

S. HRG. 114-618

**OPEN HEARING WITH HON. ROBERT CARDILLO,
DIRECTOR, NATIONAL GEOSPATIAL-INTELLIGENCE
AGENCY**

HEARING
BEFORE THE
SELECT COMMITTEE ON INTELLIGENCE
OF THE
UNITED STATES SENATE
ONE HUNDRED FOURTEENTH CONGRESS
SECOND SESSION

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TUESDAY, SEPTEMBER 27, 2016
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Printed for the use of the Select Committee on Intelligence



Available via the World Wide Web: <http://www.fdsys.gov>

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U.S. GOVERNMENT PUBLISHING OFFICE

22-966 PDF

WASHINGTON : 2017

For sale by the Superintendent of Documents, U.S. Government Publishing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800
Fax: (202) 512-2104 Mail: Stop IDCC, Washington, DC 20402-0001

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**OPEN HEARING WITH HON. ROBERT
CARDILLO, DIRECTOR, NATIONAL
GEOSPATIAL-INTELLIGENCE AGENCY**

TUESDAY, SEPTEMBER 27, 2016

U.S. SENATE,
SELECT COMMITTEE ON INTELLIGENCE,
Washington, DC.

The Committee met, pursuant to notice, at 10:04 a.m. in Room SH-216, Hart Senate Office Building, Hon. Richard Burr (Chair of the Committee) presiding.

Committee Members Present: Senators Burr, Feinstein, Coats, Rubio, Collins, Blunt, Lankford, Wyden, Warner, Heinrich, and King.

**OPENING STATEMENT OF HON. RICHARD BURR, CHAIRMAN, A
U.S. SENATOR FROM NORTH CAROLINA**

Chairman BURR. I'd like to call the hearing to order. I'd like to welcome our witness today, Mr. Robert Cardillo, the Director of the National Geospatial-Intelligence Agency, or NGA. Robert, we on this committee hear from your organization frequently. We read your products daily. We value the insights and assessments that NGA brings to the table.

As you well know, we typically hold our hearings in a closed setting so that we can discuss freely classified programs. Today, however, I want to offer this open hearing as an opportunity to let the American people know more about the NGA, the mission your workforce is tasked with and the unique value your organization brings to bear.

The NGA arguably has the broadest customer set of any organization within the intelligence community. It includes the warfighter, the policymaker, all-source intelligence agencies, foreign allies, the Federal Aviation Administration, the Federal Emergency Management Agency, state and local first responders, and others. The NGA's products range from highly classified intelligence assessments to unclassified maps. The NGA supports the warfighter and policymaker on a daily basis.

Less well known, though, are your other missions. NGA has supported disaster relief operations such as the response to hurricanes here at home, earthquakes in Haiti and Japan, forest fires in the western U.S. You support special events like the Superbowl, presidential inaugurations, as well as provide advanced data for global positioning systems, a capability that touches every American's life.

As we've discussed previously and you reference in your statement for the record, the explosion in publicly available information and commercial imagery systems means the intelligence community no longer has a monopoly on access or insights.

You had previously stated your intent to leverage these new realities by encouraging NGA to operate more in the open. I'd welcome your assessment today of how that's progressing.

Robert, you're designated as the functional manager of the Nation's geospatial-intelligence enterprise, an important function. I hope during your testimony you can discuss progress you've made in exercising your authorities to better coordinate the collection, analysis, and dissemination of GEOINT across the entire intelligence community.

I'd like to remind members that we're in an open hearing. While the Director may be able to describe how GEOINT is applied to a number of intelligence topics and perhaps provide his agency's assessment on certain topics, he may not be able to get into detail on some issues. If you're uncertain about the classification of your question, I would advise you to talk to staff.

I'd like to note that the NGA will be celebrating its 20th birthday—that would be wonderful for us, wouldn't it?

Vice Chairman FEINSTEIN. Yes, it would.

Chairman BURR. On October 1st, 1996, the NGA predecessor, the National Imagery and Mapping Agency, was established by the Fiscal Year 1997 National Defense Authorization Act. The world certainly has changed dramatically in those 20 years, but I believe your organization, your capabilities, and your tradecraft have evolved along with it.

Thank you again for appearing today. I look forward to your testimony. We thank NGA employees for the crucial mission they carry out every day, and I turn to the Vice Chairman for any comments she might have.

**OPENING STATEMENT OF HON. DIANNE FEINSTEIN, VICE
CHAIRMAN, A U.S. SENATOR FROM CALIFORNIA**

Vice Chairman FEINSTEIN. Thanks very much, Mr. Chairman.

Director Cardillo, thank you for joining us this morning, and happy 20th anniversary next month.

I want to recommend your very thorough statement for the record to all members and to the public as well. You begin by stating the motto of your agency, and that is "Know the Earth, show the way, and understand the world," individually and collectively. The written statement is fascinating and I think everybody would gain by reading it.

NGA's core mission is to provide geospatial-intelligence—now, that is images, maps, analysis, and similar data—in support of national security missions. NGA's customers, which includes the Intelligence Committee, warfighters, policymakers, and others, then use these products for a multitude of purposes.

For example, showing changes in North Korea's missile program by taking many images of key installations over time; providing that imagery that can help map ISIL's defenses around the cities in Syria; and monitor activities to ensure Iran is not engaging in

prohibited activity at its nuclear sites. Those are three good examples.

NGA has also become an important supplier of products that support a host of other government activities, like, believe it or not, fighting forest fires or responding to flooding. Imagery has become a core requirement of many missions.

The government has not been alone in increasing its use of imagery, and demand in the private sector has increased substantially. This increased demand has led to the creation of companies, like Terra Bella and Planet, both from California, my state, which launch their own satellites and provide imagery and related services for a fee.

Some of these companies may soon be able to take an image of every spot on the Earth every day. That's an unprecedented amount of information. Taking advantage of the data that can be provided by these commercial suppliers is a key challenge for the U.S. Government and for the NGA going forward.

So I commend you, Director, for understanding the magnitude of this challenge and your willingness to pursue new sources of intelligence collection. In the future we'll all have to work together to best position your department and the entire United States Government to use as much commercial imagery as possible, while ensuring that we continue to maintain and improve the traditional—excuse me—the truly exceptional capabilities offered by our government's satellites.

I'm also interested in the new NGA office you have opened in Silicon Valley. The NGA is not the only part of the IC or the United States Government to realize the potential of having an office positioned to work more directly with the tech sector in California. I'd like to understand more about what this office will do and how it will interact with other efforts, like In-Q-Tel.

Finally, I'd appreciate an update on the construction of your new facility in St. Louis. Now that the decision has been made regarding that location, we would all appreciate an update on cost and schedule and if they're all within budget and time.

Thanks, again, Mr. Chairman, and thank you, Director, for being here.

Chairman BARR. Thank you, Vice Chairman.

At this time I would inform members I think what they already know, is that we will recognize individuals in order of seniority for a five-minute round, and we'll loop back as we need to.

With that, Robert, the floor is yours.

**STATEMENT OF HON. ROBERT CARDILLO, DIRECTOR,
NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY**

Director CARDILLO. Thank you very much, Chairman Burr, Vice Chairman Feinstein, and all the distinguished members of the committee. On behalf of the women and men of the National Geospatial-Intelligence Agency and the National System for Geospatial-Intelligence, it's my honor to be here to represent them before you here today.

As the Vice Chairman noted, NGA's motto is "Know the Earth and show the way and understand the world." That motto uses both new and exciting opportunities to deliver geospatial-intel-

ligence to our customers and our partners in ways that no-one thought possible. Every day we grow in our ability to know the Earth, as we gain access to an ever-broadening pool of foundation data that includes commercial and allied, electro-optical, open sources, and direct user input from the field.

Now, to be clear, National Technical Means from my mission partner at the National Reconnaissance Office provides exquisite and peerless capabilities to meet our hardest challenges. But for NGA to provide the most value possible to our customers, we must be able and open to leverage all geospatially enabled content as a component of our daily operations.

Over the past decade, NGA has partnered with the commercial imagery industry to dramatically improve delivery of commercial GEOINT to all mission partners. Our EnhancedView contract with Digital Globe provides a diverse set of phenomenology to support 90 percent of our foundation mapping efforts, our disaster relief efforts, and our intelligence requirements. Its unclassified nature makes commercial imagery a mainstay for U.S. and allied customers in virtually every mission worldwide.

Now, we've also expanded outreach and coordination over the last year to the most mature of what we call the "new space" providers, such as Planet, formerly Planet Labs, Terra Bella, BlackSky Global, to assess mission utility and access to operational data and services. Over the coming months and years, we'll look at more of these new space providers and constantly assess the state of the industry to enable us to do more than we thought was possible.

Our mission partner, the NRO, also has a vested interest in these companies. Together, we stood up what we call the joint "Commercial GEOINT Activity," whereby NGA and NRO work more closely than ever before to identify, consider, and evaluate emerging commercial GEOINT data and services against our customers' needs. Through this CGA, we and the NRO will assess future investments and capabilities to make development decisions, both for commercial and for national, on how we match those user needs to the optimal mix of government, partner and commercial space capabilities.

As the functional manager for geospatial intelligence, my most important responsibility is to capture and represent the user needs to those that depend upon us. As such, I'm uniquely positioned to show the GEOINT enterprise how we can and must succeed in the future by operating in and with the open. Earlier this year, I called on the community to focus attention on three priority areas: professionalization, interoperability, and unity of effort.

I've also mandated professionalization by requiring that all GEOINT personnel at NGA and the services be certified—this includes me. The DOD components have been directed to finish this effort by 2019. We've also developed a groundbreaking agreement with industry partners to recognize functional equivalence between our certification program and theirs.

To promote interoperability, we're developing standards that provide the vocabulary, the grammar, and the interface rules to ensure that a product is interpreted as the author intended and that the end users interpret the product in the same way.

To demonstrate our unity of effort, I've invested fiscal year 2016 funds to support my partners' capabilities. This includes U.S. Special Operations Command's efforts on human geography in parts of the Middle East and North and Sub-Saharan Africa, and the U.S. Department of State's Secondary Cities project that generates data on urban food, energy, and water nexus in non-primary cities.

Similar efforts are underway by our Commonwealth allies. In the past several months, we've aligned structures, functions and resources, identified efficiencies through mission-sharing and collaboration, and produced a blueprint to tackle scientific and technological challenges and speed the transition and adoption of mature and operational capabilities.

National decisionmakers, military commanders, scientific researchers, and first responders all look to our agency to help them understand what's happening at any given place and time, and anticipate what may happen next, whether that be a military operation, a response to a flood or a forest fire, or understanding the changes in Alaska and the Arctic.

To answer this demand signal, NGA must capture the right knowledge from the wave of national, commercial, and open source data. We've embarked on Activity-Based Intelligence, which will use the big data analytics and methodologies to find adversarial threats inside the noise and the volume of these disparate data streams.

In short, NGA must go wherever the data exists and apply that data wherever the mission demands. We must embrace open content with the same fervor as classified content; and in many cases we must use open content first, then augment it with classified sources to confirm, reject, or increase our confidence in analytic judgments. And we must find new ways to get the data to the user, whichever system they may be on, from the most classified of networks to the world wide web.

In closing, the agency I'm privileged to lead will celebrate its 20th anniversary next week. In 1996, the National Imagery and Mapping Agency was established. Congress, with exceptionally strong support from this committee, was largely responsible for its creation. I sincerely and deeply thank this committee and all of Congress for your continued support.

Now, while we may be the youngest agency in the intel community, I can proudly and confidently report that the agency and the GEOINT discipline are more relevant than at any point in our 20-year history. Our future is rich in opportunities, exceptionally bright, and we will build the needed tools to harness the opportunities that arise. We're committed to be the NGA that the mission demands and our Nation deserves.

On that note, I ask that my full written statement be entered into the record, and I'm pleased to answer any questions you may have.

[The prepared statement of Director Cardillo follows:]



Statement for the Record
before the
Senate Select Committee on Intelligence

Robert Cardillo
Director, National Geospatial-Intelligence Agency
27 September 2016

Approved for public release under case number 16-646

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Chairman Burr, Vice Chairwoman Feinstein, and distinguished members of the Committee, on behalf of the women and men of the National Geospatial-Intelligence Agency (NGA) and the National System for Geospatial-Intelligence (NSG), I am pleased to testify before you today. NGA and our geospatial-intelligence (GEOINT) partners help decision makers, military commanders, and first responders understand what's happening at any given place and time, and anticipate what may happen next. I believe our motto says it all, "Know the earth, show the way, and understand the world." Individually and collectively, I can attest that we are fully committed to our Intelligence Community (IC) and Department of Defense (DOD) responsibilities and broader obligation to the nation's security.

NGA and our GEOINT partners across the national security community are critical to the IC's commitment to minimize surprise and enable decision advantage. We are routinely able to respond more dynamically than other traditional intelligence disciplines, as we have worldwide reach, increasingly persistent collection and systematic analytic access. With the explosion in publicly available information and non-traditional sources, the IC no longer has a monopoly on access or insight, but the IC is routinely asked to corroborate what is being reported and to put it into the context of what we know about the evolving issue, to include the motives of the participants and the potential threats to our interests. Another of the ways GEOINT is able to contribute to favorable outcomes is by providing a less sensitive source from which to expose our knowledge and perspective on a situation or threat. Put another way, our customers look to NGA and our profession to create coherence out of chaos. Imagery or other geospatial sources can be a vehicle for sanitizing or articulating the U.S. perspective to partners, the public, international fora, and even adversaries. Let me outline some examples of national security issues, where GEOINT contributes to both our understanding and to our ability to engage and represent our national interests.

NGA and our NSG partners, including the combatant commands and the service agencies, are integral players in operations to degrade and disrupt the ability of terrorist organizations. Every day, our analysts support our government's antiterrorism activities around the world.

The contested regions of Iraq and Syria are host to a web of competing interests, conflicting parties, and complex alliances. GEOINT contributes to our understanding of the actions which players undertake – such as advances of state-actors into neighboring states, the provision of lethal aid and assistance to favored factions, and the underlying terrain, human geography and physical and economic infrastructure. By continuously monitoring these targets, we provide warning, detect and describe operations, and enable policymakers and operators to pursue responses which serve our interests and minimize our exposure to threats. This includes monitoring Syria & ISIL's response to actions by traditional state actors, such as Russia, Iran, and Turkey, as well as non-state actors, such as Hezbollah, Shiite militias, and Kurdish militias.

In recent weeks, NGA has used classified and unclassified GEOINT sources to ensure all parties in Syria adhere to the cessation of hostilities agreement brokered by the United States and Russia. We also initiated and manage a contractor-provided open source program to monitor the cease fire without any classified intelligence input from the Intelligence Community. This gives the United States a program that allows us to share proof of violations with any nation or non-state actor with equities in the process. The program also serves as a testbed for future cease fire monitoring around the world, with a goal towards placing fewer peacekeepers' lives at risk.

In a similar manner, since 2014, GEOINT has contributed to our understanding and responses to Russia's occupation and attempted annexation of Crimea and aggression in eastern Ukraine. We have aggressively applied myriad sources and analytic strategies to track traditional military operations, the flow of supplies and irregular forces, and the ethnic, economic and geographic backdrop to document the flow of the conflict and to characterize the environment and the forces at play. We routinely use open and unclassified sources, such as commercial imagery and crowd-sourced geospatial information to convey appropriately sanitized versions of this knowledge to enable public diplomacy to shape international responses and further US policy and operational strategies.

The administration's Rebalance to Asia and the Pacific included NGA's attention on the South China Sea. NGA is uniquely positioned to help the U.S. Government and

our allies understand developments in the South China Sea because of the interaction between physical and human geographies. By drawing on NGA's various geospatial capabilities as well as years of expertise in the region, we provide a deeper understanding of the dynamics in the region while also supporting Department of Defense civilian and military leaders' requirements to gain and maintain situational awareness of critical developments.

NGA also continues to devote considerable collection, analytic and technical resources to monitoring North Korea's missile and nuclear weapons programs, which continue to undermine regional stability and pose a growing threat to US forces, allies, interests and territories. North Korea conducted an unprecedented number of land and sea-based missile test events this year and a fifth nuclear test earlier this month that have been designed to mature and publicly illustrate development of regional and strategic capabilities. We work closely with allies around the world to share understanding, leverage the insight and sources of all partners and enable collective response to the threat posed by North Korea.

NGA provided intelligence that informed U.S. policymakers during negotiations with the Iranians on the Joint Comprehensive Plan of Action. NGA continues to collaborate with other IC partners to document Tehran's compliance with its initial nuclear obligations. We remain actively engaged in monitoring Iranian compliance.

Throughout the decade, the agency's GEOINT helped reveal the size, scope, and impact of civil wars and regional conflicts, such as in Sudan, and we provide critical support to multiple customers, including policymakers and operators in the field. NGA products demonstrate how destruction in Sudan directly led to hundreds of thousands of deaths, and helped U.S. Government relief organizations better understand how to respond to the humanitarian disaster created by the conflict.

NGA is also proud to have deployed over 3,000 personnel to directly support defense and intelligence operations onsite at command centers, aboard ships and in field bases in support of global operations. Today, more than 100 of our teammates are deployed in or near war zones in Afghanistan, Iraq, Jordan, and the Horn of Africa.

We continue to apply GEOINT to civil missions such as disaster response and

humanitarian operations. When requested, NGA supports federal agencies including the Federal Bureau of Investigation, Federal Emergency Management Agency (FEMA), the U.S. Forest Service, and the Secret Service. Unclassified imagery and geospatial products have supported efforts in humanitarian assistance, disaster recovery, land reclamation and historic preservation, and domestic security special events. A few that I would like to highlight are

- U.S. Forest Service and FEMA for monitoring and management of California wildfires in 2015 and 2016;
- FEMA in response to flooding in South Carolina, Texas, and the Mississippi River in 2015 and 2016; and
- Secret Service and local law enforcement for the 2016 Democratic and Republican National Conventions in Philadelphia and Cleveland, respectively.

NGA also provides electro-optical commercial imagery in support of scientific and academic pursuits. In 2015, NGA developed an unclassified website to deliver NGA-produced, high-resolution digital elevation models, maps, nautical charts, and terrain data focused on the Arctic. Earlier this month, NGA and the National Science Foundation expanded that effort with the release of the first-ever, publicly available, high resolution, satellite-based map of Alaska. This 3-D map will provide data and context for decisions related to climate resilience, land management, sustainable development, safe recreation and scientific research, and was made possible through a public-private partnership that included universities and the White House Office of Science and Technology.

NGA's Maritime Safety office, which traces its lineage to 1869, collects and analyzes information and writes the Notice to Mariners that keep government, civilian, and international mariners informed of vital safety of navigation issues. NGA works openly with nearly every chart-producing nation as well as with the National Oceanographic and Atmospheric Administration's Office of Coast Survey, nine U.S. Coast Guard Districts, and the U.S. Army Corps of Engineers. We also support commercial vessels worldwide with navigation products and warning messages.

In addition to updating worldwide digital nautical charts that ensure Safety of

Navigation to a broad base of users, NGA has expanded beyond maritime to provide important Safety of Navigation information to the aeronautical community. Over the past few years, NGA increased its worldwide, industry-leading aeronautical safety library by 65%, to almost 20,000 flight procedures made available to DOD warfighters. Over the same time period, we also increased our Vertical Obstructions database from 4 million to more than 24 million features. Moreover, we converted from paper to downloadable digital maps, reducing the amount of gear pilots need to carry while helping ensure that they always have the latest information.

NGA is the primary organization responsible to develop, maintain, and enhance the World Geodetic System (WGS) 84 Reference Frame, the foundation for all DOD and IC Positioning, Navigation, and Timing (PNT), including the Global Positioning System (GPS). NGA operates 11 worldwide GPS monitoring stations that collect and use the GPS broadcast to ensure the fidelity of WGS 84, the accuracy of PNT, and the geospatial integrity of GEOINT. In addition, Air Force GPS Command and Control relies upon NGA GPS data for satellite situational awareness and signal integrity. NGA provides 60% of the data necessary to ensure the accuracy of the GPS constellation.

In addition, NGA establishes, maintains, and grows relationships with foreign partners. For over a decade, we've been working with a consortium of international partners called the Multi-National Geospatial Co-Production Program (MGCP) to share the production required to provide relevant mapping data across critical areas of the globe. The MGCP consortium has mapped over 25% of the earth's land surface, emphasizing those areas of high national importance. By partnering with allies, the US gains seven times more coverage than we could have done ourselves.

Meanwhile, our partnership with Germany's Bundeswehr Geoinformation Centre has brought together the TREx Alliance, consisting of more than 30 nations to create a the most comprehensive, pole-to-pole, global Digital Elevation Model from data collected by the German Aerospace Center. This effort will improve ground sample spacing from 30 meters to 12 meters, and in three years, more than a third of the Earth's surface, including the regions we are most concerned about, will be mapped at this higher resolution. Ultimately, this effort will provide higher resolution elevation data

for the entire globe.

Another critical international partnership has been our work with the United Kingdom to integrate their aeronautic safety of navigation content into our data holdings. This success has been replicated across our Five Eyes partners and we intend to expand to other international partners.

Enabling our customers' success compels us and drives us to search for new and better ways to meet our customers' GEOINT needs. Fortunately, advances in automated processing, the GEOINT tradecraft, human-machine collaboration, and the ability to anticipate behaviors has opened up the possibility of a paradigm shift in how we operate. This is a game-changer, and to capitalize on this revolution, NGA must succeed in and with the open.

To be clear, National Technical Means provided by the National Reconnaissance Office (NRO) provide exquisite and peerless capabilities to meet our hardest challenges, but for NGA to provide the best value possible to our customers, we must be able and open to leverage all types of geospatially-enabled content as a component of daily operations.

That's why, over the past decade, NGA partnered with the commercial imagery industry to dramatically improve delivery of commercial GEOINT, not just to NGA, but to the entire NSG. Today, the centerpiece of NGA's commercial imagery program, EnhancedView (EV), provides the majority of commercial imagery for the NSG. With its diverse phenomenology and rapid delivery timelines, EV supports everything from map-making, to disaster relief, to intelligence requirements. In fact, it supports over 90% of our foundation mapping efforts. Its unclassified nature makes commercial imagery a mainstay for U.S. and Allied customers in virtually every mission worldwide, from peace-keeping to combat support to disaster relief.

Succeeding in and with the open also means looking not just at new sources, but also at new forms of data. Most recently, NGA has been using publicly available information such as social media data, together with geospatial information to anticipate hostile actions to U.S. or Allied interests and provide a fully integrated intelligence picture.

In short, we must go wherever the data exist, and apply data wherever the mission demands. While NGA has made great strides in successfully leveraging commercial imagery and other open sources to achieve our mission, NGA's architecture, tradecraft and training, standards, governance, and culture remain optimized for classified GEOINT content. To truly succeed in the open, NGA must lead the IC in overcoming our historic reluctance to allow analysts to engage externally and embrace the ever-expanding private marketplace. Open content will be embraced with the same fervor as classified content, and in many cases, we will use open content first and augment with classified sources to reject, confirm, or increase confidence in analytic judgments.

This new open content paradigm will open the floodgates of information opportunities for us. Instead of just imaging a small percentage of the Earth each day, we will sense all of it every day. To manage that tidal wave of national, commercial, and open sources data, NGA has embraced Activity Based Intelligence (ABI) which will shift our focus from trying to extract insight from a volume of collection – report out what we see and hope it's useful to someone – to looking at the key information needs and priority threats and focusing on what sources and what analytics will detect the activity we need to care about. In other words, we will use big data analytics and methodologies to find adversarial threats inside the noise and volume of disparate data streams.

Key to ABI is NGA's transition to an Object Based Production (OBP) environment. Earlier this year, we started that transition by extracting the important information from the frame of an image to produce intelligence that's more clear, more relevant, and more useful to everyone. Then, we condition, standardize, and migrate that OBP data into a Structured Observation Management (SOM) framework that makes sure that we're feeding ABI with the right kind of information to help analysts make the connections they need.

As the commercial GEOINT industry expands at a revolutionary pace, with new and unique commercial sensors, and as the GEOINT analytic tradecraft becomes more commercialized, NGA faces the challenge of assessing and procuring these

capabilities within current budgetary constraints and in an environment of dynamic mission needs and priorities. Looking to the future, NGA anticipates taking a multi-pronged approach, including purchasing analysis as a service to augment NGA analysis, and purchasing and co-developing alerting services and algorithms for automated object-change detection from commercial data streams which will enable analysts to leverage commercial sources they would not otherwise have time to individually exploit. That's why NGA has expanded outreach and coordination over the last year to the most mature of the "new space" providers such as Planet (formerly Planet Labs), Terra Bella, and BlackSky Global to assess mission utility and access to operational data and services.

Another enabler is our GEOINT Solutions Marketplace (GSM). In recent months, we've worked with the United States Geospatial Intelligence Foundation (USGIF) to integrate the functionality of their Industry Solutions Marketplace with our GSM. The combined result is GSM 2.0, where GEOINT users can submit problems they would like to solve and innovators can submit new ideas and tools to be considered, reviewed and improved upon by the whole of the GEOINT community. This is truly an open partnership, with USGIF running the new platform while NGA manages and adjudicates every submission that's intended for our agency.

The targeting community is benefiting from changes, too. Based on feedback from services and combatant commands, NGA developed new web-based, browser-enabled targeting tools with improved geospatial accuracy and access to streaming imagery. These tools provide greater exposure to community intelligence from multiple domains, reduce research time by consolidating existing information portals, and integrate multiple data sources not previously visible in a single platform. The end result is faster, more accurate targeting tools for our warfighters.

Reforming and improving NGA's acquisition systems are critical to our mission success. Led by NGA's Deputy Director and NGA's Component Acquisition Executive, we are driving changes across agency acquisitions to more effectively meet mission needs. The changes to acquisition policy introduced by Congress in the FY 2016 National Defense Authorization Act (NDAA) coincided with internal NGA reviews to

reduce timelines and eliminate redundancies. NGA's Acquisition Strategy was released in August 2016 and focuses on the rapid evolution of NGA's acquisition systems and processes. NGA is now better positioned to engage with traditional and non-traditional vendors and enhance opportunities for industry interaction and improve procurement transparency. This is particularly important as we move to an IT architecture that allows all data, regardless of its producer, to be interoperable and flow in all directions.

Each day, we work to find ways to make GEOINT more accessible and relevant to time dominant operations, policy decisions, and ultimately, to help partners save lives. Our GEOINT Services initiative is the focal point for this mindset. This effort spans all security domains and, most importantly, it is open-ended. We are shattering the false boundary conditions that have always separated tasking, processing, exploitation and dissemination. GEOINT Services will allow us to find, get, use and contribute in a more fluid and open fashion. Working closely with the Open Geospatial Consortium, our partner for more than two decades, we are using standardized and interoperable strategies to better move valuable data across mission systems faster, sharing it across broader community of users. Our goal is to be "all in" the Cloud by the end of 2017, presenting value on all domains, including the World Wide Web.

One example was how we offered simplified access to our unclassified GEOINT holdings for relief workers in support of 14 different firefighting efforts across six states (Colorado, Utah, Wyoming, South Dakota, Arizona and California). NGA products helped firefighters prioritize resources and better respond to changing conditions. We also supported the Federal Emergency Management Agency (FEMA) with real time damage assessments in response to a number of flooding events this year, including along the Mississippi River in December and January; Houston, Texas in April; and West Virginia in June. NGA's geospatial data helped FEMA identify the hardest hit areas and reroute needed supplies around unnavigable obstructions. And, for cases when the data are not enough, we have embedded NGA analysis into a 24/7 fusion cell to support FEMA response efforts, whenever they have requested support.

We also realize the life-or-death implications to the warfighter of ensuring

common data standards and interoperability between DOD and IC systems. That is why we are working to meet the needs of tactical warfighters at the Joint Task Force level and below who need discovery and retrieval tools as well. The Defense Intelligence Information Enterprise serves as a bridge for combat support agencies between the DOD's Joint Information Enterprise and the Intelligence Community's IT Enterprise (IC ITE).

We're continuing to push GEOINT down to the most tactical levels. Our Shiprider program puts NGA mentors on U.S. Navy ships out in the fleet, to teach them new and innovative ways to access GEOINT while deployed. We have also armed these mentors and their military customers with new capabilities, such as streaming services, which allow, for the first time, access to exploit imagery in a timely enough manner to be used for time critical operations.

To make these sorts of changes happen, NGA developed an Open Content Strategy aligned to our GEOINT 2022 CONOPS and consistent with the National Open Source Committee strategic goals and ODNI strategic plans for IC ITE implementation. Our strategy lays out FY2018-22 goals and specific objectives designed to further NGA's evolution to operate in the open. I am pleased to report that we have already begun to make progress against the strategy in several key areas:

In response to the wave of emerging commercial imagery providers, NGA began engaging with the most mature of these "new space" providers to assess mission utility and possible access to operational data and services. We quickly realized that working with our mission partner, the NRO, would afford both agencies the best opportunity to take full advantage of new and emerging commercial GEOINT capabilities to satisfy mission needs. Together, we stood up the joint Commercial GEOINT Activity (CGA), whereby NGA and NRO are working more closely than ever before to identify and evaluate emerging commercial GEOINT data and services against customer requirements. CGA will serve as the focal point for engagement with our industry partners to understand and assess emerging commercial capabilities for technical feasibility and mission utility.

CGA will help shape the US commercial remote sensing policy regime to

embrace emerging commercial capabilities and the “new space” environment. Together, NGA and NRO will base all future investment and capability development decisions, both commercial and national, on matching user needs to the optimal mix of national and commercial space capabilities. CGA is the conduit that will enable NGA and NRO to fully leverage both national and commercial GEOINT as efficiently and effectively as possible to satisfy a broad spectrum of foundation and intelligence needs, increase resiliency, and improve customer support.

Succeeding in the open also requires an increase in the purchasing and adoption of commercial data, information, and analysis. The Commercial Initiative to Buy Operationally Responsive GEOINT (CIBORG) program, a collaboration between NGA and the General Services Administration (GSA), will use GSA schedules and other government-wide contracts to provide efficient, rapid access to emerging commercially-available supplies of imagery, data, analytical capabilities and services that support the NGA and NSG missions. The goal is to have CIBORG provide the means to procure commercial capabilities that are determined to have the quality and utility to support mission-driven requirements by early 2017.

NGA must also expand to include a robust unclassified production environment interoperable with our classified production environment. In another new initiative, NGA is exploring fulfillment of priority foundation GEOINT content requirements via commercial means by migrating the majority of foundation data production and management to a cloud-enabled IT infrastructure on an unclassified security domain. The unclassified cloud environment, Janus, will enable near-real time access to commercially-created and enriched content (including crowd- and community-sourced data) in a cost-effective manner that improves decision-making timelines.

Another key to operating in the open is ensuring that unclassified content from community, civil, and foreign partners can be readily integrated and disseminated through GEOINT services. The NSG Open Mapping Enclave (NOME) is an open source collaborative mapping environment designed to allow NGA and its partners to work together simultaneously to generate dynamic content in support of missions throughout the world. With semi-automated tools that enable users to quickly conflate

data to the base map and user friendly content management tools, NOME moves the community one step closer toward the concept that “every warfighter is a collector”. In this environment, users do not need to be geospatial experts to provide valuable content to the IC. Any soldier in Afghanistan can add a road they just patrolled to the living database, and populate that road with valuable information that will be immediately available to any users with access to the living map. Even with NOME still in a developmental environment, there are already over 1,000 accounts, including some with our international partners, already making contributions and getting hands-on training, giving us valuable feedback for future development needs.

This level of change integrates people, processes, and technology and drives us toward an integrated and interoperable GEOINT Enterprise. Integration and interoperability implies a change in mindset for NGA and our broader GEOINT Enterprise, the NSG, to adopt a community-first perspective and share stewardship of our Enterprise. I am strengthening my position as the GEOINT Functional Manager to set the vision and execute the changes necessary to bring about that change.

At the GEOINT Symposium in May, I called on the community to accelerate and focus attention in three priority areas: professionalization, interoperability, and unity of effort. These three priorities set the NSG's course and expand its sphere of influence in an increasingly open and connected world. And we are moving out smartly on execution.

As the GEOINT Functional Manager, I am proud to have mandated that GEOINT personnel at NGA and the services need to be certified – this includes me. Since the program began in 2013, we have awarded more than 6,000 certifications, 20% of those to GEOINT practitioners in the military services. Recently, we received national accreditation for one of our analytic occupations which will enable NGA to systemically train, track, and evaluate analytic personnel against mission priorities. In the last year, we have also completed four new Proficiency Level 2 performance assessments that enable 97% of the Defense GEOINT workforce with opportunities to become certified. At the Symposium, I communicated criteria and timelines for DoD Components to certify their GEOINT-related workforce by 2019, and stood up a Certification Program

Management Office to coordinate the development of the certification assessments, manage certification testing, and maintain enterprise records.

At the same time, industry has been hard at work professionalizing their own workforce. For us to make the best use of the valuable work industry is doing, NGA and USGIF will begin recognizing functional equivalence between our respective professional certifications. This groundbreaking agreement will provide parity and equivalence across certification programs to create portable, transparent knowledge and standards to build a true profession.

To promote interoperability, NSG members and commercial partners are conducting analytical "sprints" to model performance and imagery quality of planned small satellite constellations. Additionally, to promote interoperability and use of SOM techniques, the National GEOINT Committee (GEOCOM) issued a guide to standardize full motion video (FMV) products training and operations encompassing maritime, aeronautical, and land-based scenarios. These standards provide the vocabulary, grammar, and inference rules to ensure that an FMV product is interpreted as the author intended and that end-users interpret the product in the same way.

Demonstrating unity of effort, I invested FY2016 funds to support partners' capability development through the GEOINT Enterprise Investment program. For example, U.S. Special Operations Command will increase the NSG's collective understanding of human geography in priority countries in the Middle East and North and Sub-Saharan Africa. At the same time, the U.S. Department of State's Secondary Cities project will generate data and story maps on the urban food-energy-water nexus in non-primary cities with populations of 100,000-1,000,000, to catalyze geospatial data creation and sharing through regional hubs. I'm also impressed by the partnership and leadership of the Army Geospatial Center on local terrain data, helping the GEOINT enterprise keep up with the rapid pace of urbanization.

I am also taking steps to include more partners in up-stream decision-making. I stood up the Future Needs Working Group, an NSG forum under the GEOCOM to capture and validate future geospatial needs in support of national security. This is a critical effort to ensure that we fully understand and incorporate mission needs to drive

development and acquisition of future capabilities.

Similar efforts are underway with our commonwealth partners, under the auspices of the Allied System for Geospatial-intelligence (ASG). In the past several months we aligned structures, functions and resources; re-imagined Five Eye GEOINT Concepts of Operations; identified efficiencies through mission-sharing and collaboration; produced a blueprint to tackle scientific and technological challenges and speed the transition and adoption of mature and operational capabilities; and shaped the way forward for developing compatible GEOINT analytic standards within a multi-INT construct.

These individual accomplishments are revolutionizing GEOINT and advance the objectives relayed in my NSG Strategy. As a community, we are adding granularity to the plans, programs, investments, and evaluation methods needed to execute the NSG Strategy. But we need to do more, and we need to do it faster.

Three words capture well how I envision NGA operating in the future: lead, broker, and differentiate.

I will lead by fully exercising my authorities as functional manager to leverage the contributions of all NSG members and ensure that the highest mission needs and priorities of the Enterprise drive our resource decisions. I will also exercise my authoritative voice on GEOINT sources and methods.

I am committing NGA to satisfy community members' mission needs by fully understanding and matching requirements to Enterprise capabilities. As a broker for GEOINT data, products and services, we will provide a seal of approval to validate format, accuracy and timely delivery of GEOINT. A seal of approval will increase partner confidence regardless of authorship or source. Each military service endpoint or platform contains the technical specification to which NGA will map products and services, insuring full interoperability.

I will also work across the NSG to identify those missions that each member can do best -- where NGA, as an agency, can and will continue to make a unique contribution to national defense and global security, and where other members of our

GEOINT Enterprise can play a greater or different role. Unity of effort and mission sharing underscore my Functional Management responsibility.

Our partners in the National and Allied Systems for Geospatial-intelligence are making similar explorations. I foresee NGA relying more on its partners to maximize impact to our expanding customer base. Along with this reliance comes the obligation to build the confidence that all members of our Enterprise adhere to appropriate standards and operate in a consistent way. As an Enterprise, we expect to partner differently, work differently, and leverage strengths in ways we have not done before.

Lead, broker, and differentiate compose an activist framework and mindset for community governance. Working together, we are accomplishing more than we have ever accomplished before.

No leader or functional manager can succeed, though, without a dedicated and motivated team behind him. Every day, I am impressed by the innovation and resourcefulness of the men and women who work at NGA and across the NSG. However, the explosion of new commercial geospatial services has created a commercial demand for personnel with the same sort of skills and experience, that I have the pleasure of leading at NGA. In order for NGA to continue to have the best and brightest talent available, NGA must continually relook at the way we hire and manage our workforce.

While there is still more work to do on this front, I am proud of the proactive steps NGA is taking to ensure we have a diverse and qualified applicant pool. NGA actively partners with academic and professional organizations, the Wounded Warrior Program, and persons with disabilities organizations. At the same time, NGA is working to increase the number of people we are hiring with the necessary talent for today and tomorrow to meet the full potential of our agency.

One challenge that the whole IC faces, is how to retain individuals who are waiting for their security clearances to be processed. To combat that, we are exploring new models for hiring. We on-boarded uncleared Aero and Maritime analysts who had completed initial security screenings and put them to work supporting the unclassified portions of the mission while their security clearance reviews were being finalized. We

provided a mission-focused, consequence-enabling space for all new employees to facilitate their on-the-job training and contributions as GEOINT new hires while we adjudicated their clearances. Working in this open environment, they are able to gain new insights and new understanding of how to work with, and in, the open.

We have also modernized how our people train and develop. Our On-Domain, On-Demand training system changes the focus from instructor-centric to learner-centric training, increasing our web-based learning results by almost 300% over the past year. We've even opened our course catalog to our Five Eyes partners, and extended invitations to British, Australian and New Zealand instructors to become adjuncts at our college. In the coming years, we will open up all of our courses to all of our partners.

The foundation of NGA's future is built on its unique ability to articulate its mission and measure and associate talent to those demands. We have designed and are implementing our Mission-Talent Alignment (MTA) initiative to bring a sharper, corporate focus to our mission priorities. MTA also brings unprecedented transparency of assignments to our officers and data analytics to understand trends in our workforce demographics relative to evolving GEOINT requirements. The successful application of the MTA construct brings mission managers and career services together under a common framework to ensure that the growth of our people specifically anticipates both the direction of our discipline and vice versa. This work will significantly enhance and drive our recruitment and attrition strategies.

Another key to enabling our ability to work with and in the open is to make sure that our NGA employees have the right kind of facility and the right kind of equipment to enable them to succeed in performing our GEOINT mission. The new campus in St. Louis, Missouri, will afford us the opportunity to create a place where we can grow our partnerships with industry and academia in a more open and flexible environment to enable our mission through the 21st century.

Our next steps for the program include award of a design contract for the campus and acquisition of the property in FY2017, and start of construction in FY2018. As I weighed my site decision in June, I focused on the best decision and value to support the NGA mission.

Maintaining our schedule, including required funding and project authorization, is critical to the campus development and completion. We continue to work closely with the Army Corps of Engineers and the city of St. Louis to monitor the progress being made to prepare the site for acquisition and follow-on construction.

We have a long road ahead and I remain convinced that we are making the right investment for our agency and the St. Louis community. Your support for the program has been substantial and, on behalf of the men and women of NGA, I extend my deepest thanks and appreciation.

With your support for the growth of our Functional Management responsibilities, our Mission-Talent Alignment and our N2W project, I am confident NGA will continue to be well positioned for whatever changes in the GEOINT enterprise may lay ahead. However, rather than wait for those changes to come, NGA is taking a proactive step to be part of that change.

Earlier this year, we restructured our research and development efforts, moving NGA to leverage all sources of innovation as we conduct our research. NGA Research is connecting with tech talent, ingenuity, and expertise from national labs, universities and businesses to identify fresh ideas, novel research techniques, and path-breaking scientific opportunities. We are then harnessing their abilities to tackle our hardest problems.

Our new focus is helping us attract some of the best and brightest talent out there. For example, earlier this year we brought on board the former director of the Intelligence Advanced Research Project Agency's (IARPA) Office of Incisive Analysis, who at one time held the position of Vice President at In-Q-tel. Another distinguished new researcher was the Advisor to the U.S. National Institute of Standards and Technology (NIST) on International Science and Standards.

Another way that we are tackling our hard problems is through the use of open, unclassified challenges on topics including agile acquisition, crowd sourcing code development, managing disparate data sets, and anticipatory analytics. In compliance with the White House Strategy on American Innovation and the Report of the National Commission for the Review of Research and Development Programs of the Intelligence

Community, NGA is not only benefiting from open challenges driven by industry and academia, but leading them with National Security at the forefront.

Following in the footsteps of the National Security Agency and IARPA, we posted our first challenge.gov submission running from June 6 to July 16. The challenge was spearheaded by our GEOINT Pathfinder initiative and offered a prize award of \$10,000 for the development of new tools that would monitor and track changes in living documents. The prize winner was a computer software evaluator from Iowa, who surprised all of us with his unanticipated direction. The code is now integrated into an unclassified mobile NGA geospatial product prototype and greatly reduces the complexity in tracking changes to dynamic documents. Our involvement in challenge.gov was successful and a first of many small challenges focused on achieving short term, practical goals.

NGA is using another one of these challenges to foster innovation in the automation of imagery analytic tasks. One approach involves engaging and participating in SpaceNet, an open data initiative launched recently by In-Q-Tel's lab CosmiQ Works, DigitalGlobe and NVIDIA. SpaceNet brings to the overhead imagery arena the same collaborative approach that has enabled outstanding successes in the machine learning based analysis of photographs taken by ground-based cameras. NGA plans to participate in SpaceNet with data and with challenges. We will adapt what we learn from the unclassified advances and apply them our classified problem sets.

We are also looking to non-traditional partners for ideas about new capabilities to support the warfighter. One example is strengthening industry partnerships through our collaboration with In-Q-Tel. We've doubled our investment to improve our effectiveness in areas such as commercial space, visualization, and cybersecurity.

As NGA is looking for ways to shape how the geospatial enterprise innovates, there is no better way than by going to the geographic heart of American innovation, Silicon Valley. By November, we will have our first staff up and running at NGA Outpost Valley (NOV), which will leverage the capabilities and energy that define the Valley's open, vibrant, geospatial community. In fact, the NOV just completed its first sprint with

Hacking for Defense (H4D). By using H4D's lean methodology framework to address DoD and IC challenges, NOV is better prepared to assess and redefine GEOINT challenges and in turn shape and outfit the solutions. We currently have a team composed of NGA talent across our disciplines who have tackled a high level analytic problem statement, and in the course of six weeks, were able to scope and outline the problem for industry and academia (Stanford University, UC Berkeley) and others to explore technology solutions through a real world scenario challenge. Our hope is that the NOV will help us expand to other innovation centers, such as the Cortex Innovation Community in St. Louis – a growing, new hub of tech development. Ultimately, we will go wherever necessary, if it means we can create the service the world demands and our customers deserve.

We also recently held our first monthly NGA Disrupt event. NGA Disrupt is a forum for non-traditional partners to pitch product ideas in a “shark tank”-like environment. The results are promising – the companies that participated in the first event demonstrated a range of capabilities such as cybersecurity, 3D Visualization, Artificial Intelligence and Machine learning, and advanced search capabilities.

In closing, the agency I am privileged to lead will celebrate its 20th anniversary next week. In 1996, the National Imagery & Mapping Agency was established. Congress, with exceptionally strong support from this committee, was largely responsible for its creation. I sincerely and deeply thank this committee and all of Congress for their continued support.

While we may be the youngest agency in the IC, I can proudly, and confidently, report that the agency and the GEOINT discipline, are more relevant than at any point in our 20-year history. Our future is rich in opportunities, exceptionally bright, and we will build the needed tools to harness the opportunities that arise. We are committed to be the NGA that the mission demands and our nation deserves. In sum, GEOINT is on the rise.

And on that note, I'm pleased to answer any questions that you may have.

Chairman BURR. Director, thank you for that testimony. Your full statement will be a part of the record.

Let me point out to members: To the best of my research, this is the first time that the Director of the NGA has, in front of—in an open hearing, been asked to testify about what NGA does, why the American people should care, and, more importantly, what a vital component of our intelligence community this is. So, Director, I thank you for your willingness to do it.

I would also remind members that this is the seventh open hearing we have had this Congress. I think we made a commitment that we wanted to try to bring a little bit more light to why the American people should care about 17 agencies and the work that they do in keeping America safe and keeping the American people safe and hopefully having an impact around the globe on stability.

I'll recognize myself first.

Director, in March you sent a letter to the Vice Chairman and you stated it was your goal for the NGA to be positioned for a clean audit in fiscal year 2016. How are we doing?

Director CARDILLO. We are making progress. I will not make the fiscal year 2016 objective. I do know that we will make progress on the material weaknesses that have been identified. Our new—and I'm quite confident that we can make this goal—is fiscal year 2018. It's going to take us two more years to work off some of the issues that we have with property accountability and our book-keeping.

But I will—I'm proud to say the progress is positive. It's just more work than we knew we had. But we're confident we will make this new target.

Chairman BURR. I want to thank you, because when Senator Blunt was nice enough to invite me out to St. Louis to visit NGA, you made sure that your team there was willing to show me the good, the bad, and the ugly. And it gave me a unique perspective about, unless you've got a physical facility that accommodates the work that you do, it makes it difficult to impossible to accomplish it as effectively as you can and on the time line that you need to.

So I can understand, because I saw different financial pieces scattered around the facility that really should be collocated, but can't under the physical constraints that the facility provides you. So, as the Vice Chairman highlighted, we're anxious to see the new building start, we're anxious for its completion, and we have an unbelievably talented workforce there that will take advantage of it, and hopefully it will address some of these things like the audit.

Director, the distinction between geospatial-intelligence and all-source intelligence may seem to be a mundane topic. However, efficient use of intelligence resources is one of the key priorities of this committee. We do not want to needly fund activities outside of an organization's mandate or duplicate efforts of other agencies. Nor, however, do we wish to curtail analytic efforts of any organization if there is a unique value being provided to the intelligence community and to its customers.

My staff tells me that many of the products from NGA are de facto all-source intelligence products, even if they are claimed to be substantially based upon geospatial-intelligence. Given that, is it time for the Administration and Congress to reexamine the roles

and responsibilities of the agency, or do you feel comfortable that its mandate is stated clearly today?

Director CARDILLO. Chairman, I appreciate the question and it, “it” being how do we most efficiently apply finite resources to the greatest effect, is an issue we deal with every day. I think this committee is aware that, while I’m currently the Director of NGA, I have been in other positions through the IC, so I have had many views on your question.

As Director of NGA, I commit all of our output to all of our customers so that they can use them in the way that best serves their mission. That includes my colleagues at the Central Intelligence Agency, the Defense Intelligence Agency, and State’s INR, who are responsible to provide the Nation the coherent all-source assessment of threats and opportunities.

At the same time—so I post everything that we do so that it can be used most efficiently by any user. I also do that posting so that, should we come up against a duplication that’s unwarranted, in case we’re not making the most efficient use, that we can deal with that as well.

So I think I have plenty of opportunity today to engage those customers and to provide them that access. At the same time, when and if we do find an inefficiency, I think we also have the wherewithal to deal with that.

Chairman BURR. Last question: Do you have authorities, resources, and personnel you need to effectively exercise your functional management mandate?

Director CARDILLO. I do. What I owe you is a better flexing of the muscles you have given me. I spoke to some of that in my statement for the record. I’m happy to speak to more of that, but I would ask the committee to compel me, as you have in the past, to use what you’ve given me before I come and ask you for additional authority.

Director CARDILLO. Great.

Vice Chairman.

Vice Chairman FEINSTEIN. Thank you.

Director Cardillo, I’d like to confine my questions this round to pages 4 and 5 of your written comments. Let’s begin with the comment having to do with Russia’s occupation and attempted annexation of Crimea and aggression in Eastern Ukraine. You say you have “aggressively applied myriad sources and analytic strategies to track traditional military operations, the flow of supplies, irregular forces, and the ethnic, economic, and geographic backdrop to document the flow of the conflict.”

Tell the public exactly what this means and what GEOINT has found?

Director CARDILLO. Thank you. We have been able to expose, identify, and document the geospatial component of the Russian aggression in and around Ukraine. Some of that we’ve done through our more traditional capabilities: the establishment of new permanent bases on the proximate border with Ukraine. These are the movement of Russian forces that used to be there in a temporary status and now they’re moving to a permanent status. What that obviously does is it gives Russia more opportunity to effect a next step in a very short period of time.

Vice Chairman FEINSTEIN. You're speaking of Ukraine now?

Director CARDILLO. I'm speaking on the border of the Ukraine, in the Russian border of Ukraine.

To answer the other part of your question, about the non-traditional aspect of the Russian aggression, it's more difficult for us to use those traditional sources, because by their very nature they're more subtle indicators, they're less identifiable. That's a case in which you need me to use the other part of the spectrum that I speak of, the non-traditional sources. This is everything from social media to open source to press reporting to identifications that we get from allied partners.

Vice Chairman FEINSTEIN. Let me just say where I'm going with this, because there is a certain denial by Russia that they do have forces in Ukraine and in Crimea. How would you answer that from the position of your technology?

Director CARDILLO. It's really two questions, if you don't mind me breaking it up.

Vice Chairman FEINSTEIN. No.

Director CARDILLO. Crimea is different because Russia is in fact in Crimea. Obviously, it's against the policy interests of this country, the way they've staked their claim. But their military is quite active and quite present in Crimea and it's very visible. There's no hiding it there.

In Eastern Ukraine it's quite different. As you said, their narrative is that this is a local uprising, that this is indigenously produced and that they have no involvement. In an open session, what I'd like to just be able to assure you and American people, that we are applying non-traditional capabilities to expose that to you and to our customers. I'd rather not go into detail here because if I explain that to you then I'd be explaining it to the Russians themselves.

Vice Chairman FEINSTEIN. And what have you found with respect to Tehran's compliance with its initial nuclear obligations?

Director CARDILLO. We're pleased to be part of the IC's effort to monitor Iranian compliance. We have supported the DNI's team leadership here, and we have to date received the accesses that we expected and we've received the cooperation that was assured. But I will finish by saying that this is a day-to-day campaign that we're on and so we remain vigilant to monitoring that adherence.

Vice Chairman FEINSTEIN. You mentioned the South China Sea, with the Chinese building war-like development on the atolls. What does NGA tell us about that?

Director CARDILLO. One of the key questions we have is what's their intent with the development of these new land features in the South China Sea? Part of the Chinese narrative has been that they're commercial, even tourist-related, etc. We have identified indications that there is more to that story, and the more that we've identified are military-related structures and equipment that at least give the Chinese the option to permanently post military forces in and on these islands.

So our job, obviously, is to warn about that possibility and of course identify it when we see it.

Vice Chairman FEINSTEIN. One final one, and that's my great interest, the big wildfires burning in California. What information do you provide with respect to those?

Director CARDILLO. First of all, I just need to remind, since I'm speaking to the American people as well: The only way I'm authorized to apply my resources domestically is if I have a lead Federal agency request those services. This is nothing that we do as an intelligence community.

But in this case, with the forest fires, we do have requests from the National Foreign Service and the local and state fire-fighting services. In that case we're able, because we have that request, to provide them, one, with a better understanding of where the—not just where the fire is, but how it's progressing, where are the hottest spots in that fire, so that if you're seeking to contain it from jumping to an even greater disaster how you would combat that.

So we apply both optical capability on the expanse of it, but we also have the capability to sense temperature and heat, and that way it can steer and guide the fire-fighters to employ their resources in the most effective way.

Vice Chairman FEINSTEIN. Thank you.

Thank you, Mr. Chairman.

Chairman BURR. Senator Coats.

Senator COATS. Thank you, Mr. Chairman.

Robert, thank you for coming before us. I always get a little nervous on these public hearings because I'm afraid that I thought I read something in The New York Times and therefore it's been published and I can ask the question, then I can't remember whether I read that in The Times or I heard it in a classified setting. So if I breach anything here with a question, feel free to just say: Let's talk about that in a classified area, if you would.

Director CARDILLO. I understand.

Senator COATS. Two areas that I'd like to just pursue here. The recent article that came out on the Nextgov.com web site was published, so it is public, was titled "Spy Agency to Pilot Insider Threat Hunting Technology." It noted that "The NGA is investing in sentiment analysis technology intended to help identify insider threats."

This is an ongoing issue. Obviously, we've seen the public exposure of classified material coming from inside various agencies. Can you give us a little bit of non-classified information as to how this works and how it will be shared with other agencies, and what your participation is within the 17 communities of the intelligence services?

Director CARDILLO. Absolutely, Senator. The committee should be confident that I take the counter-intelligence mission of mine as seriously as I take the intelligence mission, because if I can't protect the service that I provide today I won't be able to do it tomorrow.

So you're asking about a real threat, the insider threat, and we can talk about external threats as well. But in this case, how do I ensure that my team is staying on my team? The pilot that you describe is one that we're doing in cooperation with the intelligence community, we're doing it in cooperation with the Director of National Intelligence and his Counter-Intelligence Center. What it seeks to do is to understand, through access to internal and, as

necessary, external communications, to identify indicators where it might be worth taking another look.

Just so you know, every time I log on to my computer at work the first screen I see is a declaration: "This is a government computer. You are authorizing access to it." So we're very careful about provision of privacy, etc., but as a Federal employee and as a member of the intelligence community, when I do my log-in I also know that I'm logging in to provide access to others who may seek to protect our capabilities.

So, as you said, it's a pilot. We will share lessons learned as we go through the project with the committee as well as with our colleagues in the IC.

Senator COATS. Thank you. That's a very relevant answer to some of the issues that are being discussed on a more national basis. I won't get into that.

Secondly, I noticed here that there's been an effort to work with our foreign partners for more information-sharing. I think there was recently an agreement with the German government relative to that. Two questions here: one, is there financial contribution among our allies in terms of this joint project; and could you describe a little bit of what you gained from this agreement with the German government?

Director CARDILLO. Indeed. The German government made the decision to invest in satellite technology. It's called synthetic aperture radar, so think radar signals from space. They flew these satellites in tandem. So as they flew together they would send signals down to the Earth and get elevation data, depending on the amount of time it took for the signal to come back.

But they did it at such resolution that we had never mapped the elevation of the Earth at that level before. As a matter of fact, Director Clapper again gets credit. He effected the agreement with the Germans to provide that data for common use. So now there's a consortium of nations that are getting together to process the data.

Think of elevation maps. We're now preparing elevation maps around the planet in a way that we've never had before. The last time we had measured the planet this way was with a Shuttle mission back in the late 1990s. So who will this advantage? It will advantage anybody who needs to move an aircraft from one place to another, anybody that needs to understand the science and the evolution of the planet, anybody who needs to understand the safety and security of a mission.

We're in the early stages of processing that data now, and we'll begin to roll out those outcomes, those maps, in the next few months and years.

Senator COATS. The question about the contributions of nations that we'll be sharing this information with?

Director CARDILLO. The way it works is that you—that what you get out of the consortium depends what you put in. So if you invest a lot of effort, a lot of computers, a lot of manpower and expertise, you get to take back an equivalent amount. So it's really up to the nations how much they want to commit to contribute, and that's what they'll get back.

Senator COATS. Thank you.

Thank you, Mr. Chairman.

Chairman BURR. Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman.

Mr. Cardillo, first of all, I appreciate your comments on audits. I have a bipartisan bill to audit the Pentagon. I think that is long, long overdue. You cannot explain to taxpayers how it is that this is the one part of government that is essentially impregnable when it comes to getting an audit. So I think your comments on that are instructive.

I want to turn for just a moment to this issue about commercial imagery. Fifty years ago, nearly all satellite imagery came from big, secret, expensive government satellites. Today it's obvious that you can save taxpayers real money by relying on commercially available imagery instead.

The challenge, of course, is big institutions with a long history may be a challenge in getting them to adapt. In March 2016, the NGA's advisory group stated that a culture of favoring the status quo—and I quote here—“undermines rewarding innovative solutions and the use of nontraditional acquisition strategies.” Do you agree with the assessment that was made by that advisory group?

Director CARDILLO. I do. Would you like me to speak to what I'm doing about it?

Senator WYDEN. Yes. Yes, that's exactly where I'd like to go. A, I'm glad you agree; and obviously, the challenge of making your acquisition workforce more open and more inclined to be receptive to new innovations is exactly what I'd like you to talk about.

Director CARDILLO. Senator, one, I certainly understand the premise and the history as you described. I've lived through a good portion of that, as I sit in my 34th year in this intel community. The era of multi-year, multi-billion dollar awards for decades' types of service had their place and their time. As the commercial industry evolves—and it's evolving very quickly day to day—we have to become more agile or we'll not be able to leverage it.

So my direction to my team is to not just engage and explore, but let's revisit some of the fundamental tenets of our acquisition strategy. We have been able to, well within the rules, obviously, and well within the regulations, create some flexible approaches.

Let me give you one example. We're setting up now with the General Services Administration a contract vehicle that we expect to begin executing in early 2017, in which I'll be able to go to some of these small companies, not with a “let me contract with you for the next three years with this multi-million dollar contract vehicle,” but “let me swipe, essentially, my government credit card to do some testing and some evaluation, some exploration of the interfaces and the opportunities.” And as those swipes turn out to show utility and benefit, we can then turn the dial up and say: Okay, I need more of that service. I may not need any more imagery, because that's again thinking—that's the thinking that we had in the prior decade. But what I will need is answers, data that I can put into my models and simulators, etc.

So that's just one example where I think we will be able to become more agile and we will be able to take advantage of this growing industry.

Senator WYDEN. That certainly sounds constructive to me. I know a lot of colleagues are waiting to ask questions. I think my point really is, this is an area where, apropos of your language, I'd really like to see you turn the dial way up on innovation.

Thank you, Mr. Chairman.

Chairman BURR. Senator Rubio.

Senator RUBIO. Thank you.

Thank you for being here and for your service to our country. In your statement for the record, you say that "The NGA is uniquely positioned to help the U.S. Government and our allies understand developments in the South China Sea because of the interaction between physical and human geography." That's a quote. What did you mean by that? Can you elaborate a little bit more?

Director CARDILLO. In that case, in that condition, I think my responsibility is to shed light where those seek it to stay in the dark. What I mean by that is that there's some physical geography things happening. They're actually developing islands. They're creating land that didn't exist before.

Then the question becomes, what's the intent behind that creation? There's an obvious claim that goes with those developments or those islands. But beyond that, the question is intent and use.

So we're able to use more specific and exquisite capabilities to say, ah, that feature is associated with this mission set. One could be safety of navigation; think aircraft control, etc. But another, weapons handling, aviation fuel storage. It's those kinds of indicators that you should count on this agency to be able to tell you what's behind the development. So we take both the geography and those indicators to create an assessment.

Senator RUBIO. In that context, how is NGA supporting efforts by our government and other foreign partners to monitor China's—because I think we're largely talking about China here—their activities in the South China Sea? How is that interaction playing out?

Director CARDILLO. Fulsomely. What I mean by that is that just about—because of the advent of commercial imagery, I'm able to have conversations in fora like this, but also in instances where we have multiple countries, and we can put facts on the ground, so that—okay, the debate usually gets really interesting when you go to intent, what's the why behind the geography.

We're able to put the framework on the table that says: Here are the facts on the ground; here's what's happened over time; here's who's being most aggressive or most provocative in the development. And then one can have a more informed debate about what's the purpose behind that island.

Senator RUBIO. The NGA has important foreign relationships from its role in the Allied System Geospatial-intelligence, or ASG, which brings together the U.S. and Commonwealth countries to advance the mission, including the U.S.-German agreement signed last year to share global digital elevation data. So do we receive now at this point, would you say we receive as much as we give with our foreign partners?

Director CARDILLO. No, Senator. The United States is still the premier provider. But I will say what this committee should think about when you mention those foreign partners, is think force mul-

tiplier, whether it's their data or ours, and when we have a sharing agreement it's both. But they also have analysts and geographers and human terrain analysts, etc. Those get added to our pool of expertise and create a greater effect.

But to be very clear, the United States is still far and away the largest provider.

Senator RUBIO. One of the core missions of NGA is the provision of foundational geospatial data to the warfighter. Our committee hears from combatant commands and other warfighters that this is an area they could use some more help. However, you're still experiencing some gaps in global coverage of foundational geospatial data.

So what steps are being taken to better avail ourselves of commercially available data?

Director CARDILLO. We are seeking to employ more and more of this. I call it the "new space." These are the companies—Digital Globe's a traditional partner; Planet, formerly "Planet Labs," is our newest partner now. Terra Bella, a piece of Google, we're also partnered with.

But we're in the research, development, test, and evaluation phase with these new companies. We need to seek to understand what kinds of questions can we answer the warfighter with these more frequently revisiting, but lower resolution, types of coverage?

Look, I think the potential is very high here. We're leaning in very heavily because, two things: One, the data's unclassified. Now, we can use it for classified purposes, but, boy, the fact that it starts unclassified, I can move it to places that before might have been difficult for me to get to because of the classification level.

But, two, when I add that assessment on top of it, I think we're able to provide some of the insights that fill some of the gaps that you recognize the military still has.

Senator RUBIO. Well, just in that realm, I know we've spoken in the past about the University of Miami Center for Southeastern Tropical Advanced Remote Sensing. We know it as "CSTARS."

Director CARDILLO. Indeed.

Senator RUBIO. It's a compliment for our technical means. It's supported Southern Command, the U.S. Navy. I'd encourage you and your staff to visit them in Florida to learn more about the types of capabilities they can provide. Have you considered working with CSTARS or any similar organizations to utilize the capabilities offered from foreign commercial satellites and the imagery they provide, they can provide the U.S. Government?

Director CARDILLO. The answer is yes, and just yesterday I received another paper from my colleagues down in Florida. We're digesting that paper now. It's a proposal to further our engagement. And, Senator, I look forward to continuing to work with them.

Senator RUBIO. Thank you, Mr. Chairman.

Chairman BURR. Senator Warner.

Senator WARNER. Thank you, Mr. Chairman.

Great to see you again, Director Cardillo, and thank you for your great work. Senator Blunt and I have actually got a joint resolution recognizing your 20 years as an entity.

Director CARDILLO. Thank you.

Senator WARNER. I know you're going to have your celebration next week. Good luck on that.

I want to build on both the comments of Senator Wyden and Senator Rubio. Obviously, we've got to keep our Nation's technical means and our exquisite capabilities above everyone else's ability. But I think, as you so accurately stated last year in one of your statements, because of the explosion amongst commercial activities, foreign activities, you're seeing the democratization—your terminology—of GEOINT.

I hear repeatedly from combatant commanders the need for this unclassified imagery to be able to share with our partners. So oftentimes that again is going to push us toward more commercial. I heard what you said in response to Senator Wyden, which I again thought was good, with this whole notion of a swipe, rather than buying the whole dataset, on a rent rather than buy basis.

Do you feel, though, that you've got enough flexibility in your acquisition activities to kind of balance off the challenges from your partners at NRO, who still wants to build hugely costly, billion-dollar exquisite systems, so that you can not only continue this experimentation, for example, with Planet, this swipe rather than buying the dataset, but also where you can use some of your budget to kind of promote innovation in the commercial sector?

Director CARDILLO. At this point, Senator, I think the answer is yes. I haven't yet come up against a wall that, boy, if only I could have this more authority or this much more room to explore. I think what you need to look to me to do and expect me to do is to continue that interaction that I described some here today.

But there's more that we can and should do. So what I'm seeking to do—I mentioned the new GSA approach and I mentioned our new contract with Planet. But we're also working with academic institutions. We're working with CRADA's, research and development grants, with even more companies, because we need to even understand the art of the possible here. As you might imagine and I think you appreciate, any large bureaucracy that's had many years of a certain experience, it's a little difficult to turn it away from that, I'll call it, that comfort zone of the past.

But I'm very confident that as we begin to have these small wins, turn into medium-sized wins, turn into answers to that military commander's questions, there will be a momentum that will build.

Senator WARNER. That's what I just want to make sure, because the pressure to continue within the established incrementalist approach, as opposed to how you make sure your customers have got that ability to occasionally have some risk capital, in effect to nudge innovation forward, I think is terribly important.

I've got two other questions I want to try to make sure I get in. I asked you this for the record last time and you said there were no such plans. But I want to reiterate again: There's no plans to move NGA's EnhancedView contract to the NRO, is there?

Director CARDILLO. That's correct, there are no plans.

Senator WARNER. Well, there continues to be scuttlebutt around that.

Director CARDILLO. We just renewed it about two weeks ago for our seventh year.

Senator WARNER. We talked about this off-line. I was interested to see the idea that, around commercial activity, you, NGA and NRO, have set up this joint activity center. On one level I'm very excited about it. On another level, I'm: Oh my gosh, is this an attempt by NRO to kind of take back the innovation side, and is there any kind of inherent conflict as this activity center takes place, since NRO's primary mission is to make sure we maintain those National Technical Means at the highest, most exquisite level?

How do you work through that conflict? How do we make sure that this activity center is not captured and keeps its forward-leaning innovation and leaning into the commercial sector?

Director CARDILLO. I really appreciate the question. This commercial GEOINT activity, as we call it, literally stands up this week. We notified the committee a few months ago of our intent to do so, but we will stand the committee up I think on the 30th—the activity.

The way you should think about this, this construct, is a place where myself and my mission partner Betty Sapp will put some key individuals together to have the right conversations about the opportunities that are in front of both of us. I'm not sending any of my authorities to that activity. Neither is Betty Sapp. I'm sustaining my role and responsibility as the protector of and defender of the needs of our community.

I certainly am protecting my analytic output and services responsibility, as well as Betty Sapp is doing. But what you should expect us to do in that is to challenge one another to either individually or as a team take on some of these opportunities that you've just described.

So I appreciate that there's some anxiety here, but I guess I'd like you to turn some of that anxiety to the positive and challenge us to take advantage of these new space capabilities.

Senator WARNER. I want to thank you for your work, and I particularly want to thank the Chairman and the Ranking Member. I know at times I have been insistent on this subject, but I very much appreciate the Chair and the Vice Chair's willingness to kind of push this sector to take a fresh look. I think under Director Cardillo we're seeing real progress made, and so many of the members have kind of come at this question in a different way.

Thank you, Mr. Chairman.

Chairman BURR. Senator Collins

Senator COLLINS. Thank you, Mr. Chairman.

Director, as the Vice Chairman's question suggests, we along with policymakers throughout government and the rest of the intelligence community rely on your agency for ground truth, and that's why the Vice Chair brought up the issue of the Russians' activities and the South China Sea as well.

I'd like to turn to Syria and try to get the ground truth of what's going on in Syria. It's been more than a week since a ceasefire was supposed to hold in Syria. Yet, according to press reports, the fighting in Aleppo in the last few days is at near highs, for a war that has already killed more than 400,000 people and forced millions more to flee their homes.

Does the intelligence that your agency is collecting and analyzing support the conclusion that the ceasefire is not holding and that Aleppo is under some of the most intense bombardment since the war began?

Director CARDILLO. Senator, if you'd allow me not to provide details, I can answer the question positively. Yes, the geospatial-intelligence that we have does support the finding that not only is the cessation of hostilities not holding, but the conflict is in fact intensifying.

Senator COLLINS. Thank you. I think that is an excellent example of why the work that your agency does is so important.

I want to turn to a different issue. Having previously served on the Homeland Security Committee as its chair and ranking member, as well as on the Armed Services Committee, and now serving on this committee, one of my top concerns has been the threat to our Nation's most critical systems posed by cyber attacks from our adversaries. Your statement for the record describes the critical technical support provided by the NGA to the global positioning system—we all call it "GPS"—which is widely used in a range of both military and civilian applications. How secure is GPS from cyber attacks from our adversaries?

Director CARDILLO. First let me say, one, we don't fly GPS, we don't build GPS. But what we do is we provide the science and the math required to make sure GPS is working as it's intended, everything from civilian uses obviously to military uses. So we're a quality control factor.

Because I don't run the architecture and because I don't man the system itself, I'm really not capable to answer your question about what the risk is, because I'm a contributor to that service rather than an owner of it.

Senator COLLINS. Does it personally concern you?

Director CARDILLO. Anything that moves digitally concerns me. So yes, I have concerns.

Senator COLLINS. As you know, during this week we are desperately trying to ensure that government keeps functioning and that we do not have any kind of government shutdown, which would represent a real failure to govern. I am hopeful that we can avoid that kind of outcome.

Could you describe for the committee what a government shutdown—what kind of impact it would have on the NGA; and even a longer-term continuing resolution, why that is a negative for your intelligence agency?

Director CARDILLO. The impact of a shutdown is really in two categories. There's the mechanical impact. I have people working today preparing for the eventuality that we may be shut down. They're not doing NGA's work today; they're doing preparing to shut down work today. But as a government leader, you would expect me to be ready for that. So that's a distraction and it's costly.

On the other hand, I'd like to talk about the mental effect. As a matter of fact, we have to begin printing letters that, if we're going to make Saturday in case it does shut down, I have to inform my teammates about their essential nature of their work or their non-essential nature of their work.

Now, we've already done that. Unfortunately, we've had practice here before, so we know how to do it. But I have to tell you, it is not an encouraging, rewarding experience to have somebody hand you a letter and say, you're a non-essential part of my team and you may be required to stay home on whatever date. And I will tell you, it affects those that don't get those letters, because we're one team. So there's both a physical impact and a mental impact.

The last question you asked, about going forward with the continuing resolution, quite frankly, it would inhibit some of the things I just heard from Senator Warner, a new start or a new engagement. Obviously, I could continue what I've started, but it inhibits me from beginning new projects, I think as you well know.

Thank you.

Senator COLLINS. Thank you.

Chairman BURR. Senator Heinrich.

Senator HEINRICH. Thank you. Mr. Chair.

Director Cardillo, as we all know, we've got a lot of inertia built up in this U.S. satellite acquisition strategy that has existed for a long time, focusing on big bucks and exquisite capabilities, very long time lines. I really want to applaud your willingness to put NGA resources into supporting smaller satellites, a more distributed approach, that I think we all believe can make our overhead architecture a lot more cost-effective and agile in a quickly evolving environment.

I had a chance recently to visit Los Alamos National Laboratory in New Mexico, where they're doing very advanced research and development on cubesats, and it's my impression that these technologies may be game changers, both for the public sector and the private sector, for that matter.

I think you said back in 2015 that we're at a bit of an inflection point here and you think that in the next five years more than a dozen constellations, hundreds of small satellites, will launch and continuously scan the Earth; and that NGA's analysis of world events is going to as a result be more holistic and persistent.

Can you just tell us a little bit about, within this setting, the investments that NGA has made to make that real, in particular around evolving technologies like cubesats and other small, responsive satellite approaches?

Director CARDILLO. I'd be happy to, Senator. We recently engaged a contract with a company that used to be called "Planet Labs." They're now called "Planet." This is allowing us access to their datasets. Now, they have dozens of very small satellites up in space now that are scanning the globe. They're employing more and more over time.

But for the time period of the contract, that will give us access to that dataset to do a number of things. We can do some test and evaluation just on some interfaces. We can accept the data, use it in our library. More importantly, what I'm excited about is beginning to apply algorithms and models against that dataset to find out, not just what you can image, but what can you sense.

Again, I'm a creature of this profession, so I've been staring at imagery for a long time as an analyst. Sometimes that frame of imagery can be a prison. It locks you into whatever you see within that image. What I'm excited about this new venture with Planet

is it's going to give us the opportunity to get beyond the frame, get to activity, get to change. Think of a service that we could subscribe, rather than a pixel flow.

That's just one example. We're pleased to be partnered with Terra Bella, which is a subsidiary of Google; of BlackSky Global, another new company. We have a CRADA with a company called Earthcast, and others.

Of course, I don't want to leave out my most long-term customer, Digital Globe, which is flying, yes, large satellites, but they, too, are moving to smaller architectures, because that's where the market's going and as a commercial company they want to be viable in the future. Digital Globe's also moving to services as well and I want to be a beneficiary of their move to algorithms and models, etc.

So I think, even though it was only a year ago, I think the statement's holding up and I think we're seeing that reality come into play.

Senator HEINRICH. Yes, it feels like we're moving from a focus on data points to a focus on trends that tell us what is happening, and I think that's a very important distinction.

Also last year, in 2015 in August, NGA launched the GEOINT Pathfinder Project. I was hoping that you could—a project that was to explore techniques to answer key research questions using only unclassified tools and data and social media. Can you give us just a little bit of an update on how this project has fared and where you see it going in the future?

Director CARDILLO. We're finishing up what we call our second sprint. We call it Pathfinder 2. The first one was 90 days. This one was 150 days, and we're literally wrapping up our lessons learned now. And by the way, we will provide those to the committee as soon as they're available.

Let me just describe my last visit to my Pathfinder team. Just to recall Pathfinder 1, it was so difficult for us to set up this WiFi, world wide web, commercially available facility in our building. We had to move outside. We were literally a couple miles away. Now, as you come into my front door, into our very nice facility in Springfield, Virginia, you turn immediately to your left and you'll find my Pathfinder 2 lab. So it's not exactly in the building—I mean, not in the center of the building, but it's on the campus, so that's an improvement.

I went to visit them the other day to see how things were going. Their real emphasis this sprint was about how do we employ updates to our customers in between our classified briefings. We see them at 10:00 o'clock when they can come into our secure facility. We might send them a classified report late in the afternoon. But the world is going on all day long. So they call it our "coffee strategy"; how do you keep them informed in the appropriate way?

So we've been moving to mobile. These are smartphone and tablet developments. As I was getting an update on the coffee strategy, across the table there was a young man on a computer coding, building the app that I was using. And they introduced him to me, and I shook his hand. They said: By the way, he's an intern.

I said: Oh, that's wonderful, because we're very proud of our interns. And he said: But he's not from college; he's from Thomas Jefferson High School. I went: Oh my goodness; how old are you?

Now, by the way, we're following all rules. There's no child labor violations, etc. But it was just so exciting. I said: You are our future; frankly, you're living the world that we're talking about.

So I was thrilled that—and by the way, they didn't come ask me, can we use an intern from a high school? Again, we followed all the rules. But what I want to let the committee know is that I've truly given them a lot of room to explore, and I'm very excited about what they're finding out.

Senator HEINRICH. Fantastic. Thank you very much.

Chairman BURR. Senator Blunt.

Senator BLUNT. Thank you, Chairman. And, Chairman, thank you again for the time you spent talking to the NGA team at the St. Louis facility. That facility's been there in one form or another for about 70 years, but only 20 years ago did it transition from oceanographic mapping and other things it had been doing for a long time to the geospatial assignment when Geospatial was formed officially.

Senator Warner mentioned that he and I and Senator McCaskill and the Chairman and Vice Chairman joined us in a resolution recognizing that 20 years of service. I want to talk a little bit about—and why Warner and Blunt on this committee, Virginia and Missouri.

I want to talk a little about how those facilities work together, the significant number of people working at Springfield, Virginia, but the Missouri facility, the St. Louis facility, NGA West—I think back in the winter you and I were talking at one after there was a government shutdown here because of weather, not budgeting, and what happened when people didn't come to the Springfield facility, Springfield, Virginia, facility? Where was that work done and how's that plan working for two facilities that are mutually supporting?

Director CARDILLO. It's a great question. Let me just set the context before I get to the specifics. In 1996 when the agency stood up, that was the Defense Mapping Agency or a key component of it on September 30th, 1996. On 1 October it became part of the National Imagery & Mapping Agency.

But, as Director Clapper found out when he joined us in 2001, that ampersand between "Imagery" and "Mapping" was really keeping us apart. So in those days mapping happened out West, imagery happened in the East, and we were really not one agency.

But over the past 15 years, Senator, we've moved mission, we've moved expertise, we've moved capability. So think of our IT architecture and our operational flow. It is now one agency.

So to your point about when we had the weather incident here and people had great difficulty getting to our headquarters, it was just a flip and we just said: Okay, 7 by 24 operations—which, by the way, support transportation, so safety of navigation; they support targeting, so when the Air Force needs help on putting a weapon on a precise point; or when they need intelligence analysis—that all went to the West and seamlessly was picked up. So

it was a great example of how we've become one agency and how interdependent we are.

Senator BLUNT. And the idea is that one agency fully backs up the other one if anything happens—a power outage, a weather event, or anything else?

Director CARDILLO. And it works the other way. When we had the recent flooding in St. Louis, some of our teammates had difficulty getting to work as well, we were able to back them up. So it's a wonderful setup.

And by the way, it's a significant investment. About a third of my workforce is there. This isn't just a few hundred people. It's 3,500 government employees between our campus downtown and our campus in Arnold, Missouri.

Senator BLUNT. And you're hoping to see that new facility started, planning-wise at least, in the next fiscal year; is that right?

Director CARDILLO. Well, we're heavily planning now. We obviously need some help from the Congress in fiscal year 2017 to authorize and appropriate the military construction dollars that would effect the property change, so that we with the Air Force could acquire the property. That would allow us to break ground in 2018, really build 2019, 2020, 2021, and move in in 2022, maybe early 2023.

Senator BLUNT. Another thing I want to talk about while I've got another minute here is, in terms of workforce preparation and attracting a new workforce, what are some of your strategies there as you're working with colleges, universities, Silicon Valley, training, in St. Louis and here?

Director CARDILLO. I just briefly mentioned our intern program. We were able to bring on board about 200 college interns last summer, both in the East and the West. We end up offering about 80 percent of those interns full-time employment at the end. The even better news is 90 percent of those 80 percent accept our offer. So it's a great entry point.

I'd also say, though, that, while that's a great stream for talent—obviously, young and highly educated—but as a combat support agency, too, I recruit strongly from those that are separating from the military. We have a Wounded Warrior Program. We take on discontinued vets, because—for two reasons. One, it's the right thing to do; but two, that experience is an immediate benefit to my workforce, because right now, because of the way that the Defense Department can support me with uniformed officers, I'm only about 5 percent military today. So I have to get that experience another way.

Then finally, these private partnerships. You don't have to be an NGA employee for me to benefit. We could have an academic relationship, we could have a contractual relationship, or a think tank. So we're looking at those different ways to get access to talent without having to become a Federal employee.

Senator BLUNT. Thank you, Chairman.

Chairman BURR. Thank you, Senator Blunt.

Before I go to Senator King: Director, let me just say this to you. I've said this to you privately and publicly. I think our expectations need to be to finish this facility faster than 2022. Challenge us as

a Congress to come up with the money, continual funding, so that we can do this like the private sector would build a facility.

It's hard for me to believe that an agency that understands the transition we've got to make wouldn't push us to show that that agency can meet their facilitation needs in the same short term of many of the things that you're helping to design and express your needs. I ask you for that.

Senator KING.

Senator KING. Mr. Chairman, since this is probably our last open hearing of this year—and, Director Cardillo, you mentioned Jim Clapper. I just want to publicly acknowledge a career that has spanned more than 50 years, extraordinary vision, capability, competence, and will be coming to a close probably in January. I just want to acknowledge what I think has been absolutely one of the most outstanding records of service to this country, not very widely known. But people should know what he has done. So I just wanted to make that comment.

You're a data business in many ways. Silicon Valley, the commercial side, is using all kinds of crowdsource data. I have an app on my phone called "Waze" that sees where cars are. I use it principally to see if my brother-in-law is headed for my house. But it has—the point is there's an enormous amount of data coming from all over the place.

Are you making—are you utilizing this, this source of data? For example, I think there's a program called "NOAM" where you're getting data from troops abroad. Is this something you're looking at?

Director CARDILLO. It is indeed. We're the government, so we created an acronym. We call it "VGI"; it's "Voluntary Geographic Information." GNOME is one example. Most people know about Wikipedia. There's a map equivalent of that. One of the best known is called "Open Street Map." It's a reflection of the reality of our life that every one of us, just about every one of us, now is a sensor.

Now, we use our sensors for different reasons and purposes, but I think I would be derelict in my duty if I were not appropriately—key word, "appropriately"—leveraging the potential from that kind of contribution.

Senator KING. So this is a conscious strategy to take advantage of this enormous amount of data that's out there?

Director CARDILLO. Right, a strategy, but, Senator, it's a recognition of the reality. Now what we're doing, again, is appropriately working what's the left and right bounds of how you use that, where it is appropriate, and how to stay within those bounds as we do so.

Senator KING. I also just want to note, you gave out this excellent presentation on the Arctic as an example of the work you do. Interestingly, you have the progression of the diminution of Arctic ice. It goes from 2010 to a projection in 2030 of 4.5 million square kilometers. Actually, in 2015 it was 4.4. This year, two weeks ago 4.1, and it's accelerating. I just think it's interesting we're already well below your projection or the projection for 2030. Now, you know, obviously one or two years is not a trend, but I was in

Greenland recently and everybody up there is seeing an acceleration of this trend over historic averages.

In any case, let's get back to satellites. To follow up on Senator Warner's question, can we look to a future architecture where we're talking about many, many smaller satellites than the large, big ticket, more vulnerable satellites?

Director CARDILLO. Well, my answer is yes. I don't even say that that's future. I mean, presently yes, I have access to many large satellites that my mission partner provides me, but almost every day we're gaining access to more and more medium and small-sats.

Senator KING. How much input do you have to NRO about what is going to go up in the air?

Director CARDILLO. I have total input. By that I mean it's my responsibility to access, document, and represent the needs of those that I serve. That needs statement drives everything that we purchase. So that's what I mean—when I say total, I mean—

Senator KING. So you're the principal customer or certainly one of the principal customers?

Director CARDILLO. I represent the customers, you know what I mean? I speak with the commands and the services and the agencies and the departments to make sure: What is it that you need from Geospatial-Intelligence to do your job? And then we capture those and we represent those.

That then becomes the target against which any architecture or any satellite is judged.

Senator KING. A yes or no question: Does NRO listen to you?

Director CARDILLO. Yes.

Senator KING. Good.

Final question, quick one: On the NGA West facility, almost a \$2 billion facility, are you going to invite other intelligence community members to utilize that facility? I hope that that could be a central intelligence—

Director CARDILLO. The answer is yes. To date the most interest that we have is from the FBI. So they're looking now at an opportunity to be collocated with us.

Senator KING. Great. Thank you very much.

Thank you, Mr. Chairman.

Chairman BURR. Senator Lankford.

Senator LANKFORD. Thank you.

Thanks for the conversation and for bringing all that you're bringing. It's quite a bit of change that's happening right now and we appreciate all the engagement on this.

Talk to me a little bit about price tag? Obviously, nothing in government ever gets less expensive. But using the commercial imagery that you're using and some of the available resources, as the shift occurs on that does that allow investment in other areas and where does that investment go if so?

Director CARDILLO. It does. I think a great example is the contract that we've had with Digital Globe. We just entered our seventh year. It's a year to year contract of 10. That price point over time, what the U.S. taxpayer gets back on the return on our investment, even if you think of per square kilometer of Earth surface, continues to go down. It's a great value.

But, as proud as we are of those results, we negotiated that eight years ago. Boy, today our conversations with these new space providers, there's very little about square kilometers. It's more about datasets and algorithms and what kind of filter can I put on that stream to understand what's happening.

Earlier I explained that we're setting up a GSA-like model so that we can pay by the—think of a credit card—swipe, versus a long-term contract. I think all of that will add to us getting more efficient and create smaller—less price points over time.

Senator LANKFORD. You're using a lot of social media now to try to use—basically, creating the algorithms to anticipate hostile actions and such. What you're doing in that work, how is that different than some other agencies are using social media to do some anticipatory work as well.

Director CARDILLO. It's a great question, and it's one that we work on all the time, because there's a crossover.

Senator LANKFORD. Right. The issue is overlap and lanes.

Director CARDILLO. Absolutely. My answer to that is to do it openly, and when I say "openly," not on the world wide web necessarily, but so that if I'm exploring a social media stream in eastern Ukraine because we're trying to find out what's really going on inside that opposition-held territory, I'm going to do that with the Defense Intelligence Agency, with the Central Intelligence Agency, with the Army, to make sure that we're not all doing the same thing at the same time.

I won't kid you, though. This is an evolving tradecraft and under this tradecraft John Brennan has the—he has the community responsibility. I just went to one of his board of governors meetings to make sure we are in fact sharing, so that we're not inefficiently or redundantly applying our assets.

Senator LANKFORD. But right now that's the spot that's actually the traffic cop basically to make sure that we're not overlapping on it, or if at times we're overlapping it's with purpose?

Director CARDILLO. That's correct, we're doing it knowingly. "Transparently" is the way I like to phrase it.

Senator LANKFORD. Give me some ideas, just as we're dealing with personnel issues and investment and hardware. You have a lot in your opening statement just about using different algorithms and computer-generated analysis of looking at images to be able to help track there. That's extremely helpful with the amount of data that's coming in.

Give me a good comparison on machines versus people in this process and what people are picking machines aren't or machines are and people can't?

Director CARDILLO. I am disappointed today in whatever the percentage I would give you on the machine side. It needs to be more. Some of this is technology, some of this is the actual science of that. I think a broader inhibitor to my team today is mind set. We're quite comfortable with that human path. We all know it, we've lived it, we've learned it, etcetera. Turning over, if you will, to an algorithm gets us a little anxious.

So part of my mantra has been to establish pilots and test beds so that we can some, obviously, technical experience, but also that cultural experience that I like to build. We just recently—I just re-

cently got a briefing. It was classified, so I won't go into details. But it resulted in my analysts spending time counting buildings in a town physically. How many buildings? 25,000. I said: Please tell me you didn't count those on your own. Oh, sir, I did. And he was very proud of his work.

But think of the hours he had to spend to do that. Now, I turned to my head of research and I said: Don't let that happen again. You know what I mean? I want to move that number up quickly and we're on a number of paths to do that.

Senator LANKFORD. Last question. All the work that's happening right now on Iran is extremely important to all of us, and compliance with the nuclear agreement the President made. How confident are you that we're able to see into the places we need to see to be able to evaluate their movement and clandestine operations?

Director CARDILLO. I'm the geospatial component of that team that adds up to the confidence you asked. From my seat, I'm very confident that we have the access and that we have the tradecraft to expose activities that could be an indicator that are in variance with the agreement.

Senator LANKFORD. Thank you.

Thank you, Mr. Chairman.

Chairman BURR. Thank you, Senator Lankford.

I want to follow up with what Senator King said, Director, just very briefly, and that's about Jim Clapper. Jim brought to the DNI an incredible amount of experience throughout the community—a very difficult thing for us to replicate when Jim leaves. But it has served this country well and I think it has brought some confidence to each of the agencies knowing that there was an individual that not only tasked them, but understood the challenges that they were up against.

Jim's had a wonderful career that will end at the end of this year and a richly deserved retirement. The next choice will be extremely tough, to find somebody with the talents and the experience that he had.

I want to commend the members. It's not always easy to go into an open hearing and mistakenly not cross the line. Some of you got right up close to it and I thought I was going to come out of my seat. But you didn't cross the line and I am grateful to you for that, because I see value to these hearings being open.

I inherently believe that the public wants to know what oversight looks like. They want to know how and why the IC community does what they do and, as much as they can, how it's done and, more importantly, why it's important to them. I think this hearing covered it.

I might say, it was a little dry. But when you've got to do it in open session it's that way. Perhaps, since both of us know about oversight, it's not too exciting. I think today we did cover the nuts and the bolts, but I think only the agencies that we have jurisdiction over understand that from the standpoint of this committee we're an extension of the IC community. We ask the tough questions, we ask them when it's appropriate to do, and we work to find a solution if there's a problem. We don't just leave them out hanging. I hope, Director, you feel the same way I do: We're partners in this.

The last thing I want to say is to you. I thought your testimony was great. I think that your written testimony is incredibly thorough, and for anyone who would take the time to sit down and read it I think they would be impressed at the fact that we've got you as the Director of the NGO.

So we are grateful to you. We are grateful to the employees that 24-7 do an unbelievable job of really leveraging the technologies that are available to us and in a lot of cases pushing what's possible to become reality and give us the edge in a very unstable and dangerous world. For that we're grateful.

This hearing is adjourned.

[Whereupon, at 11:28 a.m., the hearing was adjourned.]

