2015 ISSUE 2

trajectory

THE OFFICIAL MAGAZINE **OF THE UNITED STATES GEOSPATIAL INTELLIGENCE FOUNDATION**

UNIVERSAL

GEOINT

CERTIFICATION

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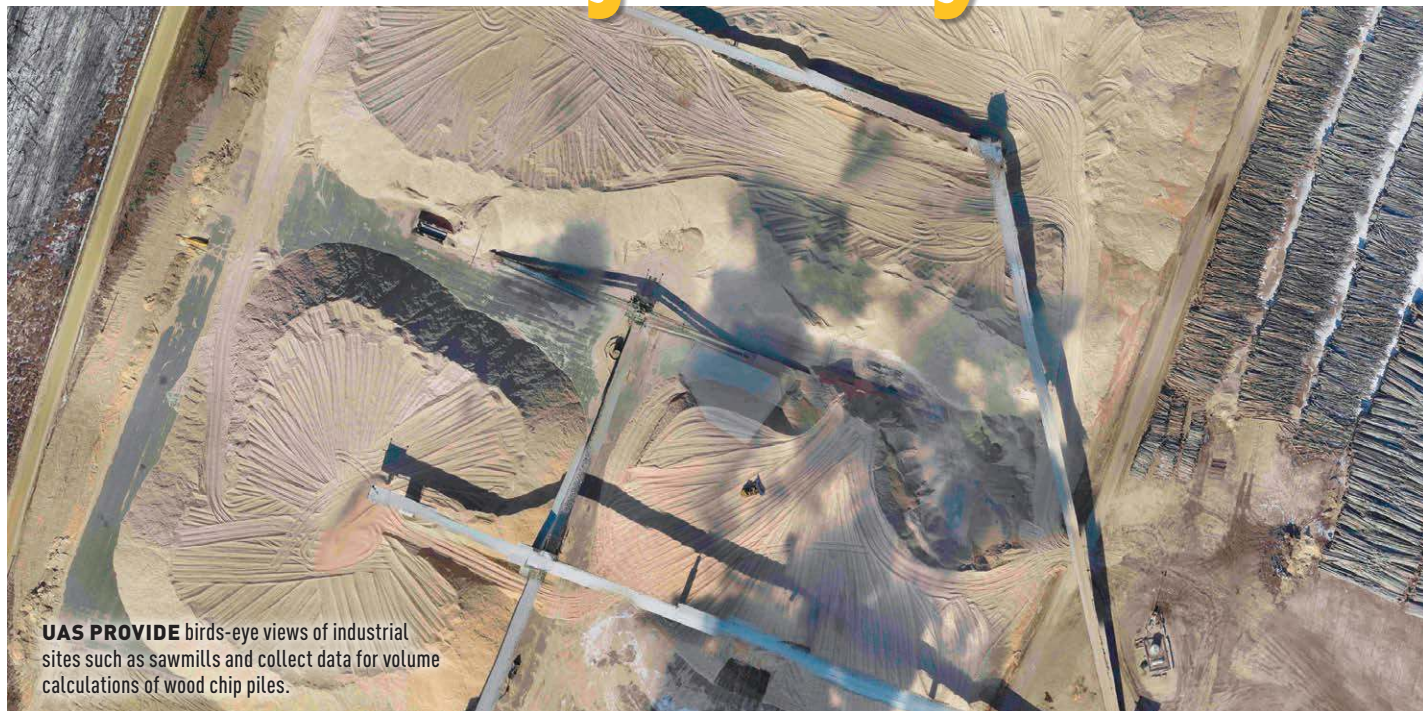❯ Learn more about Jagwire at the GEOINT Symposium in **Exelis booth #4069**

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Features

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EXCLUSIVE INTERVIEW
Read the *trajectory* exclusive Q&A with NGA Deputy Director Susan M. Gordon.

ESSENTIAL KNOWLEDGE
USGIF's Universal GEOINT essential body of knowledge will be available for download in June.

BONUS VIDEOS
View a collection of videos on commercial UAS.

READER SURVEY
Win an iPad mini! Take the *trajectory* reader survey online at **surveymonkey.com/r/ trajectory2015**.

THE PROFESSIONAL SOCIETY FOR GEOINTers

I became a card-carrying member of a professional organization today, and I'm pretty excited about it. That organization is USGIF.

Until recently, the Foundation's individual membership category had remained largely unchanged since 2004, when it was established for independent consultants who sought access to our programs. It was priced accordingly but did not appeal to the broader cross-section of GEOINT practitioners—especially because no one quite understood exactly who or what a GEOINT practitioner was back then.

As USGIF and the GEOINT discipline enter a second decade, we recognize a need for a new approach to USGIF membership. At the GEOINT 2015 Symposium we will officially unveil a more streamlined organizational membership structure that continues to improve the already clear returns on investment for corporate, academic, and government organizations and institutions. Additionally, a revamped individual membership offering immediately establishes the ability for individuals to join at a reasonable cost, and thus become part of something larger than themselves—part of our professional society.

This is all simply part of the natural evolution of the GEOINT profession, which USGIF has proudly shepherded along for its first 10 years. We began this journey awarding scholarships to students pursuing degrees in GEOINT and related fields and accrediting academic institutions to grant GEOINT Certificates. Today, the Foundation has awarded almost $800,000 in scholarships and accredited 12 colleges and universities that have produced nearly 500 GEOINT Certificate holders.

These educational and professional development endeavors are critical to our members, and we continually expand our efforts. Along with individual membership, those who seek to distinguish themselves as superior practitioners of our craft will soon be able to obtain USGIF's Universal GEOINT Certification. Managing Editor Kristin Quinn writes about your certification program in this issue's cover story on page 16.

But membership isn't just about professional development. By becoming members of USGIF, we will collectively raise the level of discourse, support networking opportunities, and weave the fabric of our community, while sustaining USGIF as the convening authority for all things GEOINT.

Individuals will now have an increased opportunity to self-select in and contribute to leaving our community stronger and more capable for the next generation. Individual members, more than ever before, will have a voice in the direction our organization is headed and can actively engage in further actualizing one or more of our three pillars: Build the Community | Advance the Tradecraft | Accelerate Innovation.

We are in the midst of a GEOINT revolution, which is chronicled in the pages of this magazine and across all of our media outlets. Those who sit idle will be left behind by this remarkable change in our profession. Those who actively engage will have the opportunity to shape the future. If you are ready to help USGIF and our community, contact us now by phone or email or stop by our booth at GEOINT 2015, and become an individual member of the only organization dedicated to GEOINT professionals and the tradecraft we practice.

> **Those who sit idle will be left behind by this remarkable change in our profession.**

KEITH J. MASBACK | CEO, USGIF
@geointer

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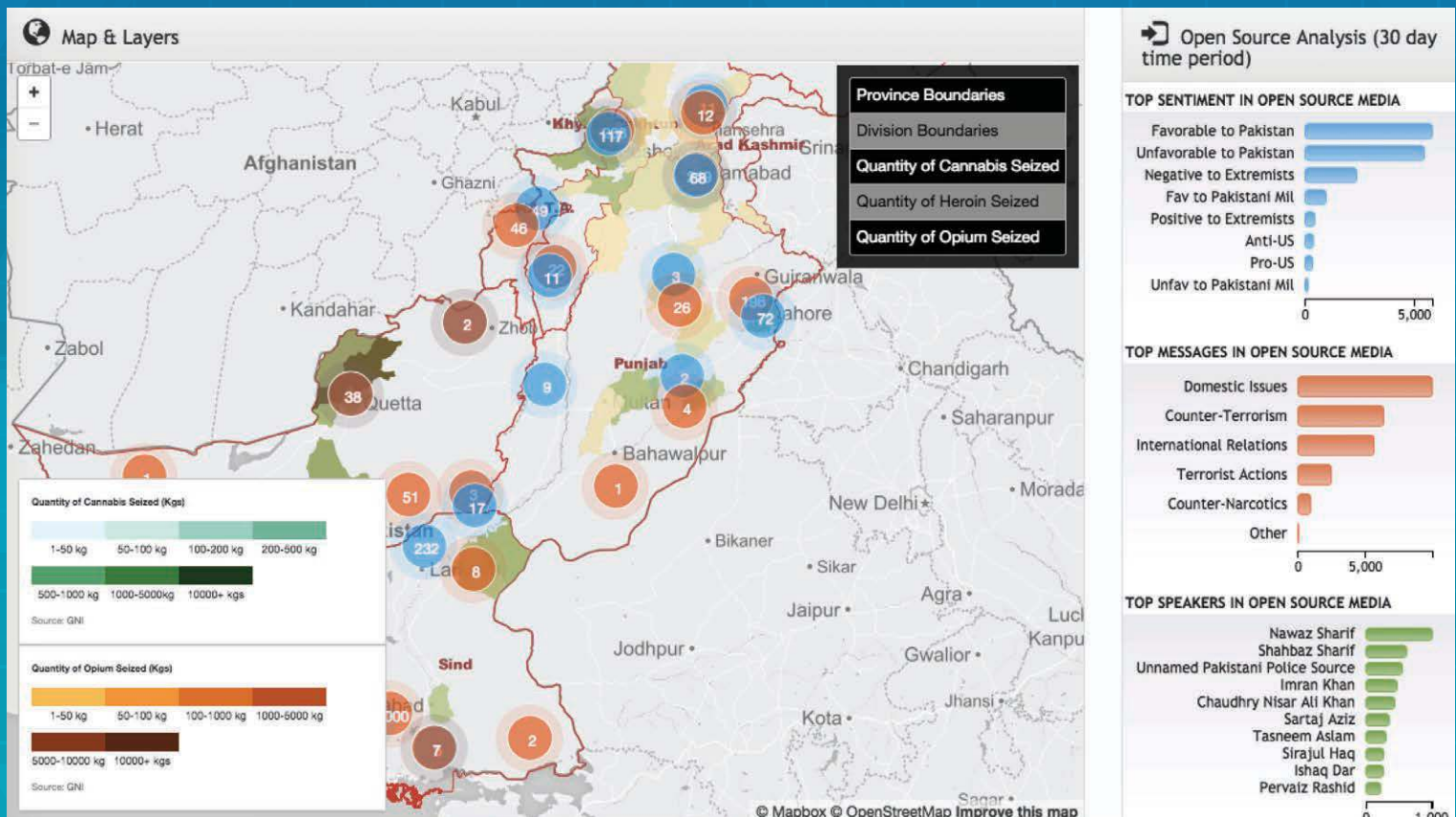
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Comments are the opinions of the author alone and do not represent the views or opinions of his or her respective company or organization.

I WAS CURIOUS

as to how GIS is being applied in the health field, and this article just gave me a nice glimpse of that.

—*Enobong Etuk, GIS Technician, University of Maryland*

COMMENTS ON "AN UNPRECEDENTED RESPONSE," Q1 2015

HIGH GROUND CONTROL

This shows what good can come from controlling the high ground. When you control the high ground—space—you can do much that is good. When you lose control of the high ground—as the U.S. is rapidly doing, giving it up to India, the EU and especially China, then you no longer have the ability to control your own society and so many of those things that we in the U.S. take for granted. How will we feel when a hostile power starts telling us they control space and satellites and therefore our financial systems, our utilities and our transportation systems? If you don't think that is possible, think again.

—*John Primm, MPM, Consultant at Carpe Diem Group*

MISSING MAPS

This region (and many other areas with populations vulnerable to natural hazards) has probably been mapped by the Multinational Geospatial Co-production Program, so why not make the non-sensitive MGCP mapping available for integration into OpenStreetMap? Problem solved, perhaps?

—*Alex Irving, GIS Consultant*

Thank you for your article on "Missing Maps." As a retired NGAer and having the good fortune to spend my last couple of years working with our team at the State Dept and USAID, this is a topic I still follow and participate in as a contributor with the Humanitarian OpenStreetMap Team, aka HOT. As I've commented in the past, some key aspects of USG support to the volunteer community include provision of hi-res commercial satellite imagery for heads-up digitizing and access to standardized geospatial information, e.g., geonames via NGA's Geographic Names Server. I think the GEOINT community could and should do more to support this effort because it really is an effective use of resources supporting those groups who are actually on the ground. In reality, the GEOINT community frequently depends on crowd-sourced mapping when a humanitarian crisis hits over data poor areas. The "Missing Maps" initiative is a logical step to try to get ahead of the curve.

—*John Gates, Geospatial Practitioner*

Great read in @TrajectoryMag on the power of OSM in response to ebola. Well done @calimapnerd @kevin_bullock trajectorymagazine.com/government/ite
—*Zac Andereck (@ZacAndereck)*

Fantastic article - Ebola, An Unprecedented Response on @TrajectoryMag shar.es/1W9Con#openstreetmap #redcross #ebola
—*DaCor (DaCor_ie)*

COMMENTS ON "THE MISSING PIECES," Q1 2015

POLI-SCI PERSPECTIVE

Excellent. I am looking at a project on Anticipatory Intelligence and the Future of the Hezbollah Intelligence Apparatus in the Post Syrian War Environment. Anticipatory tends to get conflated with estimates and a variety of similar analytical disciplines, so this article is welcome.

—*Carl Wege, Professor of Political Science at College of Coastal Georgia*

Good piece on anticipatory analysis. The Missing Pieces on @TrajectoryMag shar.es/1WSzrK via @ShareThis
—*Carmen A. Medina (@milouness)*

Thanks for the great article and the shout out! @TrajectoryMag @tonyquartararo @fcc_cio @USArmy More info on the apps are at: @WorDS_SDSC
—*Ilkay Altintas (@ilkayaltintas)*

Humans tend to be habitual; why in LE we oft look for "known shooters." @TrajectoryMag @KirkDBorne @GeorgetownCSS @SDSC_UCSD @UniofOxford
—*John A. Bertetto (@ChiTownCopper)*

Anticipation: "we have to jump out in front of problems, not wait for them to happen." @AnalyticCEO in @TrajectoryMagshar.es/1f7lwd
—*Kevin O'Connell (@AnalyticCEO)*

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COMMERCIAL GEIGER-MODE LiDAR
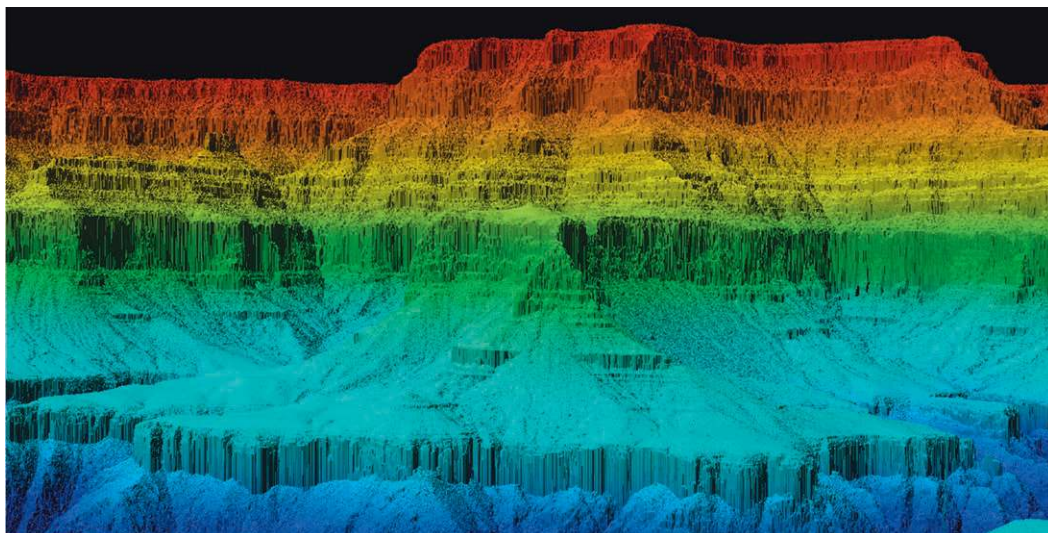
IMAGE COURTESY OF HARRIS CORPORATION

GEIGER-MODE LiDAR produces highly detailed topography, such as this scan of the Grand Canyon.

Currently, it takes three linear-mode commercial LiDAR sensors about five years to create a 3D map covering 50,000 square-miles—roughly the size of the state of Louisiana. In February, Harris Corp. unveiled its Geiger-mode LiDAR sensor and processing services to the commercial market, touting how just one sensor could cover the same area in only one year at 20-points-per-meter resolution.

The company has refined its wide-area elevation data technology throughout the past 15 years in support of U.S. Department of Defense customers and is now offering commercial customers the

THE SENSOR IS INTENDED TO REVOLUTIONIZE THE SPEED AND AFFORDABILITY OF HIGH-FIDELITY 3D IMAGING FOR BUSINESSES AND CIVIL GOVERNMENT USERS.

next generation, called the IntelliEarth Geospatial Solutions Geiger-mode LiDAR sensor. The sensor is intended to revolutionize the speed and affordability of high-fidelity 3D imaging for businesses and civil government users.

"The customers we've introduced this to already are seeing this as transformational for their business and civil governments because of the speed at which we can map, the type of pricing we can give them, and the fidelity of the images we are going to produce," said Bill Gattle, vice president and general manager of the national business unit for Harris' Government Communications Systems Division.

Geiger-mode—as opposed to linear-mode LiDAR, which transmits one broad pulse—sends thousands of laser pulses to the ground simultaneously to map the three dimensions of the Earth. Currently, it would cost commercial customers roughly three to four times as much to double their resolution using linear-mode LiDAR technology, according to Gattle. He described IntelliEarth as a "game changer" for industry that will open up a variety of opportunities in a range of markets.

GAO PUBLISHES GEOSPATIAL DATA REPORT

In March, the U.S. Government Accountability Office (GAO) released a report titled "Geospatial Data: Progress Needed on Identifying Expenditures, Building and Utilizing a Data Infrastructure, and Reducing Duplicative Efforts." The report finds the Federal Geographic Data Committee and the Office of Management and Budget made progress in an initiative for federal agencies to identify and report annually on geospatial-related investments as part of the fiscal year 2017 budget process. However, the report concluded the committee's clearinghouse for records on geospatial data lacks an effective search capability and performance monitoring. The report also called for more effective coordination across the National Spatial Data Infrastructure to eliminate duplication and avoid redundant expenditures associated with the sharing of geospatial data.

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510 SmallSats will be launched in the next five years.

SOURCE: EUROCONSULT

IMAGE COURTESY OF EXELIS INC.

INDUSTRY ACQUISITIONS

In March, **Accenture Federal Services** finalized its acquisition of **Agilex Technologies**. This acquisition will enhance Accenture's digital capabilities in analytics, cloud, and mobility for federal agencies.

CACI International acquired **LTC Engineering** to expand its C4ISR capabilities in the intelligence and cyber markets. LTC Engineering provides technical solutions and services in the areas of software engineering, cybersecurity, signals intelligence, communications intelligence, and digital signals processing.

In February, **Harris Corporation** and **Exelis** announced a definitive agreement under which Harris will acquire Exelis in a cash and stock transaction valued at approximately $4.75 billion. The transaction is expected to close in June.

KEYW acquired **Ponte Technologies (PonteTec)** and **Milestone Intelligence Group**, increasing its cyber capabilities for both government and commercial customers. PonteTec adds cybersecurity engineering and research capabilities, while Milestone supports Intelligence Community customers with core competencies in cybersecurity, cloud computing, software engineering, and test and evaluation engineering. From these acquisitions, KEYW formed a new Emerging Technologies and Markets sector.

OGSystems acquired airborne military ISR applications company **Urban Robotics**, based in Portland, Oregon. Urban Robotics creates high-resolution 3D models for special operations mission planning. The acquisition will allow both companies to leverage each other's technical development capabilities with advanced technology exploration through OGS' Viper Labs. Urban Robotics will remain in Portland.

In April, **Raytheon** announced it has entered into a definitive agreement with Vista Equity Partners to form a new company combining cybersecurity firm **Websense** with Raytheon Cyber Products. The new company will leverage Raytheon's advanced cybersecurity technologies and Websense's Triton platform to provide a new level of defense-grade cybersecurity.

LANDSAT 8 DATA ON AMAZON

Landsat 8 data is now available via Amazon Web Services. Users can perform analysis and create new products without worrying about the cost of storing or the time required to download data. **aws.amazon.com/public-data-sets/landsat**

QUIZ MAP

Enjoy a challenge? Download the Quiz Map app to compete against friends and answer questions about locations around the world from among 10 categories. Answer by placing a pin on the world map. The closer you place your pin to the location of the correct answer, the more points you receive. **quizmapapp.com**

CITYMAPS

In this app, users can personalize their own maps to keep track of and rate restaurants, retail locations, historic landmarks, and other places they love to visit. App users can also share and exchange maps with friends. **citymaps.com**

EDUCATION STORY MAPS

The National Center for Education Statistics published several story maps, bringing awareness to various issues in the U.S. education sector. Users can navigate maps to better understand regional and national issues such as public vs. private school enrollment and school bullying. **nces.ed.gov/programs/maped**

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75
percent of the 510 SmallSats will be for government, civil, and defense use with an estimated market value of $7.4 billion.

GEOINT, DATA SHARING, AND HOMELAND SECURITY

David Alexander, geospatial information officer and director of the Department of Homeland Security (DHS) Geospatial Management Office (GMO), spoke March 10 at USGIF's GEOINTeraction Tuesday event to share with the audience his office's role in the GEOINT Community.

"Homeland security is not just DHS," Alexander said. "Homeland security is an enterprise that includes the whole nation, so I do have regular interactions with the states, the locals, and the private sector both in terms of the data they may contribute to support homeland security as well as the partnerships that we can enable."

Alexander said the GMO focuses on five key areas: policy and governance; tradecraft; information; technology; and mission support.

"DHS doesn't always own the mission," Alexander said. "In many ways we are a supporter. The front lines are the state and local, so how do we best support them, engage them, and allow and enable them to be partners?"

The answer, according to him, has a lot to do with information sharing.

"We want to hear fresh ideas on how we can leverage each other's data and content," Alexander said.

He also addressed concerns about cybersecurity and health security.

"We haven't done a very good job of understanding cyber risk," Alexander said. "Of being able to put patterns of cyber risks against locations of critical infrastructure."

He also urged the audience to pay attention to the DHS Office of Health Affairs, which manages the National

Biosurveillance Integration Center. He said the country does not yet have a strong means of measuring health security's many aspects, such as the food supply chain, animals, and human contagions.

"We're trying to move away from the term you've heard in the news—'whack-a-mole,'" Alexander said. " We're trying to get a little more deliberate, predictive, and anticipatory in our operations."

DAVID ALEXANDER, director of the DHS Geospatial Management Office, spoke March 10 at USGIF's GEOINTeraction Tuesday.

2007 USGIF scholarship winner Brian Tomaszewski visited Rwanda's Mugombwa refugee camp in November 2014 for a research project.

SPOTLIGHT: USGIF SCHOLARSHIP RECIPIENT

Brian Tomaszewski, a 2007 USGIF Scholarship Program recipient, said geography and maps always fascinated him because they are "interesting to use to model, navigate, and understand the world around us."

He began his academic career with a bachelor's degree in anthropology and Mediterranean archaeology from the University of Albany. Following Albany, Tomaszewski's professional experiences with organizations such as Hartgen Archeological Associates, Element K (now Skillsoft), and URS Corp. allowed him to combine his archeology skills with GIS. Tomaszewski then decided to pursue a master's degree in geography with a concentration in GIS at the University of Buffalo.

He discovered his love for teaching while at Buffalo.

"I found academia much more interesting and engaging—I can't imagine doing any other job," Tomaszewski said.

After achieving his Ph.D. in geography at Pennsylvania State University, Tomaszewski became an assistant professor in Rochester Institute of Technology's information sciences and technologies department, where he teaches GIS, geographic visualization, programming, spatial modeling, and related topics. He said his background in industry has been a great asset to his teaching and mentoring abilities.

"Because I have knowledge of the private sector, I'm able to help students find jobs and prepare them for employment," he said.

Some of Tomaszewski's current projects are helping students in Rwanda learn basic GIS tools and educating Rwandan doctors on mobile GIS technology. He is also working with the National Science Foundation to integrate wireless and GIS infrastructure at Syrian refugee camps in Jordan for security purposes. Tomaszewski published a textbook in December titled "Geographic Information Systems for Disaster Management," which covers the basic principles of GIS and how these tools assist in disaster management.

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USGIF FILE PHOTO

USGIF CEO Keith Masback presents USGIF's GEOINT Certificate of Accreditation to Fayetteville State University Provost Dr. Jon Young.

USGIF STAFF CORNER

In January, **Bill Allder III**, USGIF membership development manager, received his Certified Association Executive (CAE) designation from the American Society of Association Executives.

Ashley Jones, USGIF sales support manager, earned her Certified in Exhibition Management (CEM) designation in April from the International Association of Exhibitions and Events.

In April, USGIF Publications & Communications Manager **Kristin Quinn** was promoted to Editorial Director. Quinn also serves as *trajectory* managing editor.

Also in April, USGIF Marketing Manager **Shameka Jordan** was promoted to Senior Marketing Manager. In May, Jordan received her Master of Science degree in integrated marketing communications from West Virginia University's Reed College of Media.

USGIF'S MURDOCK SHARES CREDENTIALING EFFORTS AT HYDRO 2015, PARTICIPATES IN NASA PANEL

In March, Dr. Darryl Murdock, USGIF's vice president of professional development, participated in the Hydrographic Society of America's U.S. HYDRO 2015 conference in National Harbor, Md. The annual conference focuses on the latest developments and applications of hydrography.

Murdock gave a five-minute lightning talk on "The Rapidly Changing Landscape of Credentialing," providing an overview of USGIF's development of a Universal GEOINT Certification.

"The hydrographic community is experiencing a time of change and renewal," Murdock said. "As USGIF prepares to launch its Universal GEOINT Credentialing Program it is imperative we maintain strong relationships with existing certification programs as part of the USGIF commitment to collaboration and maintaining full transparency."

In April, Murdock participated in the 2015 NASA Earth Science Senior Review/National Interests Panel in Washington, D.C. The NASA Earth Science Division of the Science Mission Directorate supports several Earth observation missions operating beyond their prime mission lifetimes. The panel examined these missions and participants provided input on 10 proposals for mission extension.

MORE THAN 250 ATTEND USGIF'S FIRST DAYTON TECHNICAL WORKSHOP

USGIF in April invited the GEOINT Community for a classified, two-and-a-half day event at the National Air and Space Intelligence Center (NASIC) and the Air Force Research Lab (AFRL). Focusing on the "Demands, Challenges, and Opportunities for Technical Intelligence in an Anti-Access/Area Denial Environment," this workshop allowed attendees to see the critical national security work being done in the Dayton, Ohio area.

Keynote speakers included Susan M. Gordon, deputy director of the National Geospatial-Intelligence Agency; Col. Charles E. Hogan II, vice commander, NASIC; Katrina McFarland, assistant secretary of defense for acquisition, DoD; Ruth Moser, director of the Sensors Directorate, AFRL; and others. Panel topics included integrated intelligence, battlespace characterization, and more. Along with a number of speakers and panels, attendees were able to see demos and poster presentations, tour NASIC and AFRL facilities, and experience a guided tour at the National Museum of the U.S. Air Force.

USGIF FILE PHOTO

ATTENDEES WERE TREATED to a NASIC historical presentation during an evening reception at The Engineers Club of Dayton.

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A TALE OF TWO USCs

USGIF GEOINT certificates now offered at Universities of Southern California and South Carolina

By Lindsay Tilton Mitchell

PHOTO BY GEOFF KASS

JOHN WILSON (standing) and **KEITH MASBACK** talk with Stephanie Kolbus (center) and Shuk Wai So (right), two students achieving the University of Southern California's Spatial Sciences Institute graduate certificate in geospatial intelligence.

IN LATE 2014, USGIF increased its number of accredited schools to 12 with the addition of two USCs—the University of Southern California and the University of South Carolina. Both universities proved to offer outstanding programs for students interested in geospatial intelligence.

USGIF's Collegiate Academic Accreditation Program offers GEOINT certificates to students meeting high academic standards. Accreditation ensures a pipeline for students with the necessary knowledge and skills needed to succeed in the professional GEOINT workforce.

UNIVERSITY OF SOUTHERN CALIFORNIA

Launched in 2010, the University of Southern California's Spatial Sciences Institute (SSI) offers a variety of undergraduate and graduate programs focused in geodesign, geospatial intelligence, geospatial leadership, geohealth, spatial studies, and geographic information science and technology.

"We're well-situated to present a cutting edge and vibrant set of academic programs and research to achieve measurable success," said Dr. John Wilson, SSI director and a professor at the institute. "Everything we do at SSI is interdisciplinary and we are dedicated to helping students look outward for opportunities, especially in geospatial intelligence."

SSI students can earn the USGIF GEOINT certificate after successfully completing the institute's online graduate certificate in geospatial intelligence. The graduate certificate consists of 16 credits and includes online classes in spatial thinking, spatial analysis, spatial modeling, remote sensing for GIS, cartography and visualization, and a capstone in GEOINT tradecraft.

As one of many ways in which SSI plays a leadership role in the geospatial arena, it hosts the annual Los Angeles Geospatial Summit, which offers students, faculty, and industry members the opportunity to gather in the Los Angeles area to discuss advances in the spatial sciences and the accompanying geospatial technology. Students may present papers, learn about local organizations at an industry fair, and listen to keynotes and panels hosted by senior leaders.

"The Institute has been presenting the summit for five years now as a way to foster a sense of community among the geospatial world in the Los Angeles area," said Susan Kamei, SSI associate director. "We wanted to offer an annual opportunity for all participants to learn from geospatial leaders as well as from students through their paper and poster presentations. It's a chance for all to share ideas, learn about emerging trends, and expand their networks."

At the 2015 summit, USGIF CEO Keith Masback gave a luncheon keynote address and personally presented SSI with its formal USGIF accreditation plaque.

"EVERYTHING WE DO AT SSI IS INTERDISCIPLINARY AND WE ARE DEDICATED TO HELPING STUDENTS LOOK OUTWARD FOR OPPORTUNITIES, ESPECIALLY IN GEOSPATIAL INTELLIGENCE."

—Dr. John Wilson, director, University of Southern California Spatial Sciences Institute
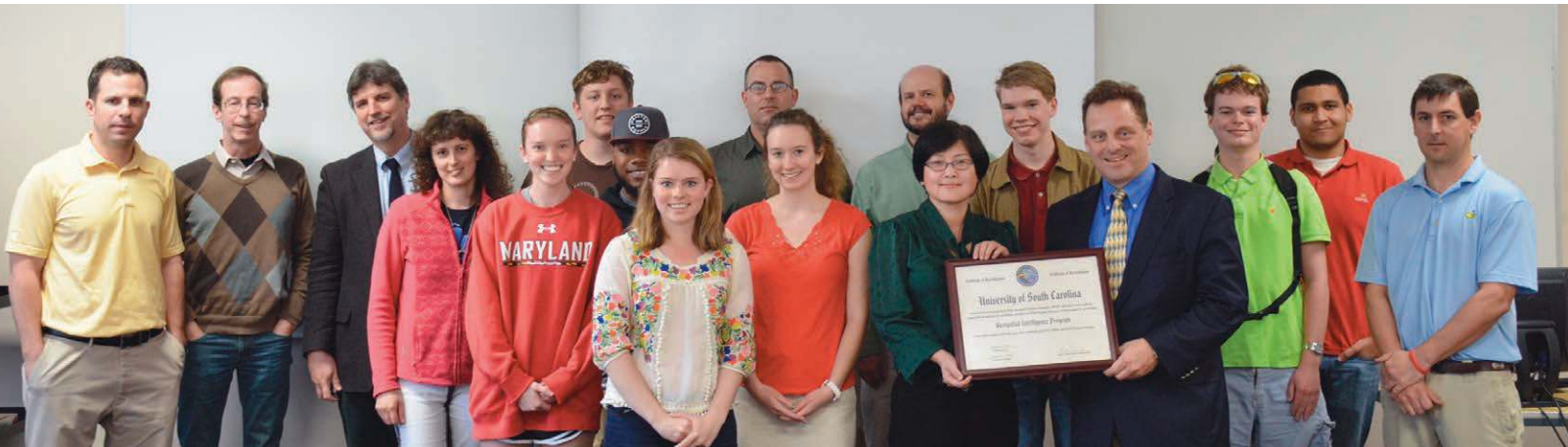
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UNIVERSITY OF SOUTH CAROLINA geography students and faculty receive the USGIF GEOINT Certificate of Accreditation presented by USGIF Vice President of Professional Development Dr. Darryl Murdock.

UNIVERSITY OF SOUTH CAROLINA

The University of South Carolina's department of geography was established in 1963 and is the only program in the state to offer both undergraduate and graduate geography degrees.

"What makes our program stand out is our department's long history with the school," said Dr. Sarah Battersby, GEOINT program co-coordinator for the university's geography department. "Former department professors, Drs. John Jensen, David Cowen, Robert Lloyd, and Theodore Steinke, have made long-lasting contributions in the field of GIScience. We also have many research offerings as well as a number of departmental and affiliated research organizations for our students to participate in."

The University of South Carolina offers USGIF's GEOINT certificate as a stand-alone credential available through its geography department. The certificate is available to undergraduate students who complete the required 21 credit hours in topics such as cartography, remote sensing, LiDAR, photogrammetric digital surface mapping, and GIS.

"It's important that students have the USGIF certificate as an option so they can adopt the knowledge learned and use it to think more spatially as well as use it for their future careers," said Dr. Cuizhen "Susan" Wang, an associate professor of geography and co-coordinator of the GEOINT program.

The university's proximity to Fort Jackson, McEntire Joint National Guard Base, and Shaw Air Force Base has helped the department generate interest in the USGIF certificate among current and former military personnel aiming to expand their GEOINT skills. The faculty has also seen interest in the certificate among incoming freshmen and current geography students.

Phillip Allan graduated in May with a dual bachelor's degree in international studies and geography with a concentration in GIS and remote sensing. He also achieved the USGIF GEOINT certificate.

"I really do believe the certificate will help open doors for my future career," Allan said. "I've had a long interest in geography, and I enjoy solving problems of where things are and why. I support the USGIF mission in what they're doing for the GEOINT Community, and I'm hoping to become a part of that community with a career in the public sector."
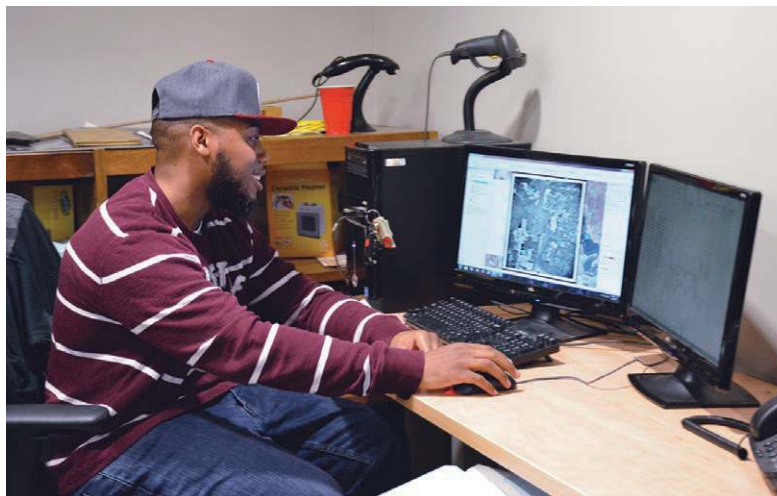
GEOGRAPHY STUDENT Terrance Randolph reviews images from the Donnelley Low Country Historic Aerial Photography Collection project conducted by the Thomas Cooper Library at USC.

PHOTOS COURTESY OF UNIVERSITY OF SOUTH CAROLINA

From data to decisions

As world-class experts in geospatial-intelligence, Ball Aerospace transforms data into dynamic, predictive, interactive intelligence across all GEOINT missions and communities. From persistent data collection hardware to advanced processing and exploitation capabilities, we provide innovative, integrated solutions for the nation and our world.

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THE PATH
TO PROFESSIONALIZE
THE GEOINT WORKFORCE

BY KRISTIN QUINN

COMMUNITY-WIDE COLLABORATION DRIVES CERTIFICATION AND THE MATURATION OF GEOINT TRADECRAFT.

The United States Geospatial Intelligence Foundation (USGIF) is blazing a trail for the geospatial intelligence professional to follow from academia to expertise. For the past 10 years, USGIF has awarded scholarships to high school seniors, college students, and doctoral candidates alike; and the Foundation has in the past seven years accredited 12 academic institutions to award GEOINT certificates. Now, USGIF is extending this pipeline to the professional certification and continuing education of GEOINT practitioners.

This fall, USGIF will offer the first Universal GEOINT Certification to both U.S. and international GEOINT practitioners across multiple industries, military, academia, and federal, state, and local government.

"We know not everyone will follow the exact path of our pipeline," said USGIF CEO Keith Masback. "There are many roads to becoming a GEOINT professional, but no matter how an individual arrives at this profession, the Universal GEOINT Certification will distinguish him or her as among the best in this field."

This certification is a natural evolution in the advancement of GEOINT and perhaps the most important Foundation initiative to date, according to Masback.

"The community made up the term GEOINT about 12 years ago

and had a vision for what we thought it would be," Masback said. "We now have a body of knowledge to articulate what is encompassed by this thing we call GEOINT. Initially, we were able to identify the academic requirements that fed into the workforce. Now, as technology changes and tradecraft evolves, the next step in the maturation of this process is to provide professional certification to the workforce."

Since the term GEOINT was written into law by Congress in 2003, there have been several attempts to create standardization throughout the community, according to Dr. Darryl Murdock, USGIF's vice president of professional development. What's different today is the blending of skill sets and the need for expertise that goes far beyond the database maintenance now primarily performed by software. GEOINT is no longer about technology but about the analysis the technology enables.

"It used to be you were either a GIS or a remote sensing professional," Murdock said. "Those once separate activities are merging. If you're looking for an overarching and progressive way to apply geospatial science and technology to both everyday and defense and intelligence activities, then you're talking about GEOINT. The GEOINT professional is the person in government and business who informs decision-makers about spatiotemporal issues and provides timely answers to key questions."

USGIF's Universal GEOINT Certification is designed for GEOINT professionals across the globe with at least three to five years of real-world experience and a working understanding of physical and human geography. To achieve certification, candidates must pass a series of rigorous exams based on the fundamentals of remote sensing, GIS, data management, and data visualization.

All exams, recommended training modules, and certification maintenance requirements will fall under the umbrella of USGIF's Universal GEOINT Credentialing Program. Murdock and his team are building the certification to be "transportable and transparent"—meaning not only will it

are recognized globally," Murdock said. "The U.S. DoD has selected NCCA as its certification accreditation body, so we are considering NCCA to maintain continuity with the DoD community."

In addition to transparency, collaboration has been a key element in USGIF's certification development process. USGIF and the National Geospatial-Intelligence Agency (NGA) in fall 2013 entered into a cooperative research and development agreement (CRADA) allowing the organizations to share best practices and define a set of GEOINT competencies for the entire community. This set of competencies will inform the processes of both organizations as NGA develops its separate,

"USGIF is working collaboratively with existing certification providers with an end goal of having an uncluttered and easily understandable credentialing landscape," Murdock said.

WHY CERTIFICATION?

GEOINT certification has the potential to benefit all stakeholders—analysts, hiring managers, industry, the defense, intelligence, and homeland security communities, and so on. On the individual level, certification helps personnel demonstrate their ability to perform beyond the skill level at which they were hired, making them more marketable for new positions and eligible for promotions, awards, bonuses, and more.

"Certification brings value to both the industry and the individual professionals," said USGIF Credentialing Manager Ayana Nickerson, who has helped establish a number of successful certification and training programs throughout her career. "This certification will generate increased awareness of and credibility for the GEOINT profession overall."

> ## "This certification will generate increased awareness of and credibility for the GEOINT profession overall."
>
> — Ayana Nickerson, USGIF credentialing manager

be globally recognized and applicable to all industries and organizations, but also that USGIF strives to be as transparent as possible in its development and program efforts.

After USGIF's certification has been in existence for a year, or 500 professionals have participated in exams—whichever comes first—the Foundation will be eligible to seek third-party accreditation for its certification by the National Commission for Certifying Agencies (NCCA) and the International Organization for Standardization (ISO). Both organizational accreditations provide impartial, third-party validation that a certification program meets recognized credentialing industry standards for development, implementation, and maintenance.

"Because USGIF serves a global community, we are considering both accreditation paths as ISO processes

mandated certification for the National System for Geospatial Intelligence.

USGIF has also reached out to the broader geospatial sciences community to offer a concerted environment for discussing the many disparate but united GEOINT-related credentials.

Today, GEOINT has grown from strictly an intelligence discipline to become ubiquitous to casual users. Anyone with access to the Internet can pull up commercial satellite imagery to look at their backyard, but if you want to dig a ditch knowing you're not going to hit a utility line—information you

USGIF'S UNIVERSAL GEOINT CERTIFICATION has the potential to benefit stakeholders from across the defense, intelligence, and homeland security communities in addition to civil, international, and commercial GEOINT markets.

PHOTO BY STAFF SGT. TIMOTHY KOSTER

PROFESSIONALIZING THE NSG

While USGIF is in the process of standing up its Universal GEOINT Certification, the National Geospatial-Intelligence Agency (NGA) is developing a mandated certification program specifically applicable to the National System for Geospatial Intelligence (NSG), which includes all personnel in GEOINT-designated work roles in defense organizations, including NGA, the Defense Intelligence Agency, the National Security Agency, and all branches of the U.S. armed services.

In October 2011, Michael Vickers, then Undersecretary of Defense for Intelligence (USD(I)), issued a memorandum calling for the accredited certification of intelligence professionals, including those at NGA. In the memo, Vickers cited the professionalization of the Intelligence Community workforce as "critical" to evolving mission demands, and called upon training and education to meet skill gaps in analysis, foreign language, cyber, human intelligence, counterintelligence, and technical intelligence.

In response to Vickers' memo, then-NGA Director Letitia A. Long cited USGIF as a partner organization to help the agency meet this goal; and in October 2013, USGIF and NGA entered into a cooperative research and development agreement (CRADA) allowing the two organizations to share best practices and partner on defining a set of GEOINT competencies for the entire community.

NGA is building its GEOINT Professional Certification program to proficiency levels (PL) defined in Intelligence Community directives. To date, the agency has tested more than 7,000 personnel across the NSG at PL-I, which assesses knowledge of core competencies, including information specific to the Intelligence Community and GEOINT doctrine.

"From the test results we're determining what people know and what they don't know by service, agency, work role, and location," said Timothy Hegarty, NGA's chief learning officer and certification lead.

The agency aims to have all 10 of its planned PL-II full performance certifications available for testing by the end of 2015. The 10 performance areas will include aeronautical analysis, imagery analysis, GEOINT collections, geospatial analysis, cartography, applied science, human geography, geospatial data management, imagery science, and maritime analysis.

"These certifications are being designed by defense intelligence subject matter experts for the analysts serving the defense intelligence enterprise," Hegarty said. "The DoD manual governing certification states GEOINT certification applies to any GEOINT-designated position within DoD. The word 'accredited' in the OUSD(I) memo is a distinguishing feature. The National Commission for Certifying Agencies (NCCA) is the designated accrediting organization for DoD certification programs developed under the OUSD(I) mandate. To comply with NCCA standards, all stakeholders, or people who will be tested, have to be represented in the certification development process. It's not just NGA in a little room developing it."

Hegarty said NGA is still determining the value proposition of developing and delivering PL-III and -IV certifications, which would be for advanced and expert levels, respectively.

"When you get to the advanced and expert level competencies go beyond just technical ability," he said. "Soft skills such as the ability to communicate, influence, and negotiate are considerable factors."

NGA and USGIF are exploring the potential for reciprocity between their certification programs and are considering a variety of possibilities. For example, could training under USGIF's Universal GEOINT Credentialing Program satisfy a portion of NGA's professional development maintenance requirements? Is there potential for an NGA analyst holding USGIF's Universal GEOINT Certification to receive reciprocity for certain requirements under the NSG certification process? Or could an NGA analyst seeking USGIF's Universal GEOINT Certification be exempt from one or more USGIF exams based on his or her NSG proficiency level?

"We're trying to find what's unique about each program but also not unique, and how we can determine defendable equivalencies between the programs," Hegarty said. "The goal of transportable credentials between NGA and USGIF stakeholders is the real value proposition of the partnership. An extra benefit of sharing competencies with industry and academia is potentially preparing more DoD-ready GEOINT analysts to come into the [defense intelligence enterprise], and that's wonderful."

GEOINT certification requirements will also apply to all DoD contract personnel in GEOINT-designated work roles. NGA is developing a time-phased implementation plan to provide contractors with adequate notice and a reasonable amount of time to meet certification requirements. A number of options to test contractors are being considered, but there has been no final determination on the process or timeline.

"Contractors want the opportunity to be certified," Hegarty said. "We need to implement a well thought-out plan that meets regulations and does not disadvantage competition."

Similar plans covering DoD GEOINT contractors will also have to be implemented across other intelligence agencies and the military services. As with any strategic change in government, it will take time for the full effect to emerge, Hegarty said.

"There's going to be a transferability between industry, academia, and the DoD that is pretty powerful at some point, but it is going to take some time before people accept the power and value of the credential," Hegarty said.

Reese Madsen, chief learning officer for OUSD(I), sees the USGIF-NGA partnership as a model to hopefully apply to other intelligence disciplines but laments there is no USGIF equivalent for other functional areas.

"We rely so heavily on not just contracts but on industry as a whole and academia, and that is the trifecta of USGIF," Madsen said.

In a written statement, NGA Director Robert Cardillo described the USGIF-NGA partnership as seeking to create a common understanding on GEOINT competencies between government and industry.

"Though champions of the GEOINT profession to different communities, we have shared goals and objectives that are independently and jointly focused on the art and science of geospatial intelligence and its advancement, the development of GEOINT practitioners, and the consequence of geospatial products, data, and services for our customers," Cardillo said.

CREDENTIALING GLOSSARY

ACCREDITATION: The process by which a non-governmental agency grants a time-limited recognition to an institution or organization after verifying it has met predetermined, standardized criteria.
- Academic use: Approval of an educational program, such as USGIF's Collegiate Academic Accreditation Program.
- Credentialing use: Status awarded to a certification program that has demonstrated compliance with the Standards for the Accreditation of Certification Programs set forth by the National Commission for Certifying Agencies or the International Organization for Standardization.

CERTIFICATE: A document issued after an individual attends or participates in a particular meeting or course and/or passes a particular exam.

CERTIFICATION: The voluntary process by which a non-governmental entity grants a time-limited recognition and use of a credential to an individual after verifying he or she meets predetermined, standardized criteria. It is often the vehicle a profession or occupation uses to differentiate among its members.

CREDENTIAL: The umbrella term that includes the concepts of accreditation, licensure, registration, and professional certification. A credential is awarded when an entity grants formal recognition or designation to an individual or organization. Licenses, certificates, certifications, and academic degrees are all types of credentials.

CREDENTIALING PROGRAM: The standards, policies, procedures, assessment instruments, training modules, and related products and activities through which individuals are publicly identified as qualified in a profession.

ESSENTIAL BODY OF KNOWLEDGE (EBK): The body of knowledge and skills a professional must possess in order to perform successfully.

UNIVERSAL GEOINT EBK
USGIF's Universal GEOINT essential body of knowledge will be available for download in June at **trajectory magazine.com**.

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may bet your life on—you want precise information from a professional.

"That really drives the need for credentialing," said Michael Hauck, executive director of the American Society for Photogrammetry and Remote Sensing (ASPRS). "With the commercial proliferation of geospatial technologies it's easy to be an amateur. So how does one tell whether the information he or she is looking at is professionally provided and is known to be of a certain accuracy and precision?"

David DiBiase, director of education for Esri and former director of the John A. Dutton e-Education Institute at Pennsylvania State University, sees the profession evolving from an academic standpoint as well. DiBiase notes higher education currently turns out the most geospatial science credentials, including the certificates awarded by USGIF-accredited academic programs.

Whereas GIS and remote sensing used to be focus areas within geography, forestry, or environmental science departments, in the last 10 to 15 years there has been a steep increase in the number of master's degree programs specializing in remote sensing, GIS, or geospatial intelligence, and even a rise in dedicated bachelor's degree programs. This represents a broad trend toward the professionalization of the field, according to DiBiase.

"For a long time, people thought of GIS and related geospatial technologies simply as tools that were used in a variety of occupations," DiBiase said. "That remains true but also there is now a growing community of people who identify themselves as GIS or GEOINT professionals."

As the field becomes more competitive, professionals seek credentials for an edge in the job market. Conversely, employers seek a method for differentiating the hobbyists from the experts or the exceptional from the average.

Dr. Andrew Hock, senior director of advanced technology programs for commercial SmallSat developer and data analytics provider Skybox Imaging, oversees a small research and development group of elite GEOINT analysts tasked with creating the advanced algorithms that extract data from the trove of images produced by the company's growing constellation.

"If I saw [Universal GEOINT Certification] on a candidate's resume—for this R&D group that has to understand how a human mind extracts information from geospatial data—it would definitely be a feather in their cap," Hock said.

Sue Kalweit, a principal with Booz Allen Hamilton, looks closely at personal initiative and professional development when choosing a new employee.

"The certification would indicate the candidate's interest and commitment in being a geospatial professional, suggesting they would want to continue developing their skills, knowledge, and professional network," Kalweit said. "I want to hire people who want to grow in their professional career and demonstrate an interest in taking the initiative to do so. The certification also would signal that the candidate has met certain standards for geospatial skills and knowledge that are needed in the workplace, thus indicating their readiness to immediately support clients in providing geospatial services."

In the GEOINT Community, a common standard is sought to professionalize the industry in the same way other professionals—doctors, lawyers, and engineers, for example—demonstrate skill and earn prestige.

"GEOINT credentialing benefits the NSG/ASG and industry by developing common standards for practitioners, identifying those practitioners that are competent, increasing trust, and facilitating movement across the enterprise," NGA Director Robert Cardillo said via written statement.

As GEOINT continues to become more critical in many industries, Masback

believes the certification will quickly grow from a nice-to-have to a necessity.

"USGIF's intent is the Universal GEOINT Certification will set apart the highest qualified GEOINT professionals and grow into a needed professional designation similar to well-known credentials such as the Project Management Professional (PMP) certification or Certified Defense Financial Manager (CDFM) requirements," Masback said.

ESSENTIAL KNOWLEDGE

The development of any new certification begins with creating an essential body of knowledge (EBK) for that profession. USGIF produced its Universal GEOINT EBK by conducting a cross-industry job analysis to identify the knowledge, skills, and abilities critical to the GEOINT workforce.

"Through the development of the Universal GEOINT EBK, USGIF is creating a set of GEOINT industry standards," Nickerson said. "Such a set of standards didn't previously exist. Our credentialing program will be built

using these validated standards."

Although USGIF's GEOINT certification is rooted in the defense, intelligence, and homeland security communities, the Foundation takes a broader view of the profession and has designed the program to be relevant to international professionals as well as those applying GEOINT in commercial industries—hence calling it a "Universal" GEOINT Certification. U.S.-based and international subject matter experts from GEOINT-related verticals such as defense and intelligence, federal and civil, public safety and emergency response, business, oil and gas, forestry, and agriculture all helped generate and validate the EBK.

RENEE DOMINGO, director of emergency services and homeland security for the city of Oakland, Calif., in front of the main monitoring screen at the city's Domain Awareness Center (DAC). In 2014, the DAC combined emergency data and information sets from city police, fire, the Port of Oakland, and others.

VOLUNTEER OPPORTUNITIES

BETA TESTERS
Each exam developed as part of the Universal GEOINT Credentialing Program will require beta testers. Beta versions of the GIS and Analysis and Remote Sensing and Analysis exams will be administered at the GEOINT 2015 Symposium, June 22-25, in Washington, D.C. Qualified symposium attendees will have the opportunity to take one or both of these exams required to achieve the Universal GEOINT Certification for free.

CREDENTIALING BOARD MEMBERS
USGIF is creating a Credentialing Board to oversee and provide guidance for its Universal GEOINT Credentialing Program. Board membership involves a time commitment of quarterly conference calls and one in-person meeting per year.

GEOINT SUBJECT MATTER EXPERTS
Now and throughout the ongoing development of its Universal GEOINT Credentialing Program, USGIF will seek GEOINT subject matter experts (SMEs) to help write and review exam questions.

SME requirements include:
- A minimum of five years experience performing GEOINT functions
- Currently performing GEOINT functions or managing others who perform GEOINT functions
- Currently working in a GEOINT-related field with hands on knowledge in: GIS; remote sensing and imagery analysis; geospatial data management; and data visualization

Experts are asked to dedicate a sufficient amount of time to developing and reviewing exam questions as well as to attend workshops either in person or virtually.

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For more information on these opportunities email **credential@usgif.org**.

In June, upholding its commitment to transparency, USGIF will publish the EBK, which comprises six knowledge areas and more than 200 topics GEOINT professionals should be proficient in to perform successfully. These topics include remote sensing fundamentals, database design and management, data security, visualization principals, and imagery enhancement, transformation, classification, and analysis.

In addition to informing certification requirements, the EBK will also enhance the earlier stages of USGIF's GEOINT pipeline. Beginning this fall, USGIF-accredited universities will use the EBK as a guide for program curricula.

USGIF's academic accreditation guidelines were developed and have since been updated using the Geographic Information Science & Technology Body of Knowledge (GIS&T BoK) produced by the University Consortium for Geographic Information Science in 2006, then the Geospatial Technology Competency Model (GTCM) introduced by the U.S. Department of Labor in 2010, according to Dr. Maxwell Baber, USGIF's director of

academic programs. The inclusion of the EBK will foster more well-rounded and technologically current curricula for GEOINT students.

"The GEOINT EBK provides a set of professional standards complementary to the GIS&T BoK and GTCM, produced with input from professionals both within and externally to the national security enterprise, with balanced emphasis on remote

sensing, GIS, data management, and data visualization," Baber said. "USGIF is updating its accreditation guidelines to align curriculum requirements to the new GEOINT EBK while continuing to recognize the significance of GIS&T BoK and GTCM."

As the accredited programs are periodically reviewed and updated, the EBK and associated certification exams also will be reviewed frequently to ensure content continues to evolve and equate with real-world job skills.

COMMUNITY COLLABORATION
In April 2014, just before the GEOINT Symposium in Tampa, Fla., USGIF hosted a Future of Geospatial Certification Workshop to gauge interest in community-wide collaboration on certification. Representatives from NGA, ASPRS, the GIS Certification Institute (GISCI), the American Association of Geographers, Esri, the U.S. Geological Survey, USGIF-accredited academic programs, and others met for an unprecedented dialogue. The gathering resulted in a greater community understanding of USGIF's budding Universal GEOINT Credentialing Program, a decision to collaborate among interested organizations moving forward, and increased professional trust among stakeholders.

"USGIF is an honest broker and neutral ground for discussing continued development of geospatial credentials," said Talbot Brooks, director of Delta State University's Center for Interdisciplinary

GEOINT SYMPOSIUM attendees in April 2014 had the opportunity to participate in a GEOINT Certification Town Hall to learn more about USGIF's development of a Universal GEOINT Credentialing Program, which will officially launch this fall.

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GOVERNMENT SOLUTIONS

USGIF'S UNIVERSAL GEOINT Certification will be applicable across multiple commercial industries, such as oil and gas, where professionals with GEOINT skills are essential to inform decisions such as where to drill a well or how to lay out a pipeline route.

Geospatial Information Technologies. "When I participated in [the] meeting last year in Tampa, I was a bit stunned to see representation from more than 25 geospatial organizations. … I also have great respect for the USGIF leadership team as they are able facilitators and consensus builders."

USGIF in October 2014 hosted a daylong forum as a follow on to the Tampa workshop. Representatives from across the broad spectrum of the geospatial science and remote sensing communities convened at USGIF headquarters in Herndon, Va., to discuss lessons learned, best practices, and how USGIF's credentialing program might be integrated with existing certification processes. USGIF intends to reconvene this gathering each fall.

Two organizations crucial to these conversations since the early days of USGIF's EBK development are ASPRS and GISCI. Earlier this year, USGIF signed a memorandum of understanding with ASPRS and a memorandum of agreement with GISCI to further inform the Foundation's development of its credentialing program.

ASPRS offers six certifications related to photogrammetry and remote sensing while GISCI is known for its GIS Professional (GISP) certification.

"We are very pleased that we have entered into this relationship with USGIF as we are convinced it marks a continuing step in the geospatial evolution of our profession and industry," said Bill Hodge, executive director of GISCI. "This agreement gives USGIF and GISCI the opportunity and means to continue our conversation to find a common ground in geospatial certification and credentialing as both efforts move forward in our respective organizations."

DiBiase, who has participated in USGIF-hosted credentialing discussions, said USGIF is working earnestly to ensure its activities cohere rather than

fragment the GEOINT Community.

Hodge agreed the trend is moving toward cooperation, not competition.

"The concept of competing certifications has been the historic framework and mindset, and we're looking at moving into an era of complementary certifications and credentials," Hodge said.

These information-sharing partnerships are also intended to explore the possibility of reciprocity among existing GEOINT credentials and those currently in development.

"ASPRS has a long-standing certification program in photogrammetry and in mapping sciences," Hauck said. "It makes sense for us to work with USGIF

"USGIF is an honest broker and neutral ground for discussing continued development of geospatial credentials."

— Talbot Brooks, director of Delta State University's Center for Interdisciplinary Geospatial Information Technologies

A SAMPLING OF GEOSPATIAL CERTIFICATIONS

PROFESSIONAL CERTIFICATIONS:

ASPRS

The American Society for Photogrammetry and Remote Sensing (ASPRS) offers six certifications: photogrammetrist; mapping scientist, remote sensing; mapping scientist, GIS/LIS; photogrammetric technologist; remote sensing technologist; and GIS/LIS technologist. ASPRS-certified professionals must have at least several years of professional experience, pass a rigorous exam, and maintain certification through continuing education.

GISCI

The GIS Certification Institute (GISCI) offers a Certified Geographic Information Systems Professional (GISP) certification. A GISP has met the minimum standards for educational achievement, professional experience, and manner in which he or she contributes to the profession and practices ethically. GISP holders also seek continuing education opportunities while preparing for recertification. More than 7,000 people around the world have achieved the GISP.

TECHNICAL CERTIFICATIONS:

ESRI

Esri stood up its technical certification program in 2010 to increase the competency levels of Esri employees and distributors around the world. Esri Technical Certification exams recognize expertise in three domains: desktop, developer, and enterprise use of ArcGIS. Certifications are offered at two levels: associate and professional. To date, more than 4,000 people have earned at least one Esri technical certification. An entry-level certification is currently in development.

INTERGRAPH

Intergraph's certification program focuses on GIS and mapping professionals who want to develop personal skill sets and increase their opportunities for providing consulting, training, and services. The company offers three certifications: Intergraph Certified Developer, Intergraph Certified Product Trainer, and Intergraph Certified Solutions Trainer.

ORACLE

Oracle offers more than 140 credentials and has certified more than 1.5 million people in areas such as database, applications, Java and Middleware software, systems virtualization, and more.

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and its credentialing program to find alignment where we can. For both USGIF and ASPRS, it's about providing service to our members and the community at large."

MISSION FOCUSED

Training is another area where reciprocity might be possible, according to Murdock. USGIF will offer its own training modules as well as recommend outside training programs to its Universal GEOINT Certification candidates. However, the USGIF credentialing program will be training-agnostic, meaning training will not be a prerequisite to sit for any of the exams.

"Each test required to achieve USGIF's Universal GEOINT Certification will have recommended training associated with it, and we will partner with USGIF member organizations and interested parties that have training that matches our EBK," Murdock said. "We are not reinventing the wheel. We will develop what we need in terms of training that doesn't already exist."

USGIF's training will also be offered to help Universal GEOINT Certification holders meet their certification maintenance requirement to demonstrate ongoing professional development.

"This could come in the form of vendor-neutral training, event attendance, academic coursework, etc.," Nickerson said. "The specific ways an individual can maintain certification are still being defined, but the purpose of maintenance is to promote continuous learning."

The training modules under USGIF's credentialing program will also provide a resource for companies and organizations to train their employees.

"We would like to help USGIF members reduce costs by providing them with training solutions," Nickerson said.

David Alexander, director of the Department of Homeland Security's Geospatial Management Office, said the Universal GEOINT Certification has the potential to reduce the department's training burden during the onboarding process.

"We would like to spend less time on training new geospatial analysts on how to apply their GEOINT education to DHS and more time on integrating new hires into the mission and culture of the organization," Alexander said. "A GEOINT certification that included use cases and example scenarios on how to use geospatial and imagery analysis to support border security, incident management, special security event planning, immigration enforcement, and other DHS missions would help build practical expertise with new hires, so they could start making an impact on day one."

DiBiase said certification usually affects a community as a whole even more so than individuals.

"If a profession is coherent and recognized and respected by society, than the industry overall will benefit," he said.

DiBiase invoked his own twist on a John F. Kennedy quote: "Ask not what certification can do for you, ask what certification can do for your profession."

In addition to advancing the GEOINT Community, Alexander believes certification will help unite it.

"GEOINT is a critical resource that provides numerous benefits in relation to operational efficiencies and mission effectiveness," Alexander said. "[Certification will] strengthen our collaboration and bring the community closer together to achieve common outcomes."

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imminent UBI

Las Vegas bursts with hyperbole. Along with untold miles of neon and gallons of champagne, the city is home to the FleurBurger 5000, a $5,000 burger made with Kobe beef, foie gras, and black truffle; the Golden Opulence Sundae, a $1,000 ice cream dessert adorned with caviar and gold leaf; and Slotzilla, an 11-story zip line attraction shaped like a slot machine. Its exaggerated trappings are so abundant and outrageous they can easily overwhelm and distract the senses. The chaos is so much so that when something notable happens in Las Vegas, it often flies under the radar—sometimes literally.

CEO ELLEN CHRISTOPHERSON combined aviation, surveying, and engineering to found Canada-based data collection business Elevated Robotics.

BY MATT ALDERTON

QUITY

THE PROLIFERATION OF UNMANNED SYSTEMS PROMISES TO INFUSE COMMERCIAL ENTERPRISES WITH THE POWER OF GEOINT.

Such was the case Jan. 6 during opening day at the 2015 International Consumer Electronics Show (CES), the annual tech-toy spectacular. Amid the buzz of smart TVs and superphones, wearables and wireless, attendees were so busy looking around that some of them forgot to look up. If they had, they would have witnessed the show's most prescient products: unmanned aerial systems (UAS)—otherwise known as unmanned aerial vehicles (UAVs) or drones—surveying the crowd from their home base in the first International CES Unmanned Systems Marketplace.

One of 20 category-specific marketplaces at the International CES, the inaugural Unmanned Systems Marketplace comprised 6,500 square feet of exhibit space occupied by 16 commercial UAS companies. This was proof, according to one exhibitor, that UAS is finally ready for prime time.

"The drone industry has really boomed in the past two years," said Jessie Lu, director of communications at EHang Inc., a Chinese UAS company that displayed its signature Ghost drone, a UAS controlled via a smartphone app. "Two years ago [UAS] didn't even fill up a single conference room at CES. This year we had a whole section in the exhibit hall."

The reason isn't just that unmanned systems are cool—it's that they're disruptive.

"Unmanned vehicles have the potential to create new businesses and new jobs and give consumers unprecedented remote access to our skies. They also will improve and protect lives," Consumer Electronics Association (CEA) President and CEO Gary Shapiro said at the 2015 International CES. "Drones already are helping emergency and disaster management programs, national weather service tracking, and traffic management programs among others … [and] are revolutionizing how we capture and monitor our world."

CEA research estimates the global market for consumer UAS will approach $130 million in 2015, up 55 percent from 2014, with unit sales expected to reach 400,000 worldwide. Within just five years, CEA predicts, revenue from consumer UAS sales will easily exceed $1 billion.

As more consumers adopt unmanned systems, so too will more companies, according to Gretchen West, former executive vice president of the Association for Unmanned Vehicle Systems International (AUVSI) and now vice president of business development and regulatory affairs for DroneDeploy, a San Francisco-based maker of geospatial software for commercial UAS. "There's been tremendous interest in grassroots, organic development of technologies for the commercial market," West said. "Lots of people have seen the value in that market because there are literally hundreds of potential applications."

Because imagery and location services are among unmanned systems' innate features, those applications are poised to unlock in ways heretofore unimagined the transformational power of GEOINT.

"It's not just about a small vehicle flying through the sky," West continued. "It's about collecting information that just isn't readily available right now. It's the real-time data this technology can provide that's going to be revolutionary."

REDEFINING 'DRONE'

Like so many technologies before them such as microwaves, computers, and GPS, unmanned systems were born in the military. The world's first UAS were balloons launched by the Austrian army, which in 1849 assaulted the city of Venice with a battery of explosive-laden balloons. Approximately 70 years later, during World War I, the U.S. military used the same concept to turn unmanned airplanes into flying bombs.

"This technology was really founded back in World War I—even prior to that—and it's developed since then over several decades of use," explained West, who said the commercial application of unmanned systems has been in the works almost as long as the military application. "Look at the Academy of Model Aeronautics, which was formed in the 1930s to represent the hobbyist community flying model airplanes. Clearly, the technology has been around outside the military for quite some time."

That public discourse on UAS has evolved to include not only military Reapers and Predators but also recreational quadcopters suggests a tipping point.

"The conversation has changed from a debate strictly about targeted military killings to a much broader discussion about what this technology will mean for our society, including its implications for business," said Dan Gettinger, co-director of the Center for the Study of the Drone at Bard College.

Echoed Lu, "Just a few years ago we were still in the Iraq war and people had an instinctive, defensive response to the word 'drone.' They still have concerns, but we are definitely starting to see public perception change."

As it does, UAS will become synonymous not with war, but rather with efficiency, ushering in a new era that embraces drones instead of fears them.

JONO MILLIN, co-founder of DroneDeploy, demonstrates the ease of flight planning for drone use in commercial markets.
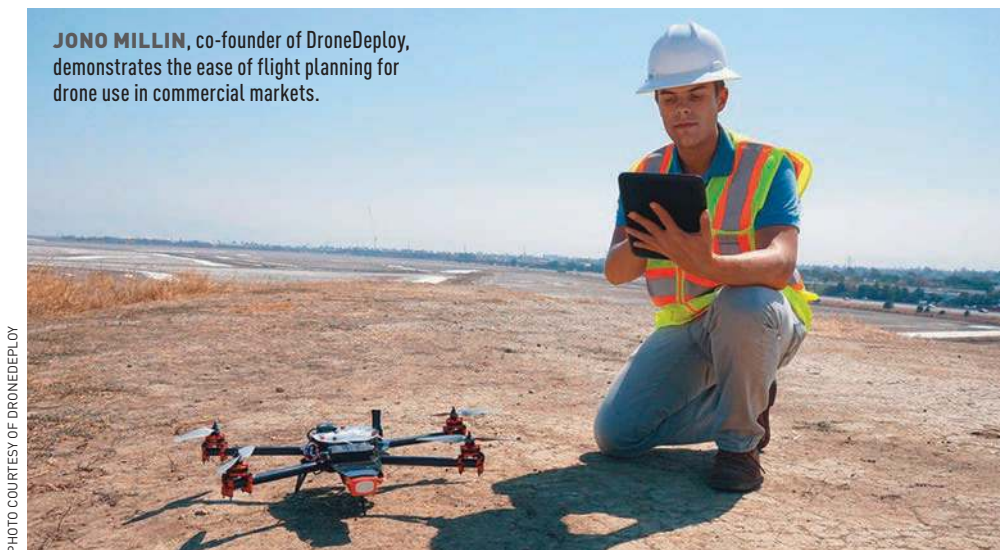
PHOTO COURTESY OF DRONEDEPLOY

The proof is in the profits.

"Right now the global UAS market is at \$11.3 billion; over the next 10 years, that market will grow to over \$140 billion," said AUVSI Government Relations Manager Mario Mairena, who cited AUVSI data encompassing not only consumer drones—the subject of CEA's data—but all manner of UAS. "The economic impact of UAS airspace integration [in the United States alone] will be over \$13.6 billion in the first three years and will grow substantially, accumulating over \$82 billion between 2015 and 2025."

In the commercial market, two principal motivations are driving growth, according to West. "The two key words are probably 'money' and 'efficiency,'" she said. "The commercial end user needs to make smart decisions about their business in a very timely manner. They need good data to make those decisions, and that data needs to be captured in an efficient way that's quick, affordable, and actionable. That's where drones are very, very valuable because they can capture and process information quickly and cost-effectively in a way that enables the end user to make data-based decisions right away."

DULL, DIRTY, OR DANGEROUS?

In the United States, tight regulation by the Federal Aviation Administration (FAA) has kept commercial UAS mostly grounded. Slowly, however, the skies are clearing for takeoff. In February, the FAA proposed new rules for commercial UAS suggesting private companies should be allowed to operate the systems as long as they do so below 500 feet, at speeds less than 100 miles per hour, and only during daylight. Current rules forbid commercial UAS entirely, except in instances where the FAA issues a special "Section 333" exemption; at press time the FAA so far had granted only 99 such exemptions. However, that doesn't mean the FAA isn't forging ahead, albeit with caution. In May, the administration announced a new program called Pathfinder, in which three companies—CNN, PrecisionHawk, and BNSF Railway—will test the use of UAS for commercial purposes.

Restrictions haven't stopped dreamers in the U.S., who continue to imagine new commercial applications for UAS every day.

"So far, there have been more than 300 different uses identified for the UAV in our economy," said Michael Drobac, executive director of the Small UAV Coalition, a consortium of UAS companies that promotes the adoption of small UAS for civil and commercial use. "The possibilities are limitless."

The "three Ds" are a good starting point for determining the commercial applications of UAS, according to USGIF Vice President of Professional Development Dr. Darryl Murdock. "If you want to know when and where companies are going to use UAS," he said, "ask yourself: 'Is it dull, dirty, or dangerous?' If it's any of those, chances are it's a good fit for UAS."

Among the earliest adopters, according to Lu, are filmmakers, videographers, travel companies, and extreme sports producers, all of whom want to use UAS to capture new and awesome perspectives with GoPro cameras, whether it's Spiderman swinging through the city, the bride and groom at a destination wedding, sunset in the Grand Canyon, or a pro surfer riding waves.

"Human beings have always wanted to fly. Many companies want to latch onto that human instinct and magnify it by filming things from the air," said Lu, whose company plans to launch a UAS

regulating the future

Drones. Unmanned aerial systems. Unmanned aerial vehicles. Whatever you call them, their commercial versions won't just deliver packages and pizzas. They'll also deliver a host of regulatory questions and challenges, according to Kevin Pomfret, executive director of the Centre for Spatial Law and Policy.

"The driving issue right now with respect to drones is the FAA and how they're going to develop a regulatory framework that allows for drones to be integrated into the national airspace," Pomfret said. "That's a significant task, and it's going to take some time, but I think it's going to work itself out."

When it does, UAVs will face yet another layer of legal and policy issues.

"Privacy will be huge," Pomfret continued. "You're also going to have intellectual property rights and licensing issues associated with data as well as liability and insurance issues. There's a whole host of things that are going to evolve over time."

Although UAS companies are keen to address the issues at hand—the industry, for example, recently launched NoFlyZone.org, which allows consumers to register their address in a shared database that UAS companies will use in concert with geofencing to create no-fly zones—doing so without legal guidance is like throwing darts in the dark.

"Most companies recognize there are issues and to the extent possible are trying to design around them," Pomfret observed. "But it's really hard to do without some understanding of what your obligations are from a legal standpoint."

In the end, Pomfret believes, drones will be as widely accepted as makers and users hope. Along the way, however, turbulence is likely.

"In general, we'll move forward," he said. "But I do think in the short term that there will be a period when companies are unable to collect the geospatial data they can collect today because of laws and court rulings that develop with unintended consequences. It won't be permanent—those laws will be overturned or replaced eventually—but we should be prepared for some setbacks."

PRECISION AGRICULTURE accounts for approximately 80 percent of potential commercial UAS markets. Germany-based Skysense has developed a waterproof charging pad to solve the problem of UAS battery life for industries such as agriculture, inspection, security, mining and energy, and more.

designed especially for the commercial market later this year.

Applications aren't just visual, however. In addition to full-motion video, sensor-equipped UAS have the potential to capture thermal, hyperspectral, and infrared data, providing utility across a range of industries.

Perhaps the biggest of these industries is precision agriculture, which according to AUVSI totals approximately 80 percent of the known potential commercial UAS markets. "Farming is going to be the biggest sector for UAS domestically," Mairena said. "Deployed on farms, UAS can determine whether crops need to be watered, if soil is healthy, and whether herbicides or pesticides are needed. And because of the low lift in altitude, when they're used for application of herbicides and pesticides they practically eliminate environmental runoff."

In May, the FAA granted approval for a remotely-piloted helicopter called the RMAX, produced by Yamaha, to spray crops in the U.S.—an important step toward helping more industries realize the benefits of UAS, according to supporters.

> "So far, there have been more than 300 different uses identified for the UAV in our economy."
>
> — Michael Drobac, executive director of the Small UAV Coalition

Construction is another significant area of opportunity. "If an engineering company wants to do an assessment on a bridge, they can't do it with a plane, and doing it with a helicopter is extremely dangerous," Mairena continued. "But with a micro platform that weighs only 10 to 12 pounds, you can collect live video and very easily determine what portions of the bridge may be damaged and in need of repair."

UAS could contribute to project management as well, with builders and developers deploying UAS on job sites at timed intervals to collect data on deliveries and construction progress.

Canada-based Elevated Robotic Services regularly serves sand and gravel companies and pulp mills, both of which commission UAS to monitor the volume of their raw materials.

"We also provide a lot of data to surveying companies, which use aerial imagery for planning, and … utilities, which use UAVs to inspect pipelines and power lines," said Ellen Christopherson, founder and CEO of Elevated Robotic Services.

Whether they use UAS to inspect utilities or monitor crops, the availability of fast, accurate, and affordable data from unmanned systems will help companies act early to solve problems and seize opportunities, the results of which could benefit the public at large. Enhanced land surveying, for example, could mean better redevelopment in blighted communities or shorter pipelines for projects

of public benefit such as renewable energy and mass transit.

"Access to more data is going to shift companies from catching things after the fact—being reactive—to catching things before they happen, being proactive," Christopherson predicted.

GEOINT'S OPPORTUNITY

Companies hoping to extract value from commercial UAS must focus not only on acquiring the systems, but also on developing the resources needed to support them—in particular, the human resources capable of analyzing data streams.

"GIS specialists and remote sensing specialists are going to be much more in demand because those are the skills companies are going to need to have in-house to be able to properly analyze data from unmanned systems," Christopherson said.
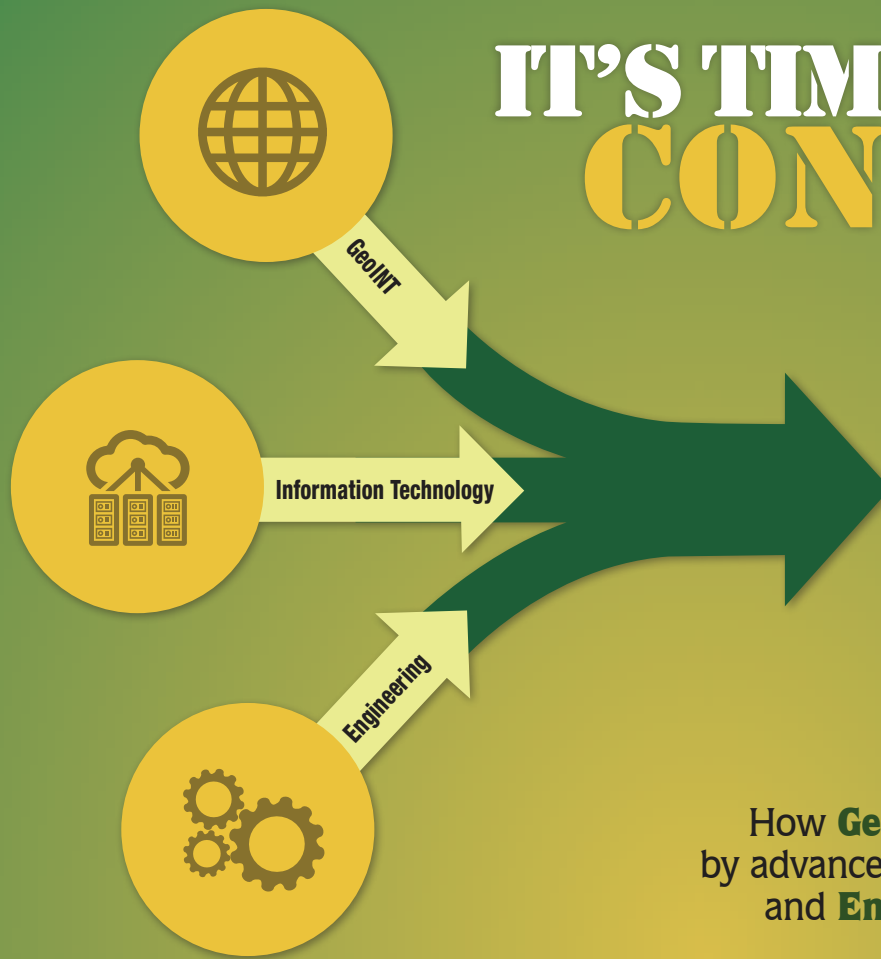
Although several universities have established programs to train and educate future UAS pilots, data scientists likely will have—at least initially—military and intelligence backgrounds, since defense heretofore has been the fountainhead of GEOINT tradecraft.

"The commercial side of UAVs is a fledgling industry, so my assumption would be that the military will be providing the basis of experience in terms of data analysis, because that's really where the experience so far has been," Gettinger said.

Retired Air Force Maj. Gen. James Poss, former assistant deputy chief of staff

on land and at sea

UAS potential isn't limited to the air. In fact, unmanned systems promise as many commercial benefits on the ground and at sea as they do in the sky.

"Ground robots are extremely important," said Mario Mairena, government relations manager at the Association for Unmanned Vehicle Systems International (AUVSI), who touted as an example the impending rise of autonomous cars, which eventually will offer safety, liability, environmental, and cost advantages not only to individual motorists, but also for industries that rely on ground transportation, such as shipping and logistics, emergency services, and mobile asset management.

Startup company Transcend Robotics, which designed a ground robot capable of climbing stairs and curbs, emphasizes the benefits of ground technology, including superior battery life, payload capacity, maneuverability, and durability.

"Ground robots have applications in all sorts of different situations," said Phillip Walker, CEO of Transcend Robotics. "The most common we've seen so far is HAZMAT and structural inspection; we've already attracted nuclear plant inspectors and bridge data mappers to our product."

Another dangerous sector where ground robots could likely flourish is mining.

"You could send robots down into mines to assess whether there are gaseous fumes in the area that may pose a risk to human life," Mairena said. "And if there's an accident, you can send ground robots down to search for missing miners. That's huge."

At sea, companies such as Fugro and Leidos have introduced unmanned systems that deliver similar benefits to the offshore oil and gas industry, which uses autonomous underwater vehicles (AUVs) for deep-water surveying.

"Fugro has six autonomous underwater vehicles, and three of them are based in the Americas," said Edward Saade, Fugro's

FUGRO'S STATE-OF-THE-ART Echo Surveyor AUV is designed to operate at depths up to nearly 10,000 feet.

RENDERING COURTESY OF FUGRO

regional survey director for the Americas. "Obviously, when you have an autonomous underwater vehicle you're not putting people at risk, which is a major benefit in the oil and gas world because you're operating in a tough environment."

AUVs also could assist with environmental risk mitigation by providing continuous monitoring of deep-water oil wells.

"All of us remember the BP disaster a few years ago. As a result of that, there's been a lot of pressure for the oil and gas industry to develop more vehicles and technology to be able to monitor the general well-being and health status of their systems," said Gunnar Galsgaard, division manager of maritime vessels at Leidos, which on behalf of the Defense Advanced Research Project Agency is currently developing an autonomous continuous trail unmanned vessel (ACTUV) capable of surveilling the ocean for months at a time.

Although ACTUV is being designed for anti-submarine warfare, its technology could be translated for commercial applications.

"It's a fully autonomous surface vessel, but the foundation is applicable to the undersea environment in addition to the surface-ship environment," Galsgaard said.

Unfortunately, there still won't be enough GEOINT talent to go around. Poss predicts an unavoidable analyst shortage in the commercial sector based on his Air Force experience.

"The Air Force is now awash in digital video and imagery, and we've barely kept up with it … We're barely surviving with a fairly large contracting force in some of our areas, which are almost 90 percent retired military imagery analysts," Poss said. "The Air Force, in that way, is an example of what is going to happen to the rest of the aviation industry once we're allowed to fly UAS [more freely] in the national airspace."

Provided the programs are created proactively, junior colleges and technical schools might be a solution to the talent shortage.

"It's possible to scale-up quickly," Poss said. "We can train a really solid imagery analyst in the Air Force in about four to five months, and that's about what a junior college would be able to do in a year or 18 months."

An open-minded GEOINT Community could also contribute to this emerging demand, according to USGIF CEO Keith Masback.

"The commercial UAS community is going to create a need for a new genre of analytic workforce," Masback said. "More platforms with more sensors are going to create more data. In many cases it's going to take qualified imagery and video analysts to turn that data into actionable insight to apply to problem sets and support decision-making in a

for intelligence, surveillance, and reconnaissance at U.S. Air Force headquarters, confirmed Gettinger's assumption.

"We already lose a lot of our young airmen to contracting after their first enlistment because when they come back they can get paid two to three times what they were paid [in the military] to do

basically the same job in the civilian sector," said Poss, now executive director of the FAA UAS Center of Excellence Team at the Alliance for System Safety of UAS through Research Excellence at Mississippi State University. "We lose our cyber guys to Microsoft all the time. It will be the same thing with GIS and UAS."

wide range of industries, from realty to precision agriculture. For many in the GEOINT Community, this will transcend what they traditionally envision when they think about an imagery analyst. This is GEOINT in its broadest sense, being leveraged across multiple business areas."

FLYING HIGH

In addition to labor challenges, commercial UAS enterprises also must overcome technological and regulatory hurdles.

On the technological side, companies must contend with limited endurance and payload capacity, both of which could hamper near-term efforts. Companies such as EHang, however, are hard at work on research and development that in the long term would likely render such issues moot.

"Currently, flight time on [most commercial] drones is less than 15 minutes," Lu said. "Our next-generation Ghost drone is going to improve that to an hour."

Data storage likewise could be an issue—but probably won't be,

according to Murdock. "Because the cost of storage is cheap, we're rapidly reaching a point where we have the ability to collect and store an unlimited amount of data," Murdock said. "The military is grappling with storage because they want persistence. Their mode of operation is to collect everything you can and figure out later how to deal with it. The commercial sector will be much more surgical about data capture, storage, and retention. They can't afford to collect everything and figure it out downstream, so they're going to be very specific about the information they want."

If technology isn't ultimately a roadblock, regulation could be.

"There's no question that businesses want to adopt this technology," Drobac said. "Unfortunately, it hasn't been easy for them to do so in the United States."

Not knowing what regulations will allow makes it hard to plan for the challenges and opportunities ahead.

"Until we know what the FAA is going to let us do, we can't know how to prepare," Poss said.

Even so, commercial enterprises and the larger GEOINT Community have reason to be sanguine.

"I'm generally a pessimistic person, but I am extremely optimistic about this because technology always wins," Drobac continued. "When something is as life-changing as this is, it will prevail."

> "Currently, flight time on [most commercial] drones is less than 15 minutes. Our next-generation Ghost drone is going to improve that to an hour."
>
> — Jessie Lu, director of communications at EHang Inc.

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A NEW *wave* OF

INNOVATION

BY LINDSAY TILTON MITCHELL

NGA IS SHAKING UP ITS CULTURE TO USHER IN A NEW ERA OF TRANSPARENCY AND INDUSTRY COLLABORATION.

RENDERING COURTESY OF NGA

As human beings, innovation is in our genes. Humanity is always developing new ideas and inventions with an eye toward the future—whether it is Orville and Wilbur Wright's first successful flight or Thomas Edison's invention of the light bulb.

Today, the National Geospatial-Intelligence Agency (NGA) is pushing the envelope with respect to innovative geospatial technology and Intelligence Community culture and policy by fostering a higher level of engagement with industry and the public at large. Soon after NGA Director Robert Cardillo took the helm of the agency in October, he began building a legacy of industry engagement and transparency. That same month, he vowed to continue to grow partnerships in his open letter to industry: "I am committed to working with you under fair, open, and responsive business processes; opportunities for small and disadvantaged businesses; and innovative solutions that will drive the right consequences for our customers."

At numerous speaking engagements since October, Cardillo has described a sea change in the GEOINT Community that will require major adjustments to every aspect of the discipline. This necessary transformation is the result of the democratization of data by new tools and technologies such as SmallSats, social media, the Internet of Things, geolocation-enabled smartphone apps, and more.

"[This] seismic shift combines the impact of democratization of unclassified content, the integration of content and context, and the persistent mindset," Cardillo said during a keynote address at an NGA industry day in March. "To master this shift requires industry and NGA to form an even more powerful partnership than the strong one we now enjoy."

With many new initiatives in motion to partner closely with industry and pave the way for the Intelligence Community to publicize unclassified data and leverage open-source tools, the agency is poised to master this "seismic shift."

INDUSTRY = INNOVATION

To execute his vision, Cardillo brought Susan M. Gordon on board as deputy director Jan. 1, and he named agency veteran Mike Geggus industry innovation advocate. Prior to joining NGA, Gordon spent 26 years with the Central Intelligence Agency (CIA), during which time she led the establishment of In-Q-Tel, the CIA's nonprofit arm that works to identify and invest in venture-backed startups developing technologies aligned with the Intelligence Community mission.

Gordon described Cardillo as incredibly passionate about sharing his vision for promoting industry innovation—a vision he intends to see come to fruition.

"It's fun and games to talk about innovation and the ideas we could pursue, but the real measure is are we pursuing those ideas?" Gordon said. "[Mike and I] are working with the whole organization to make sure we not only have an entry portal for ideas but also have the mechanisms in place to drive adoption."

With more than 20 years of experience in the U.S. Air Force and numerous leadership positions at NGA since 2004, Geggus is tasked in his new role to engage with industry and facilitate more effective relationships that improve the rate of innovation. He has outlined this new business strategy in an Innovation Advocacy Adoption Model. According to this model, NGA recognizes industry is in many ways surpassing the U.S. government's ability to produce cutting-edge technology due to budgetary and acquisition rules that can restrict agile development. To overcome this challenge, NGA is seeking further industry-government collaboration to leverage more commercial technology.

"This model helps get NGA out of the point-to-point sales meetings and allows us to spend time and build more personal relationships," Geggus said. "We want to make the marketplace more accessible and open to sharing capabilities."

NGA aims to create these new industry relationships with the recent

NGA DEPUTY DIRECTOR Susan M. Gordon (right) and Ellen McCarthy (middle), NGA director of plans and programs, with Air Force Chief Master Sgt. Rachel M. Zeigler (left), NGA senior enlisted adviser, at NGA Campus East in Springfield, Va.

PHOTO COURTESY OF NGA

launch of its GEOINT Solutions Marketplace (GSM), according to Geggus. GSM is a web-based platform accessible via nga.mil that provides non-cleared, non-traditional vendors from industry and academia access to NGA needs, design standards, toolkits, and more. It also serves as a portal to submit white papers and pitch concepts to the agency.

In parallel, NGA is collaborating with USGIF to develop an Industry Solutions Marketplace (ISM), a digital demonstration sandbox for industry to showcase the functionality and interoperability of its solutions. ISM will allow anyone from industry—with or without government contract experience—to demonstrate existing solutions to real-world GEOINT problems, all while protecting intellectual property.

"The centerpiece of the Innovation Advocacy Adoption Model is GSM, ISM, and the idea of openness, connections to ideas, and innovative dialogue going on in the community," Geggus said.

But the technologies alone are not enough. Face-to-face interaction is needed to foster additional dialogue between NGA personnel and industry innovators. NGA established a Training With Industry program that pairs its employees with industry partners to gain additional experience from outside the walls of a federal agency.

"One of the best things about industry-agency relationships is it gets [NGA] folks to see the work through a different lens," Gordon explained. "As I say the word 'lens,' I keep thinking about [Cardillo's] lens of consequence. This is just a different type of consequence for a different set. It's looking at our work through our industrial partners' perspective."

NGA is also courting startups and companies that have potential to offer outside-the-box GEOINT solutions. In February, the agency's analysis directorate hosted a first-of-its-kind Discovery Summit, where industry representatives showcased more than 20 new technologies. Topics included advanced GEOINT visualization, data integration, Big Data, open-source information, and technology challenges. Following the event, NGA released a broad agency announcement noting its intent to award multiple GEOINT analysis contracts and seeking "all innovative ideas for path-breaking analytical research."

"We're serious about seeking ideas wherever they are," Gordon said. "What's cool is the technology and architecture is moving so [NGA will] be increasingly accessible to those people who only have one piece of the puzzle to the solution. When we can do that, it can expand our horizons on the solution space."
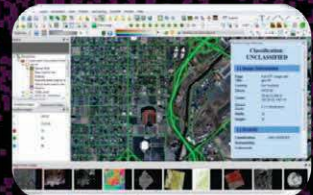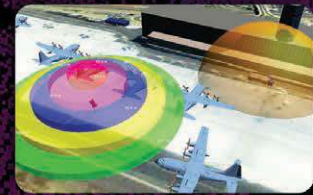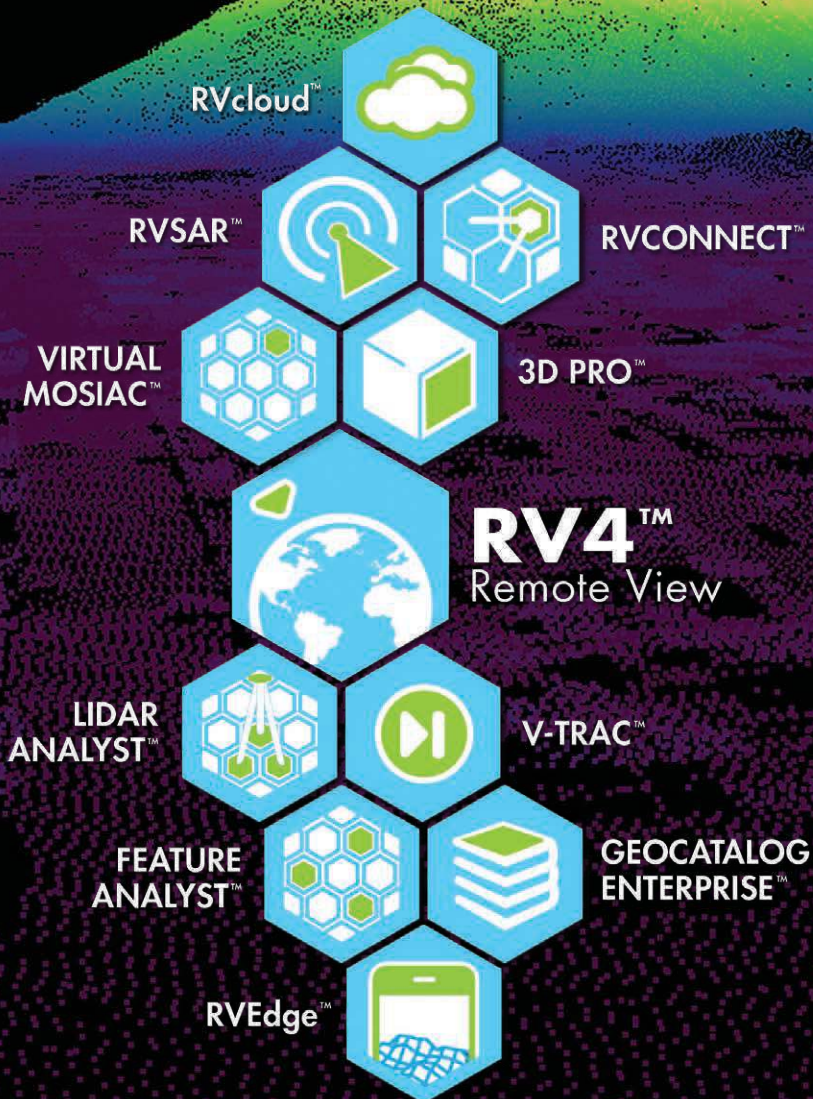
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available in the app store

NGA is not only the first intelligence agency to publish code to GitHub, but it is also the first to distribute mobile applications for public use via iTunes and Google Play.

Anti-Shipping Activity Message (ASAM)
Developed in collaboration with Booz Allen Hamilton and released in November 2014, ASAM allows users to select a geographic location and view reports of piracy, robbery, hijacking, kidnapping, and other hostile acts against maritime ships, crews, and passengers in that region. Granting the maritime community access to NGA's data within the app enables mariners around the globe to avoid piracy hot spots.

Disconnected Interactive Content Explorer (DICE)
Released in March, the DICE app allows users to load interactive content generated in HTML, CSS, and JavaScript to a mobile device, while displaying that content without network connectivity. This app, which NGA developed in collaboration with BITSystems, a subsidiary of CACI, is tailored for use in disaster response, search and rescue missions, and other disconnected environments.

OPEN-MINDED
NGA's support of disaster relief efforts in the past decade has allowed it to be transparent in ways other intelligence agencies usually cannot. And with some recent cultural changes, NGA is now publishing data and information in unprecedented measures.

Perhaps the strongest example of NGA's commitment to transparency through wide distribution of unclassified data is its response to the Ebola Crisis in Western Africa. Using Esri's ArcGIS Online, OpenStreetMap foundational data, and DigitalGlobe commercial imagery and human geography data sets,

NGA provided a public website with 500 data layers, more than 200 products, and about 70 applications. From October 2014 to February 2015 the website was viewed more than one million times. And when a 7.8 magnitude earthquake struck Nepal April 25, NGA followed its Ebola response method, launching a public website to assist with relief efforts the very next day.

"If I sit behind a closed environment and say, 'That's not my space,' we will not have served the nation with the best we bring to bear," Gordon said. "The reason NGA has to be more transparent is we have significant value to bring based on

our years of knowledge and tradecraft, but the world is going to move on without us if we aren't participating in the way it wants to interact with the information."

At Esri's Federal GIS Conference in February, Cardillo declared he aims to make NGA the most transparent of the U.S. intelligence agencies through the wide distribution of unclassified data.

In March, NGA furthered its commitment to openness with the announcement of its GEOINT Pathfinder project, an experiment designed to answer several intelligence questions using only unclassified sources such as commercial SmallSat imagery, open data subscriptions, and social media.

Classified information will be blocked to encourage participants not to resort to existing behaviors, according to Gordon. Participants will operate through a network of in-house labs, offsite locations, and telework—all interconnected through a secure, unclassified collaboration service.

Foreign partners are invited to join, and students from the University of Missouri, the U.S. Military Academy at West Point, and the U.S. Air Force Academy will also take part in helping to answer the project's research questions.

Gordon said the groundwork is being laid now for an August launch, adding the agency plans to reward fundamental curiosity and select personnel for the program passed on the creativity of applicant proposals.

"I have seen things that allow me to imagine myself sitting at a computer and asking questions that today are just illusory, but tomorrow the data will be in front of us," Gordon said.

CODING WITH THE CROWD
In 2014, NGA took its commitment to transparency one step further—from publishing unclassified data to publishing code—as the first intelligence agency to leverage online open-source community GitHub. The website enables programmers to collaborate on and exchange code as well as to modify and re-distribute it.

With more than eight million users on GitHub, minds around the world now have the potential to contribute to NGA projects, said Chris Rasmussen, NGA's lead for public open-source software development.

"From a Big Data perspective, in order to grow the ecosystem we have to be in the open space," Rasmussen said. "We're thinking differently and out of our comfort zone to be on [GitHub]."

On GitHub, the agency's role in disaster relief operations is once again a key enabler in driving transparency. Workflow management and imagery analysis tool GeoQ, designed for use in humanitarian relief and public safety, was the first to debut on NGA's GitHub account.

"When we assist in disaster relief efforts we noticed everyone had different tools and workflow, and it created lags in the response time," said Ray Bauer, NGA's information technology innovation lead. "GeoQ is a geospatial task manager with real-time feedback. When there's a disaster, we build the project, create jobs, then crowdsource those tasks out to a team."

Bauer said GeoQ is the most popular of NGA's GitHub tools thus far with more than 180 active users exercising the code and suggesting changes to the

agency for consideration. Bauer believes an appeal to users is the gamification aspect, which allows them to earn points and unlock badges after completing a task.

"It's a fun way to engage users," Bauer said. "Culturally and policy-wise it's a different way of operating."

The MITRE Corp. helped develop the crowdsourcing, gamification, and

training capabilities for GeoQ, and is a strong advocate of open-source technology, with several public GitHub repositories of its own.

"Putting our ideas out through open source is important as a way to share research and help advance the state of the art," said Jay Crossler, a senior principal software systems engineer with MITRE. "This relationship where

NGA DIRECTOR
Robert Cardillo
(right) meets with
Huntsville, Ala.,
Mayor Tommy Battle
(facing Cardillo) in
November to discuss
GEO Huntsville's
use of NGA's GeoQ
geospatial task
manager.

we partner with NGA to publish open source is a new one, and we are excited about the model. This is truly working in the public interest."

And some members of the public are already experiencing the rewards and contributing back to the open-source community. GEO Huntsville—a collaborative nonprofit engaged in geospatial technology applications in the

Huntsville, Ala., area—adopted GeoQ in 2014. GEO Huntsville's Blueprint for Safety (BFS) project, which has the goal of building safer communities through multi-jurisdictional information sharing, implemented GeoQ for emergency response exercises.

Originally, the BFS team used GeoQ to conduct damage assessments on imagery in a crowdsourced environment. But

it soon realized the utility on the ground. Now during exercises, first responders and search and rescue teams use the tool to contribute and share data from the field as well as to track their locations and progress.

"[GeoQ] has changed our world dramatically," said Chris Johnson, executive director for GEO Huntsville. "If we had to start from scratch on this, there is no way we could have supported all of the things that have happened in less than a year. The fact that we were able to co-create and co-develop this with both the NGA team and others that participate on GitHub adds features back to the core set of code much more rapidly and robustly."

In January, NGA collaborated with DigitalGlobe to release MapReduce-Geo (MrGeo) on GitHub. Built on HADOOP, the MrGeo toolkit provides simplified, raster-based geospatial capabilities for analysts.

Tony Frazier, DigitalGlobe's senior vice president of U.S. government solutions, said the decision to put MrGeo on GitHub yielded wide-reaching benefits.

"The strategy to open source MrGeo allowed the broader community to get involved and address the problem of improving workflow processes and analytic timelines—it's relevant across the U.S. government and commercially," Frazier said.

academic connections

The NGA Academic Research Program focuses on research in science, technology, engineering, and mathematics (STEM) to advance GEOINT. By offering grants and cooperative research and development agreements to colleges and universities, NGA is able to support its applied and advanced research programs and promote agency-academic innovation.

NGA has also partnered with a number of high schools in Virginia; Washington, D.C.; and St. Louis, Mo., to accelerate student interest in STEM. NGA hosts an annual STEM GEOINT R&D Symposium at NGA Campus East in Springfield, Va., inviting students to present research and meet with scientists and analysts.

Dr. Lenora Gant, NGA's senior STEM advisor, said the agency has a consistent presence at its partner high schools to help students realize the career possibilities in GEOINT.

"Many of these students may not have been aware of the Intelligence Community or know what NGA is until now," Gant said. "...This is an exciting time for STEM because the U.S. is in need of it for the long term. It's up to the government to reach out to K-12 and universities to shape thinking about STEM."

NGA also teamed with NJVC to release the code for RFI Generator, a tool providing a quick and simple method for NGA customers to request and receive data. Bill Cloin, director of NJVC's Center for Technology Integration, uses GitHub for several other projects and feels strongly that for open source to be effective participants need to contribute in addition to taking code.

"Open source is a great way to find good innovation, ideas, and code reuse," Cloin said. "But when you take that code and enhance it, maintain that open-source model and contribute back so everyone else can benefit from it."

A PROSPEROUS FUTURE

NGA has broken through many barriers in the past few years as it homes in on more industry collaboration, publishes more and more unclassified data, and takes advantage of open-source tools—all leading to an era of heightened innovation.

But new partnerships and the deployment of agency-wide initiatives aren't possible without considerable change, and with change comes what Cardillo refers to as an "uncomfortable excitement."

"I realize that this seismic shift will cause tremors across NGA and industry," Cardillo said during his NGA industry day speech. "The way we do business,

the way we do collection, the way we do analysis, the way we hire and train, the way we serve our customers all will change. I ask you to move forward with me to grasp the opportunities that this shift creates. Perhaps the greatest opportunity of all is the chance to create a future of security and prosperity for the community and the nation."

As the Intelligence Community adjusts to these new business strategies, NGA promises new successes on the horizon. The agency's GitHub account continues to grow while new methods of collaboration such as GSM and GEO-INT Pathfinder are just getting underway, prompting a more interactive dialogue between government and industry.

"It's exciting because the leadership is moving forward and we're moving our business to better things, but at the same time there's discomfort because change is a common disruption," Geggus said. "Change causes discomfort, but it is inevitable. … Innovation is new ideas, a new methodology, and a wider perspective." ▪

MAVENS OF THE BELTWAY

CARAHSOFT FACILITATES RELATIONSHIPS BETWEEN BUSINESS AND GOVERNMENT

High-level matchmaking inside the Beltway can be a tricky business. But Reston, Va.-based Carahsoft has cracked the code when it comes to meeting the needs of both technology manufacturers and government end users.

Carahsoft in 2014 celebrated its tenth year and is recognized by *Washington Business Journal* as one of the fastest growing companies in the D.C. area. The privately held company is organized around business units that provide IT solutions for federal, state, and local government agencies. At any given time, Carahsoft is working with 200 to 300 different technology companies, ranging in size from a two-person start-up to publicly traded Adobe, to pair their products and expertise with potential government clients.

"Our model has always been to take care of emerging new technology companies by helping them get their products to market," said Michael Shrader, Carahsoft's vice president of Intelligence and Innovative Solutions. "We're always willing to talk to a technology company, but we have to make sure it's the right fit for both sides. We want to make sure they solve a business proposition for our government customers."

Carahsoft ended 2014 with more than $2.2 billion in revenue, up from $1.7 billon at the end of 2013, and its staff of nearly 500 has roughly doubled since 2011. It is partner to a number of leading software manufacturers, including Red Hat, SAP, and Symantec. The company also hosts annual events including the Government Big Data Forum and the HP Software Government Summit, which help government participants discover innovative ways to solve difficult problems.

CARAHSOFT offers proven technologies to support the government's all-source intelligence missions and the most flexible, agile contracting and delivery options available including open source, cloud, and utility-based pricing.

When it comes to matching a tech company to an end user, Shrader explained that while small technology manufacturers have cutting-edge solutions to offer the Intelligence Community, Department of Defense, and civilian agencies, those companies typically have little government visibility or experience. So Carahsoft provides expertise around the government contracting process, promotes the vendors' technologies through webinars and on-site forums, and manages security clearances. As Shrader said, Carahsoft "takes the pain out of the process."

In the last decade, Carahsoft has seen many changes, including substantial growth in the number of emerging technologies on the market. Furthermore, terror and cyber threats increased while budgets shrank, forcing the company to offer more innovative services.

"We're able to help make the connection between what government needs to do with less money and what the manufacturers want to do on the tech side," said Carahsoft's Mary Warmkessel, senior director, Intelligence Community Focal Point.

Joint purchasing of technology within and across agencies, for example, increases efficiency for both the government and manufacturers. Furthermore, technologies such as VMware, Arista, PernixData, and Splunk contribute toward consolidating data centers and streamlining IT operations, Shrader said, allowing government customers with constrained budgets and broadening missions to accomplish more with less.

Among the biggest growth areas are secure cloud computing and nearly anything related to mobility, cybersecurity, Big Data, and the Internet of Things. According to Shrader, some of today's most imaginative technologies include Gridless Power's ruggedized mobile power stations; Looxcie, a wearable, wireless streaming camera that could be useful for first responders; ikeGPS, which performs GIS data collection and measurement on mobile devices; iMapData, a geospatial platform that visualizes data; TouchShare, which provides real-time geospatial collaboration tools; and Terra Pixel, the leading developer of OGC standards-compliant

CARAHSOFT sponsored a partner pavilion at the GEOINT 2013* Symposium, and will do so again in June at GEOINT 2015.

geospatial data services used by the Department of Homeland Security.

One way Carahsoft keeps up with customer needs is to exhibit annually at USGIF's GEOINT Symposium. In the past, the "Carahsoft Pavilion" has housed a couple dozen technology vendors as well as space for demonstrations. Carahsoft will do the same this June at GEOINT 2015—which is likely to draw even more customers since the event will be held in Washington, D.C., for the first time.

Carahsoft forecasts significant growth throughout 2015. The company plans to hire about 100 new employees including many recent college graduates and will move into new Reston offices, nearly doubling its space.

As customer needs grow, Carahsoft works to stay one step ahead of the government wish list. By knowing short-, medium- and long-term requirements, Shrader said, the company is able to seek out solutions. The adoption of cloud technology, for one, is behind the curve.

"There are plenty of initiatives in this area," he said, "but moving to the cloud while maintaining the government security standards has been the challenge."

And thus, the search continues for the perfect match. ■ BY MELANIE D.G. KAPLAN

"We're always willing to talk to a technology company, but we have to make sure it's the right fit for both sides. We want to make sure they solve a business proposition for our government customers."

— Michael Shrader, Carahsoft's vice president of Intelligence and Innovative Solutions

READING LIST
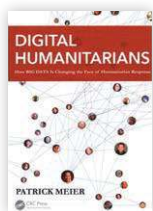
DIGITAL HUMANITARIANS: HOW BIG DATA IS CHANGING THE FACE OF HUMANITARIAN RESPONSE
*By Patrick Meier*

In his new book, renowned crisis mapper Patrick Meier chronicles the rise of "digital humanitarians," or volunteers actively collaborating with traditional humanitarian organizations to help solve what Meier calls "Big Crisis Data" challenges.
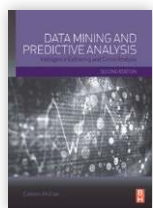
DATA MINING AND PREDICTIVE ANALYSIS: INTELLIGENCE GATHERING AND CRIME ANALYSIS, SECOND EDITION
By Colleen McCue

Crime clusters and other intelligence can be used to deploy security resources most effectively, according to McCue. This book highlights new and emerging technology, discusses the importance of analytic context, and offers a clear, practical starting point for professionals who need to use data mining in homeland security, security analysis, and operational law enforcement settings.
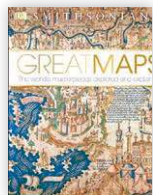
GREAT MAPS: THE WORLD'S MASTERPIECES EXPLORED AND EXPLAINED
By Jerry Brotton

From Ptolemy's world map to the latest maps of the Moon to Google Earth, the Smithsonian's Great Maps provides a fascinating overview of cartography through the ages, revealing the stories behind 55 historical maps and their key cartographers.

USGIF EVENTS CALENDAR

JUNE
22–25
GEOINT 2015 Symposium
Washington, D.C.

JULY
14
GEOINTeraction Tuesday

SEPTEMBER
8
GEOINTeraction Tuesday

OCTOBER
5–9
GeoAcademic Week

NOVEMBER
16–20
GEOINT Community Week
Northern Virginia

PEER INTEL

NGA Deputy Director **Susan M. Gordon** was named an advisor to the USGIF Board of Directors. Gordon became NGA's sixth deputy director Jan. 1, after 26 years of service with the Central Intelligence Agency. Board advisors serve as non-voting members on the USGIF Board of Directors.

Former USGIF Chairman of the Board **Stu Shea** recently launched a new company. Shea Strategies is a Chantilly, Va.-based consulting firm serving the national security market in areas such as corporate and investment strategy, mergers and acquisitions, leadership development, and transforming business operations.

Letitia Long, former director of the National Geospatial-Intelligence Agency (NGA), was appointed to the boards of directors for both Urthecast and Raytheon. Long brings extensive experience in intelligence and technology, most recently serving as NGA's fifth director.

Tony Frazier is now senior vice president of DigitalGlobe's government solutions business. In this new role, Frazier will oversee the geospatial imagery provider's work with U.S. government customers.

Northrop Grumman named **Alan Lytle** vice president, underseas systems business unit, for the company's electronic systems sector. Lytle is responsible for all undersea systems programs and products involving the design, development, and production of advanced undersea capabilities to include submarine sensors, unmanned maritime systems, minehunting systems, and torpedoes.

Deloitte Global announced **Punit Renjen** as its new chief executive officer. Renjen assumed this new role June 1.

The Open Geospatial Consortium announced **Carl Reed** retired from his position as chief technology officer and standards program executive director. **Scott Simmons** assumed the role of standards program executive director, while George Percivall became CTO.

President Obama appointed **Tony Scott** as the next U.S. chief information officer and administrator of the Office of Management and Budget's Office of Electronic Government and Information Technology. Scott has more than 35 years of leadership and management experience, including holding the position of CIO at VMware.
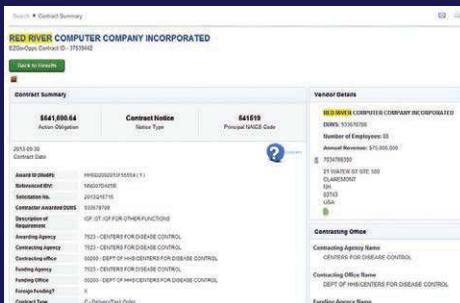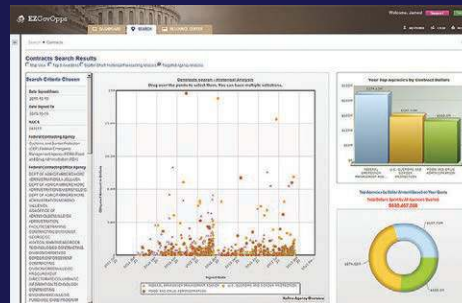
IMAGE BY PAUL BORRUD

The Rise of the Digital Humanitarian

On April 25, a 7.8-magnitude earthquake devastated Nepal killing more than 8,500 individuals, injuring thousands, and leaving approximately half a million people without homes. The breadth and speed of the GEOINT Community's response to such a large-scale natural disaster looks vastly different than it did a decade ago thanks to the National Geospatial-Intelligence Agency (NGA) and the growing number of crowdsourcing volunteers around the globe. Following the earthquake, the Community immediately responded with copious amounts of imagery, data, and volunteer mapping initiatives. Similar to its Ebola response efforts, NGA released a public website full of unclassified GEOINT data, products, and services the very next day following the earthquake. DigitalGlobe's WorldView-3 satellite captured imagery of the region that was released publicly and uploaded to Tomnod's crowdsourcing platform for volunteers to analyze. Digital Humanitarianism is growing considerably and becoming a critical asset to disaster relief efforts according to Dr. Patrick Meier, who recently penned a book titled *Digital Humanitarians*. Among other initiatives led by Meier, his Humanitarian UAV Network has been a boon for Nepal aid. By flying UAVs over the region, the group helped triage damage and determine areas of priority. Paul Borrud, a Humanitarian UAV Network contributor, flew his personal UAV over villages in Nepal 48 hours after the earthquake, capturing images such as the one shown above.

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