Japan’s Greenhouse Gases Observing Satellite and Europe’s Global Ozone Monitoring Experiment. However, ESA’s Fluorescence Explorer (FLEX)

"I don't think the Intelligence Community has done it well, I don't think the administration has done it well, I don't think the international community has done it well, and the presidential candidates aren't talking about it." — Lt. Gen. (ret.) Mike Flynn



satellite is expected to provide unprecedented capabilities in fluorescence observation and help scientists better understand the global carbon cycle, state of food security, and effects of climate change on crops. FLEX is a candidate for ESA's eighth Earth Explorer mission in competition with CarbonSat, which intends to study levels of carbon dioxide and methane in the atmosphere to understand how they are linked to climate change. ESA and the Earth observation community will select in September which mission will launch under Earth Explorer.

GAPS REMAIN

For the amount of scientific data we have on the world's changing climate, we still lack the ability to predict its effects, said Jim Baker, director of Forest and Land-Use Measurement for the Clinton Foundation. The ability to answer the queries of the Intelligence Community (How much will it rain? What will this volcano do?), he said, requires a stronger understanding of the atmosphere, as well as faster computers to crunch the data.

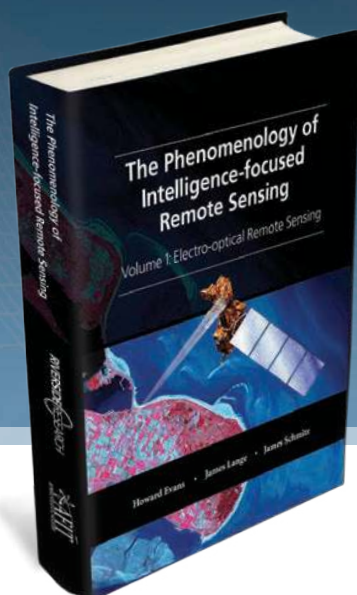
"We know the overall trends, but knowing when a drought or storm will

start or end is very tough, and that's exactly what national security wants," Baker said. "If you have an area of conflict—Syria or Iraq—and there's a big change in climate there, do you know what the weather impacts are? Other than broad predictions, I'd say no."

Security experts say the only thing harder than predicting the climate is predicting human behavior. Climate change is largely a human geography problem, rather than one of physical geography. When a region is hit with a climate shock, one community may come together and become more resilient while the other deteriorates and becomes violent. How will any one population react?

Currently, the Intelligence Community addresses such questions by gathering multidisciplinary subject matter experts on a particular region, Engel said.

"If the climate scientists tell us in 2040 [a particular] country will experience [a predicted] kind of stress, you ask the experts, 'how will people



RIVERSIDE RESEARCH

FIRST-OF-ITS-KIND

Remote Sensing Textbook AVAILABLE SEP 2015

PHENOMENOLOGY • SENSORS • INTELLIGENCE APPLICATIONS

"As an imaging science engineer with a career in remote sensing, I have witnessed extraordinary accomplishments when science and technology are harnessed to produce new mission understanding. This book benchmarks the state of understanding so our next generation of engineers and scientists can innovate and advance intelligence tradecraft."

Jeffrey K. Harris—Former Director of the National Reconnaissance Office



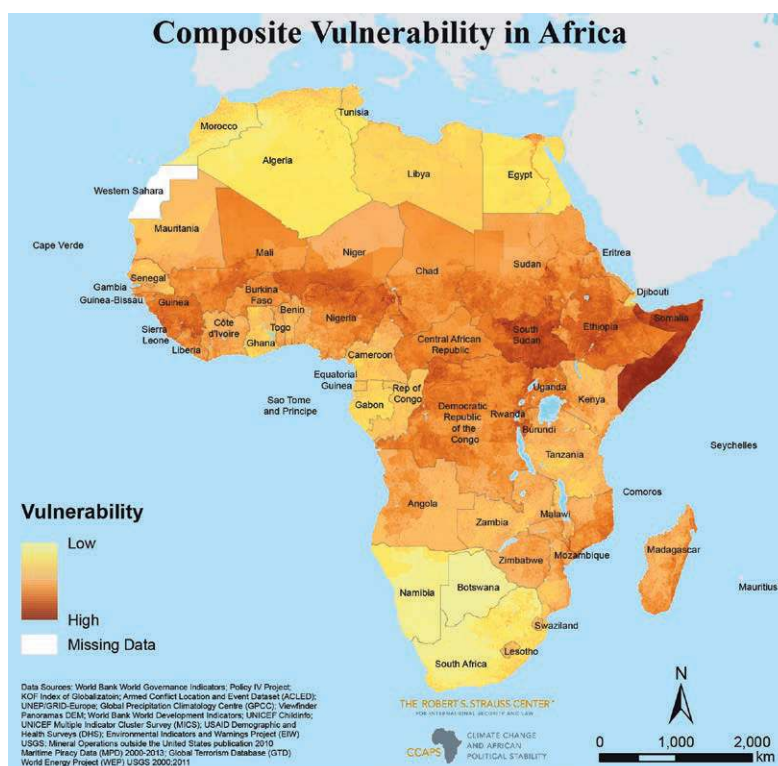
PRE-ORDER NOW

www.riversideresearch.org/textbook

Textbook proceeds
will be donated to:

USGIF
Scholarship Program

THIS COMPOSITE MAP factors four variables to determine climate change vulnerability: physical exposure, population density, household and community resilience, and governance.



react?” he said. “In a part of the world that has high Internet connectivity and an existing grievance against the government, a stress from climate change may put people in the streets and result in social disruption, if not political disruption.”

However, the Intelligence Community is working toward visualizing such intelligence. That’s exactly what the Climate Change and African Political Stability Program (CCAPS) at the University of Texas at Austin’s Robert S. Strauss Center is doing. Funded by DoD’s Minerva Initiative, CCAPS’ online tool enables policymakers to visualize data sets on climate change vulnerability, conflict, and aid in any combination over set time periods for any African country. The tool uses

historic and real-time data to depict chronic hotspots and relative vulnerability levels, and is intended to be a point of departure for further dialogue.

With a \$1.9 million grant from the Pentagon that began in September 2014, the center is developing a similar tool for South and Southeast Asia that is expected to be available next year. The center is also starting work on a Middle East mapping project to explore the nexus of water, energy, and human security. Finally, they’re looking at adding the ability to explore different scenarios, i.e., if health care quality or sanitation were improved one percent, how would that change overall vulnerability? Ashley Moran, associate director of the center, said the idea is to create plug-and-play tools that can

interface with existing DoD systems and allow decision-makers to explore intervention strategies.

The Air Force’s 14th Weather Squadron is also exploring how to overlay maps with public health data that would be useful in better preparing for situations such as Haiti, where a devastating earthquake was followed by a hurricane and a cholera outbreak. In addition, the squadron is working on creating a global version of the U.S. Drought Monitor so the DoD and Intelligence Community can improve six-month outlooks. This would inform them when a country is 90 days from running out of water, and enable them to visualize reservoir levels and local unrest as a drought becomes imminent.

Levy said connecting the dots in these ways is more important than any one initiative. He noted that an NRC report, which recommended the Intelligence Community establish a system of periodic “stress testing” for countries to better manage potentially disruptive climate events, made an important suggestion, but the government hasn’t yet acted on the recommendations.

The Intelligence Community wants to know how to determine risk, said Roger-Mark DeSouza, the Wilson Center’s director of Population, Environmental Security and Resilience.

“How do you assign a value for risk that you can use for decision-making?” he said. “You try to be objective, but it’s a little bit of an art. If there’s a way to do that in terms of technology, it would be very compelling.”

Cope said at NGA, the bigger challenge is not the technology, but rather educating a new generation to think about these multidimensional problems and to reason spatially, temporally, and contextually. He said the next level of capabilities would enable users to see connections and interdependencies as well as consequences of their decisions before they’re made.

“How can we enable people to make these good resource decisions and help them visualize the outcome?” Cope said. “Having a keen grasp of the near present, having insights to connections, and observing that something has changed—that’s what gives us that magic anticipatory power.” ■

“Having a keen grasp of the near present, having insights to connections, and observing that something has changed—that’s what gives us that magic anticipatory power.”

— Ted Cope, director for Basic and Applied Research, NGA



All the Buzz about Geospatial Biz

NOW
SHOWING
LIVE

12:00 PM Mon-Thu
Eastern Time

GeoBytes

Not just news

Industry Upbeat

Comprehensive Industry Analysis

Open.Edu

Geospatial Education for all

www.geobuiz.com



CONNECTING MAP USERS & MAKERS

TERRAGO'S MOBILE MAPPING SOFTWARE GROWS AND IMPROVES ALONGSIDE SMARTPHONE AND GPS TECHNOLOGY

In the late '90s, telecom giant Southwestern Bell Telephone Company (SBC) acquired many “baby Bells,” which brought with them a mishmash of regional maps ranging from Computer-Aided Design diagrams of Chicagoland infrastructure to 100-year-old hand-drawn maps of lines running through West Texas ranch country. In a quest for order and computerized mapping capabilities for its service trucks, SBC turned to TerraGo's one-time parent company, Layton Graphics, to standardize its maps.

While working toward uniformity, “Sooner or later, somebody asked the logical question: ‘Can we hook up GPS to this?’” said George Demmy, TerraGo's chief technology officer, who has been with the company since its Layton Graphics origin.

“That's partially what got us into the geospatial side of things.”

As the millennium arrived, TerraGo transformed SBC's static maps into interactive georeferenced PDF map books with supporting software to allow for measurements and display of coordinates. This helped workers in the field find what they needed more quickly or to point out items on the map to headquarters for correction or update. The National Geospatial-Intelligence Agency and Army Geospatial Center got wind of this capability and adopted Layton Graphics' GeoPDF tools to make maps easier and quicker for warfighters to create and use.

As a result, Layton Graphics in 2005 spun off its mapping software business as TerraGo, which has

< DESIGNED TO DELIVER availability in disconnected and low-bandwidth environments, TerraGo expands geospatial intelligence products to warfighters and personnel anywhere, without requiring connectivity or complex geospatial tools on their desktops, field-deployed laptops, or mobile devices.

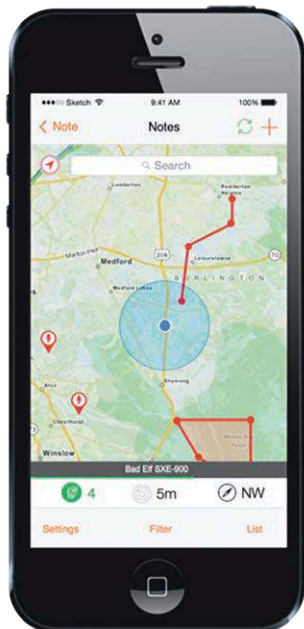
for the last decade created tools to facilitate map creation and dissemination.

“Our purpose at TerraGo was then and has always been providing tools for people to better communicate their work, information, data, and insight to the widest possible community,” Demmy said.

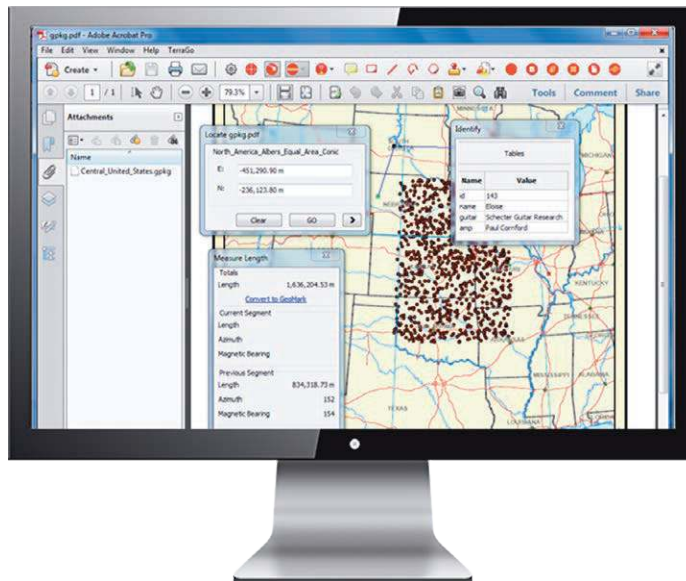
The company was at the forefront of the smartphone revolution, helping companies use mobile devices to collect geo-referenced data and receive maps in the field. TerraGo leadership predicts a near future where this process will be as ubiquitous as social media.

“If you think about some of the paradigms of social networking—ease of use, the ability to share what you see and what you understand in a trusted environment of only the people who need to see it—that’s what we’re trying to do [with maps] at TerraGo,” Demmy said.

Communications between headquarters and personnel in the field have only improved as smartphones get smarter. When Apple and Google added location capability to their respective mobile device operating systems in 2007, organizations had options for a growing number of GPS uses



TERRAGO EDGE enables personnel to collect GPS field data from a mobile device and synchronize location notes, including forms, photos, and videos with headquarters in real-time.



TERRAGO'S OPENGEOPDF

combines open spatial database features and application logic within portable, intelligent maps so intelligence can be delivered to and from the tactical edge of any mission.

in decision-making as well as access to an increasingly smartphone savvy workforce.

TerraGo developed its Edge product to take advantage of emerging location-based smartphone tools, suggesting smartphones—particularly those attached to Bluetooth GPS receivers—were capable of highly accurate geospatial data collection.

“Edge is a distributed, enterprise-managing, group-sourcing application that’s got a server component and uses mobile clients to collect and share information,” Demmy explained.

Data sharing brings TerraGo back to its roots. With Edge, offline mobile devices can gather geo-referenced photos, videos, and notes to be sent to organization headquarters and compiled into maps once connectivity is regained. The maps are returned to the field for use and further updates.

“Talk about democratization of data,” Demmy said. “Where once you had several dozen piles, now you’ve got this OGC (Open Geospatial Consortium) GeoPackage that can actually be consumed through SQLite technology, which is on every smartphone and web browser on the planet. It can be consumed on non-geospatial and geospatial workflows as well. That’s democratization of data in spades.”

Companies now use mobile devices to perform surveys and utility fieldwork, inspect oil and gas pipelines, dispatch

“We’re not a GIS company in the sense that we don’t build geographic information systems—we extend them and make them more relevant.”

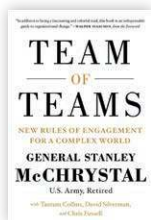
— George Demmy, chief technology officer, TerraGo

emergency services, track transportation and shipping, and much more.

As the smartphones and location-enabled technology continue to proliferate, TerraGo’s products are hardly static. The company’s GeoPDF-oriented software suite is at version 6.7, and Edge recently introduced version 3.6.

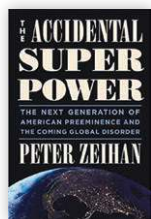
“We’re not a GIS company in the sense that we don’t build geographic information systems—we extend them and make them more relevant,” Demmy said. “We don’t create the document workflow software, we extend document workflows and make them more powerful. What we do is connect the person making the map to the person consuming the map, and we create a very intimate relationship between the two. We need location in order to do that job effectively.” ■ BY JIM HODGES

READING LIST

**TEAM OF TEAMS: NEW RULES OF ENGAGEMENT FOR A COMPLEX WORLD**

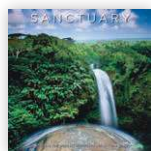
By Gen. Stanley McChrystal, U.S. Army (Ret.)

McChrystal set out to discover whether the lessons he learned as commander of Joint Special Operations Command were unique to the military or if they reflected a universal change that could be applied to government and business. The findings make the case for modern organizations to develop a “team of teams,” and eschew traditional hierarchy to instead promote transparency and decision-making throughout their organizations.

**THE ACCIDENTAL SUPERPOWER: THE NEXT GENERATION OF AMERICAN PREMINENCE AND THE COMING GLOBAL DISORDER**

By Peter Zeihan

In his book, international strategist Peter Zeihan examines how geography will matter more than ever in a de-globalizing world, and how America’s geography is sublime when considering factors such as free trade, energy independence, and an aging population.

**SANCTUARY: EXPLORING THE WORLD’S PROTECTED AREAS FROM SPACE**

By The Institute for Global Environmental Strategies

From the Great Barrier Reef in Australia to the Sundarbans in Bangladesh, this collection of stunning satellite images and nature photography highlights how the view from space is an important tool to help protect some of the world’s most threatened locations.

USGIF
EVENTS
CALENDAR**SEPTEMBER**

8

GEOINteraction
Tuesday, Va.

OCTOBER

5-9

GeoAcademic Week
Herndon, Va.

20-21

NGA Tech
Showcase West
St. Louis, Mo.

NOVEMBER

16-20

GEOINT Community
Week
Northern Virginia

DECEMBER

1-2

GEOINT 101
Herndon, Va.

FEER INTEL

The **Radiant Group** acquired data analytics and software development company **HumanGeo**. The acquisition will enhance The Radiant Group’s technology offerings by adding HumanGeo technology in the area of mission-focused data analytics. HumanGeo will retain its company name and leadership team.

Former USGIF Chairman of the Board **Stu Shea** was appointed to the board of trustees at Riverside Research. He was formerly COO of Leidos and has more than 30 years of leadership and business development experience in the government contracting space. Shea is now CEO of Shea Strategies.

Boeing announced several executive appointments effective in June following the creation of a data analytics group within its defense, space, and security business. USGIF Board Member **Dewey Houck** is now chief data analytics officer for defense, space, and security. Houck was previously the vice president and general manager of electronic and information solutions for Boeing’s network and space systems business.

L-3 Communications appointed **Mark Von Schwarz** senior vice president and president of the company’s Aerospace Systems business segment. Von Schwarz is a 15-year veteran of L-3, having previously served as president of the ISR and Aircraft Systems section and Mission Integration division of L-3 Aerospace Systems.

Dr. Kirk Borne was hired to serve as principal data scientist with Booz Allen Hamilton’s strategic innovation group. Borne was previously a George Mason University professor of astrophysics and computational science focused on data science education and research.

Northrop Grumman appointed **Steve Lunny** vice president and program manager for its intelligence, surveillance, and reconnaissance division within its information systems sector.

American Systems added **Keith McGhee** to its executive team. McGhee serves as vice president and director of the global training and development directorate, overseeing the group’s business development, financial management, and workforce management goals.

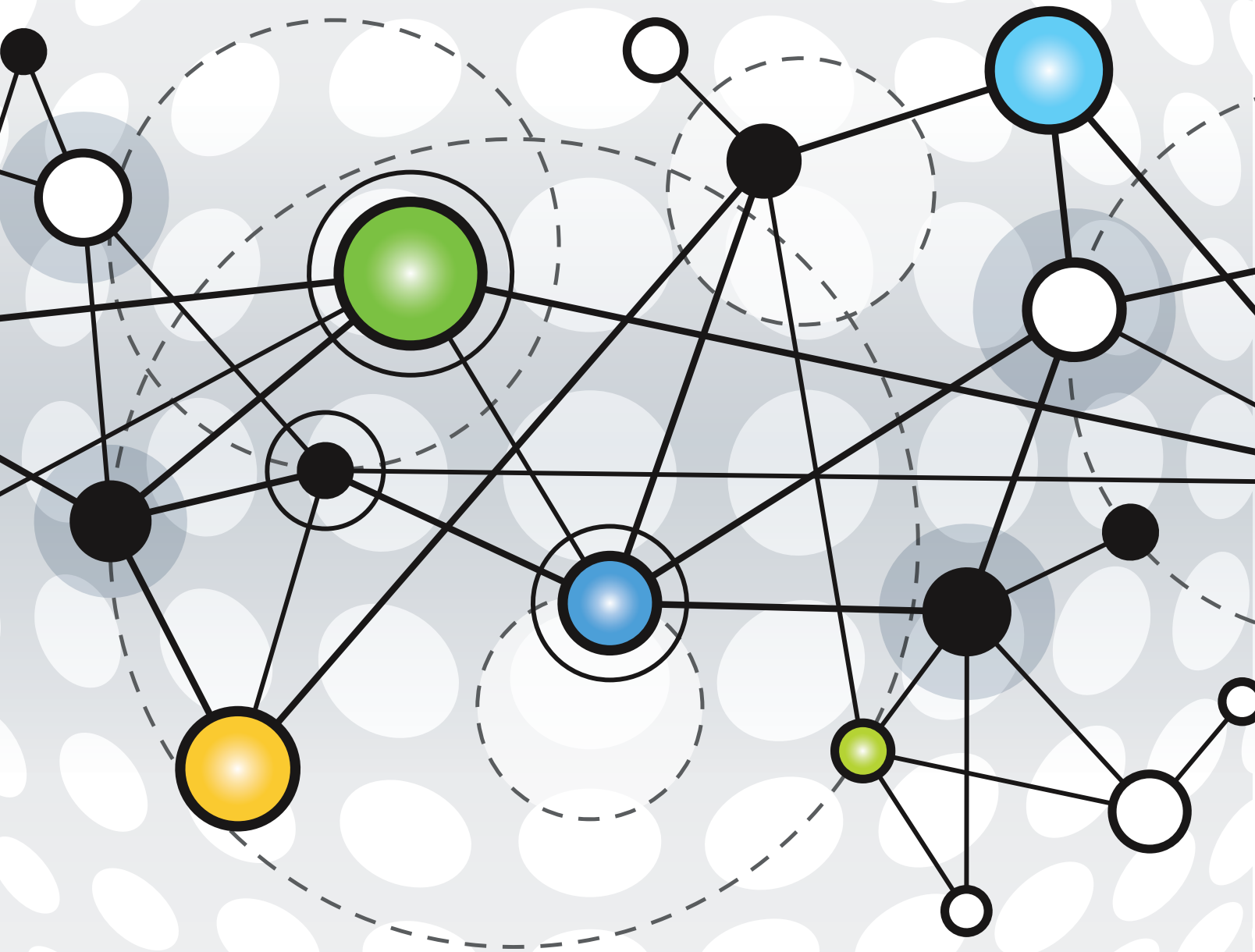


USGIF

2015 GEOINT COMMUNITY WEEK

NOVEMBER 16-20 ☀ **NORTHERN VIRGINIA**

**Join us for a week of briefings, educational sessions, workshops,
technology exhibits and networking opportunities.**



usgif.org

Aperture



Families Welcomed at GEOINT 2015

Attendees at the June GEOINT 2015 Symposium in Washington, D.C., had the opportunity to participate in Family Day during the final afternoon of the event. Families learned about the world of GEOINT by exploring the technologies in the exhibit hall offered by 294 exhibitors. About 60 eighth through 12th graders from Anne Arundel County Public Schools' summer STEM program also toured the exhibit hall. USGIF's Young Professionals Group hosted a ScavenGeo Dash, an educational scavenger hunt with challenges designed for all ages. From simple imagery analysis to identifying satellite components using Lego models, the challenges helped participants learn basic GEOINT knowledge. Prizes were awarded to teams that completed the dash in the shortest amount of time.

Pictured is the Wenks family, whose team IntelliGEOINT'sia won the ScavenGeo Dash.

From left to right: Tyler, age 9; dad Lt. Col. Kevin Wenks, Joint Staff Directorate of Intelligence; Caroline, age 11; and mom Christina.

To learn more about Family Day and view videos of GEOINT 2015 keynote addresses, breakout discussions, exclusive interviews, and more, visit www.vimeo.com/trajectoryonlocation.

I AM USGIF

United States Geospatial Intelligence Foundation



Join the only organization dedicated to promoting the geospatial intelligence tradecraft and uniting industry, government, and academia communities.

Join Today at usgif.org

#IAMUSGIF



Analytics

See relevant data from every angle. And extract the critical insights.

Arm yourself with superior analytics and you'll see better utilization of your scarce resources - along with better efficiencies, lower costs and reduced risk in transforming your data into decision making. From intelligence sharing to metadata management to geographic rendering, our defense and security software can help you visualize your big data on a single platform - better than you ever thought possible.



Visit us
sas.com/NationalSecurity



sas
THE POWER TO KNOW®