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Remarks as Prepared for
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Thank you, Victoria, for that kind introduction. I would also like to recognize Lon Levin, Chairman of the Space Foundation Board and President of SevenSky Ventures. Thank you, Lon, for all you do to enhance the role of the Space Foundation. And I look forward to working with you on the Defense Business Board. And a special "shout out" to Elliot Pulham, Chief Executive Officer of the Space Foundation, for the invitation to address this Symposium. It is a professional privilege – and a personal pleasure -- to speak to this critical forum during my first year as Director of NGA.

But before I begin my remarks, I want to take a moment to honor the recent passing of an icon well loved by space enthusiasts everywhere. Both as an actor and as advocate, he inspired three generations, including mine, to appreciate the wonders of space exploration.

With impeccable dignity and resolute logic, he played the half-human, half-Vulcan Mr. Spock of Star Trek on its fictional five-year voyage… a journey of exploration, discovery and understanding. Of course, I mean Leonard Nimoy, who died on February 27th. As you may know, the Space Foundation awarded him the Douglas S. Morrow Public Outreach Award in 2010. That honor celebrated and recognized his advocacy for public awareness and support of space programs.

How many of you were inspired as young men and women to pursue careers in space because of Mr. Spock and Star Trek? I suspect many were so inspired – as was I. So I thought it fitting to pay tribute to Nimoy's rich life – and the difference he made. Through his many contributions, he showed that each of us is on a personal journey – to go where no one has ever gone before. The USS Enterprise traveled in the 23rd century on its five-year mission to explore strange new worlds, to seek out new life and new civilizations."

Ironically, the show lasted only three years. But the series and movies became cultural icons. They demonstrated the power of imagination and adventure to inspire real technological advances. Many 21st century technologies crucial to NGA's mission far surpass Star Trek's fictitious technology: Unfortunately, we have not yet mastered warp speed or teleportation – although I suspect a lot of brilliant minds here today may be working on both.

However, modern smart phones are many times more versatile and more powerful than Mr. Spock's communicator -- his was little more than a push-to-talk flip phone. But it did have a precise geolocation system that foreshadowed our own GPS and the power of georeferencing. It also recognized the critical importance of spatial-temporal context. And it was the forebear of our profession of geospatial intelligence – GEOINT. And remote sensing technologies that Star Trek portrayed – remember "scanning for life forms"? -- are already NGA's bread and butter.

We scan the electro-magnetic spectrum for high-resolution color imagery, radar, infrared, laser, hyperspectral, and full motion video to collect vital data. With all of our advanced expertise and capabilities, NGA exists for only one reason – to enable consequence for those we serve.

We provide a dynamic, persistent pro-active intelligence service that:

- Sharpens the focus of our customers' limited time;
- Gives them the GEOINT-based insight they need for decisions, operations, and actions;
- And positions them for success.

Our challenge is help our customers sustain their freedom of action to decide the best course of action in dynamic situations. Looking toward the real future for the space industry, I find that human progress over the years has been achieved by many small incremental changes, or sometimes, a few huge leaps. In less than one generation, the GEOINT discipline, NGA, and the Intelligence Community have been turned on their heads.

During that generation, we have made significant progress in many core areas:

- We have matured and added diversity to our national technical means,
- We have partnered with the commercial industry to grow into the principle source of our foundation data,
- We have repurposed sensors created for a specific mission into mainstream phenomenologies – and applied them to new intelligence problems.

- We have taken full advantage of new airborne sensors, especially full motion video,
- We have closely integrated with other intelligence disciplines,
- And we have developed the tradecraft, tools, and techniques to turn these technological changes into meaningful consequence for our customers every day.

In short, we have shown a willingness and ability to adapt quickly over the years. And we can—and will—do it again to meet the growing threats of our time.
We have arrived at a strategic inflection point that I call a "Seismic Shift" in geospatial intelligence. I'd like to discuss what I mean by this "Seismic Shift" and what it means to NGA, to you, and to the future of our national security as well as that of our allies. And I'll share with you how and why I believe that only an ever deeper partnership will enable us to enhance our success.

There are three fundamental changes driving this Shift:

- First is **potential** – the explosion of data and access outside of the government's control – Darkening Skies of small sats, global expansion of social media, and the Internet of Things.
- These technological game-changers have created enormous new sources of content and capabilities that will allow NGA to achieve virtual persistence over critical areas.
- Second is **enterprise capacity** – Radical advances in cloud technology, automated "Big Data" analysis, and network integration allow us to create and leverage new analytic methods and tradecraft. The IC Information Technology Enterprise (aka ICITE) must succeed for these advances to reach their full potential. With these methods and tradecraft, analysts will develop deeper insights into global crises and deliver them to decision makers more quickly.
- Third is **resources** – And by resources, I really mean people. People are our real power – our discriminate value proposition in an indiscriminate world. To leverage the power of our people, we must transform outdated government processes, embrace diversity, adopt new workforce strategies, and encourage them to master the new methods and tradecraft. And we need a better flow-through of talent and experience.

But – a challenge and a warning.

We have only a limited time to transform our mindset and unleash the power of our people to leverage our enterprise and fulfill the potential that these massive changes offer. Since the first photograph of a battlefield was taken from a balloon in the Civil War, the edges of that image literally and figuratively framed and limited our perspective.

Those borders reduced our ability to understand the threat in a way that enables our customers to be successful. Beyond limiting our vision, those edges became barriers to our thinking – and thus inhibitors to our value proposition.

I know because as a new imagery analyst 32 years ago, that was my job. And while our overhead capabilities have expanded enormously since the Civil War, imagery was scarce and highly classified when I joined this profession. Thus, I spent a lot of my time on the hunt…for this. Once I found the elusive image, I literally zoomed in and studied every pixel.

My core challenge was to build upon this blink in time--to expand my static exploitation of the snapshot across time so I could build some sort of a temporal context. To do so, I would look at image after image so I could connect those blinks in time to understand the threat. Remember that an image represents only one second out of the 86,000 seconds in a day. Then, I projected my theories to assess what might happen in the future. Ultimately, I had to put my assessment through a detailed review process that could take days or weeks or longer. Frankly, this system did an amazingly good job during the Cold War when the threat was large, regimented and slow.

One chief reason for our success was our virtual monopoly on sources -- and we were very successful in our closed system. Obviously, today, the global threats are changing more rapidly than ever – they are small, fluid and fast. We must arrive at understanding more quickly by trending, predicting, forecasting and—anticipating—the threat in hours, if not minutes. And we must dynamically offer our customers potential courses of action.

Consider the impact of these recent events:

- In 2014, Russia moved swiftly to occupy and annex Crimea. It has put enormous strain on the Ukraine and all of NATO by redefining armed aggression.
- The Ebola epidemic erupted from a West African local challenge to become an international security crisis in just a few weeks.
- A small band of brutal terrorists has destroyed international boundaries, declared a caliphate, and attracted a global following.
- And the promise of the Arab Spring has turned into an Arab Winter of civil wars and disintegrating states.

In short, we must now expect the unexpected to happen every day anywhere. And thus we must quickly learn how to succeed in the open. Fortunately, as it has since the first U-2 overflight of the Soviet Union on 4 July 1956 – almost 60 years ago -- the commercial industry continues to drive the changes that will help the Intelligence Community to overcome these challenges. A recent In-Q-Tel report called the small

satellite revolution the “Cosmic Shift.” It forecast that within three years, constellations totaling hundreds of small sats will continuously image the earth every day.

Imagine the world as millions of one-meter slices -- every day— with common access to that imagery. That Cosmic Shift is driving what I call the “democratization” of GEOINT. The content that fuels our profession is becoming more commoditized and commercialized every day – and this is a good thing. Like an ever-expanding universe, the explosion of “social-local-mobile” data on the Internet is accelerating – another good thing.

This rapid democratization depends on one common element: geolocation. Every challenge – and every opportunity – we face has geolocation at its heart. Today, there are more than 3 billion Internet users and more than 2 billion smart phones—not simple mobile phones, but smart phones. By 2021, the Internet and the smart phone will spread quickly to the “O3”—that is, the other 3 billion people who will join this community. Social media and its immediate impact on global events will become ever more ubiquitous. The Internet of Things has emerged with geolocation sensors in everything from self-driven automobiles to our clothing. And all are capable of communicating with each other.

Thanks in part to these billions of ever-present geolocation devices, we in the GEOINT Community face a revolution of similar size, scope, and scale. That is the “Seismic Shift.” It means that we must leverage the unclassified world far more than we ever have before.

With your help, we will master the Seismic Shift and succeed in the open so we can access, assess and document sources to:

- Detect patterns of activity;
- Interpret behaviors;
- Create insight and understanding from the tsunami of data; and
- Enable decision advantage for our customers.

On this new and open playing field, NGA’s advantage – our value proposition – will be our focused effort to create coherence from chaos.

How? We must reduce the barriers between our government system and that “Cosmic Shift” in the commercial market.

An example of our future is a completely unclassified project I recently launched called the GEOINT Pathfinder. This project will attempt to answer intelligence questions with

only unclassified data, commercial information technology, and flexible contracts to bring capabilities on board more rapidly. It will deliver high-quality unclassified GEOINT to our customers on their mobile devices. The project will operate through a network of in-house labs and off-site locations. They will collaborate on integrated virtual teams through a secure – but not classified -- service called Sage -- an unclassified version of i-Space.

The GEOINT Pathfinder team will consist of a world-class group of data scientists, application developers, open source researchers, methodologists, and analysts. It will take a few months to set up the team. But as soon as they start, they will do 90-day sprints to answer intelligence questions. However, this project and our shift toward the unclassified world do not mean the end of our classified world. Far from it. It means that we must think asymmetrically to detect, identify, understand and outmaneuver our adversaries.

As we master this Shift, we'll be able to realize the persistence we sought from that balloon over the Civil War battlefield by looking at it in a new light. As our approach toward GEOINT must change, we must see persistence as a mindset, not as a system of collection platforms. It's a mindset that encourages analysts to use any combination of methods to answer intelligence questions.

The massive increase in the variety and combination of collectors allows us to choose from many more—and more effective—ways to persist over threats:

- The Darkening Skies of small sat constellations,
- Our deeper partnerships with commercial industry,
- New fleets of airborne collectors, and
- Evolving and exquisite national technical means.

All of these capabilities enable more persistence – more time over more enigmas when and where we need it – in other words, less time between blinks. NGA depends on Industry to provide the precise tools, the advanced technology, the sophisticated techniques, and the specialized expertise that enable Team NGA to deliver decisive consequence for our customers. By the way, I include everyone here today to be a member of Team NGA.

But we face a threat—maybe the only threat—that can prevent us from winning the day. Frankly, that threat is our choice to embrace the shift or reject it. Will we stand firm during the tremors of change and move forward? Or will we lose our balance and our confidence? Our choice will determine whether together, we succeed in the open during

the coming decade. While we should be very proud of our history of support and success, what's gotten us here will not get us there.

I know our new path may seem shaky at times. But if we stay poised and cooperate as true partners, we can—and I am confident, we will—succeed. In that proud history, we tended to focus on (pun intended) on spatial resolution – and then spatial-temporal resolution.

We must evolve our thinking to what I call "activity resolution."

In the past, we collected and analyzed spatial data—those blinks in time I mentioned before. And we tried to deduce meaning from that data by building assumptions and hypotheses to fill those large gaps in coverage. Those efforts were a lot like driving forward by looking in the rear view mirror. Today, since change happens so much faster on so many fronts, we must understand how objects change through time – that is, resolve their activities faster. When we understand how people, things, and events change through time and space, we achieve our goal of activity resolution. Achieving that goal enables us to give our customers deeper context for the decisions they must make, rather than react to the things that have already happened.

In short, deeper context improves awareness, insight and understanding at their point of decision. We gain awareness from the multiple sources of content we expose through our Map of the World – this baseline service provided by NGA is now operational at all secure levels.

This Map is the platform for intelligence integration because it includes:

- Imagery from across the spectrum,
- Multiple layers of geospatial data,
- Unclassified sources,
- A conduit to non-NGA contributions
- Human geography, and
- Cross-discipline content.

We derive meaningful insights as we integrate our awareness with that of other intelligence analysts and apply our deep expertise to the problem. Finally, those insights lead to a thorough understanding of an event or activity that we then convey to our customers. When we master true understanding of a situation, we provide real value to our customers. And we rapidly and consistently convey this understanding to our customers – whether they're Senior policy makers, warfighters, intelligence planners, or first responders – so they can obtain the objectives they seek.

And that's how we will define success:

- If our customers succeed, we succeed.
- If they're not successful, we fail.

Our focus through the lens of consequence makes NGA – and you as our partners – increasingly valuable in a future in which everything and everyone is interconnected. We can't realize our vision and fulfill our mission unless you work with us more closely than ever before. We realize that we have added many new technologies and tools, but we have, wrapped them around outdated business practices around them. We especially need your help to identify and apply leading edge business practices so we can maximize the impact of these massive technological changes.

Let me share with you now the five critical priorities where we need your help. My challenge to you is to bring us your answers to these priorities:

- One, accelerate data to answers. I envision a future where we will move from analyzing Big Data toward realizing the potential of Fast Data. Thus, we need to invest in a near-real-time, small satellite-based analytic system that continuously streams data from hundreds of platforms, pre-analyzes that content, and delivers that change within minutes of collection.
- Two, we need sensors, systems, algorithms, and tools that combine the full electromagnetic spectrum, open sources, and integrated intelligence in real time in a geospatial context. We will build a self-organizing enterprise to replace the traditional collection process –with continuous feedback, collaboration, and integration among sensors, automated processors, advanced analytics, and analytic models. The small sat constellation will continuously image thousands of facilities and activities across countries and continents – true global coverage. Again, a major part of this effort will be ensuring the success of the IC Information Technology Enterprise – IC ITE. IC ITE is well on its way to solving issues with security management, cross-domain services, and integration of new sources.
- Three, we must fully leverage non-traditional sources, especially open sources and non-NGA geoint content, and integrate them continuously in real-time with all of our other capabilities. We must do so throughout the day, all night, in all weather conditions, every day of the year, across the spectrum of sensors in the face of sophisticated denial and deception and both natural and man-made interference.
- Four, we must embrace and trust secure automated systems throughout the environment. They will be driven by learning-based analytic models and state-of-the-art collection platforms.

- Five, and as I have stressed, the most important element of all is the people. We must transform our GEOINT cadre by recruiting, retraining, and retaining technically savvy GEOINT professionals to work in a host of transformed occupations. We must develop them into subject matter experts who will lead integrated virtual teams of data scientists, artificial intelligence assistants, and source experts. And, we must embrace the same openness with our workforce that we are envisioning with our work. We want our officers to move in and out of the private sector and work across government agencies to include our policy brethren during the course of their careers. We want them to acquire the breadth of experience and the depth of knowledge that will allow them to see challenges from different perspectives and to develop new understanding.

As I hope you can see, NGA is accelerating our progress as quickly as we can. But only you can create and deliver the innovative capabilities that we must have.

In conclusion, let me share with you my view of the future that can result when together, we master the Seismic Shift of a democratized world of open GEOINT. We'll buy basic imagery analysis as a commodity -- much like we buy foundation data today. Imagery, geospatial data, full motion video, and unclassified source content will be constantly updated and integrated through persistent collectors—small sat constellations, ground borne, airborne, and national technical means (NTM).

The value of NGA will grow as our analysts make invaluable discoveries from these massive collections of georeferenced content. In other words, we must fully move – physically and mentally – into our customer centric mode and mindset. Our value proposition will be how well we bring to the decision maker coherence from the chaos and confusion of so much data from so many sources.

And beyond that coherence, we must pursue and discover meaning. We will discover the vital patterns and uncover relationships hidden in the massive collections of content continuously updated in and through the Map of the World. And we will deliver highly visual, easy-to-understand insights on mobile devices in every security domain.

We'll move from seeing to sensing – from sensing to understanding – from understanding to anticipating – because our adversaries demand it and our customers deserve it. All of this is enabled as we move from blinking to persisting.

But the most important factor of all in this scenario is this: It can come true only if NGA and industry are bonded in partnership as Team NGA. It can come true only if we work together to develop, acquire, and deliver the advanced capabilities that we need. I

realize that this Seismic Shift will cause tremors across NGA and industry. The way we do business, the way we do collection, the way we do analysis, the way we hire and train, the way we serve our customers all will change. I ask you to move forward with us, to grasp the opportunities that this Shift creates.

Recall that the USS Enterprise had only a five-year mission. But Team NGA is embarked on a bold, never-ending journey of our own to raise GEOINT to heights it has never achieved before. Yes, the pace of change is accelerating -- but it is also exhilarating. Within every momentous change, we will find equally momentous opportunity. I urge you to join me in the greatest mission of all – let's go together where no one has gone before – to ensure a safe, secure, and prosperous future for our nation and our allies.

A final tribute to Mr. Spock – live long and prosper.

Thank you.

[END]