

SPACE DOMAIN AWARENESS: A GLOBAL CHALLENGE

Konichiwa and thank you Yoshitomi-San for that very kind introduction. It is great to be back in Japan and I look forward to the opportunity of seeing many great friends. As some of you may know, I was the Vice Commander of 5th Air Force and Deputy Commander of 13th Air Force at Yokota AB from December 2010 to July 2012. My family and I thoroughly enjoyed living in this wonderful country and it is great to be back once again.

I attended this conference in 2012 and 2013 and have always found the discussion intellectually stimulating and very worthwhile. Let me just say, I am greatly honored and appreciate the invitation to share some thoughts with you today on Space Situational Awareness.

Collectively, we have made great strides over the past couple of years in the Space Situational Awareness mission area. We continue to develop and foster strong partnerships, we are

sharing data more broadly, we continue to integrate additional sensors into our Space Surveillance Network, and we have brought the first increment of our new SSA/C2 system called the Joint Space Operations Center Mission System online. These advances are important milestones as we strive to keep the domain safe for all to use. However, the space strategic environment continues to evolve and the domain is becoming even more congested, contested and competitive...much more so than just a couple of years ago when I last addressed this forum.

This strategic environment demands we take Space Situational Awareness to a new level. In fact, I am using a new term to describe this mission area and that term is Space Domain Awareness. The term SSA is rooted in our space catalogue mission that tracks the locations of thousands of objects on orbit in space. However, as the domain continues to evolve, just knowing where an object is located...is no longer good enough. We need a more comprehensive approach to raise awareness.

Let me bring this to construct to life for you.

In 2014:

Catalogue

- SSN takes approx. 340,000 observations every day
- Tracks approximately 23,000 objects in orbit
- Approx 1,300 are active satellites...the rest is debris
- Of those 1,300 satellites 75% are maneuverable
- Estimated 500,000 objects too small for us to track

Conjunction Assessments

- We screened 446,317 payloads for collision avoidance
- Updated spacetrack.org over a quarter million times providing SSA data for the world
- We notify owner operators around the world of potential conjunction
- 121 times last year (once every three days) a satellite maneuvered based on our warning to avoid collision
- International Space Station maneuvered 3 times

Launches

- 11 countries have an indigenous launch capability
- More than 170 countries access space capabilities
- In 2014 there were 86 space launches...what has changed is a significant increase in the number launches carrying multiple payloads
- 229 new satellites

- Including 158 cubesats...following this trend there will be well over 2,000 of these small satellites in orbit within the next five years

CubeSat technology represents a new incredible potential, but poses significant flight safety concerns. Unlike a traditional launch announced to the global space community by the owner-operator and then tracked by the U.S. Space Surveillance Network, with one or several satellites on top of a dedicated space launch vehicle...CubeSats are typically deployed into orbit by a uniquely different means. Their owner/operators negotiate rideshare opportunities on established launches, and often are deployed in bunches or flocks from the host vehicle. Today, scores are deployed—and they are very small and hard to track. Unfortunately, the excitement we feel as space professionals for new missions is tempered by the realization of their growing risk to other operators and the resources needed to promptly and effectively assess their impact to the domain. In order for us to successfully track these satellites in a timely manner, and reduce

the risks, we need to achieve a higher level of coordination and cooperation with the owners and operators.

Another significant threat demanding increased domain awareness is the continued development of counterspace capabilities. Many countries are seeing the National, strategic, operational, and tactical advantages gained from space capabilities...and some nations are developing a range of technical capabilities to deny access to space. That could be anything from reversible jamming of communications and Precision Navigation and Timing satellites on the low-end of the spectrum to the very destructive kinetic Anti-Satellite weapons on the high end...plus everything in between.

History has shown that across the range of engagement from humanitarian assistance/disaster relief to armed conflict... Senior leaders and military commanders must strive for complete awareness of the domain where they are operating...space is no different.

Just last year we launched two spacecraft as part of the new Geosynchronous Space Situational Awareness Program (GSSAP). This pair of satellites is orbiting near geosynchronous orbit (GEO) in order to dramatically improve our Situational Awareness of the GEO belt. This is analogous to a neighborhood watch program where the satellites will monitor the belt and characterize activity in this vital orbital regime to help us more fully understand the space environment.

We're also fielding a new Space Fence, which is scheduled to reach initial operating capability in Fiscal Year 2019. The program will improve uncued detection of objects in low earth orbit... and help us track the other half-million objects I referred to earlier that are too small to track with today's sensors. Site 1 of the system is being established on Kwajalein Atoll.

We're also moving a C-Band radar from an island in the Atlantic Ocean to Western Australia. This radar is going to enable us to track critical objects in LEO over that part of the world.

Additionally, we're taking a brand new telescope and moving it to

Western Australia. It is called the Space Surveillance Telescope, or SST. These new capabilities are going to help us achieve the domain awareness we need to keep the domain safe for all.

In addition to the new sensors, equally important are the strong relations we are building with partner nations. We depend on strong partnerships to effectively and efficiently operate in the space domain... partnerships with both commercial industry as well as allied counterparts. Growing and fostering these relationships is one of my top priorities.

We have a great relationship with Japan and this partnership is very valuable to both of our countries. We are friends--and I mean *good* friends--allies, and partners. Just as we partnered four years ago in Operation Tomodachi, we must continue to develop close partnerships in the space domain. I look forward to continuing our close working relationship with JAXA and helping us build strong military-to-military relations in space.

Our two countries have signed SSA Sharing Agreements allowing us to share data and perform services for each other

related to anomaly resolution, collision avoidance, conjunction assessment, de-orbit/re-entry support, disposal/end of life support, launch support, and we share on-orbit information.

Today, we cooperate and coordinate on launches, reentry assessments, collision avoidance, conjunction assessment, sensor validation, and we share on orbit information. Our Joint Space Operations Center (JSpOC) performs conjunction assessments for 70 Japanese satellites...Every Day! (21 Comm'l, 27 gov't, 20 academic, 2 hobbyist).

This new idea of Space Domain Awareness is in everyone's interest. What I am really saying is we must do more than just catalogue. We must work together. It is in our collective best interest for all peaceful space-faring nations to encourage the sensible and responsible use of space. Collisions in space are detrimental to the entire space environment, not just the colliding satellites. Hostile and non-transparent acts can threaten the peaceful use of space and negate the productivity and efficiencies the global economy achieves through space capabilities. The

more like-minded nations partner and collaborate in space, the more it discourages bad actors. Even more importantly it helps build a strong foundation for information sharing and economic development.

In conclusion, Space has changed dramatically over the past thirty years. Space is no longer an exclusive club for a few nations and it is no longer a sanctuary. Space has become a competitive, congested and contested domain. We must adapt to the changing landscape...and we are in the process of doing so as we speak. Moreover I truly believe that our best prospect for improving space domain awareness...securing space...and maintaining the peaceful use of space...is by partnering with like-minded space faring nations and with the commercial space owner operator community in order to share data and discourage irresponsible behavior. Once again, thank you for inviting me here and I'm looking forward to listening to and learning from the other speakers. It has truly been my honor to speak before you today.