Government Business Council

The Final Frontier

The Intelligence Community in Space

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INTRODUCTION

Increasing numbers of both state and commercial actors are moving operations into orbit, and with this rise in activity comes not just opportunities, but also challenges and conflicts. The intelligence community (IC) plays a key role in the national mission to protect American assets in space, most recently formally incorporating the intelligence arm of the U.S. Space Force, known as Space Delta 7, in early 2021. With more hardware being sent into orbit at an accelerating pace, the question becomes: How can America's intelligence community remain agile and effective in this environment as space becomes increasingly congested, contested and competitive?

THE BIG IDEA

From communications to global positioning systems to tools that aid in surveillance and reconnaissance, space is becoming an increasingly critical operation zone for both commercial and government actors — including the intelligence community. But with more allocation of resources — and more dependence on space for military and economic activities — the threat surface also grows.

WHY IT MATTERS

The IC has long enjoyed advanced space-based capabilities, such as those provided by the National Reconnaissance Office, to rapidly receive and analyze information that supports and protects national security. However, the increasing commercial and state activity in space creates challenges in both integrating with these new capabilities and defending U.S. assets when warranted. Defense and intelligence assets must continue to improve their resilience and security prior to launch to avoid jeopardizing many of these key capabilities.

NATIONAL SECURITY IN SPACE

AT THE FRONTIER

National security has long relied on tools in space, and modern technologies provide new capabilities to serve that mission. Satellites track movement and provide GPS navigation, support precision strikes, allow for instantaneous communication across the globe, and can even help predict the weather. As this arena becomes more crowded, however, space is also a growing frontier for risk. Global economic reliance on space, from internet service to GPS, exposes new areas of vulnerability, which enemies could exploit in order to cripple economies and national capabilities. Our military and economic reliance on space poses major security risks that American defense organizations look to mitigate.

> “This move not only underscores the importance of space as a priority intelligence and military operational domain for national security, but ensures interoperability, future capability development and operations, and true global awareness for strategic warning.”
>
> — **John Ratcliffe**, former Director of National Intelligence

NATIONAL SECURITY IN SPACE

INTELLIGENCE COMMUNITY IN SPACE

The intelligence community (IC) has been a core line of defense in space since the 1960s. The community most recently expanded its engagement in this arena with the incorporation of the U.S. Space Force's intelligence arm, Space Delta 7, in January 2021. In 2020, the Director of National Intelligence (DNI) also committed significant funding toward countering threats in space and supporting technical intelligence about space-related threats, such as anti-satellite weaponry being developed by China and Russia.[1] The IC is consistently at the forefront of technology in space, allowing them to rapidly collect and disseminate intelligence and outmaneuver adversaries to protect American interests.

The DoD and IC have different priorities and missions in space, though they may use some of the same technologies. The addition of Space Force to the IC recognizes the unique and integral role that space holds in intelligence efforts. Maj. Gen. Leah Lauderback, the Air Force's director of Intelligence Surveillance and Reconnaissance, reported that Space Force's intelligence priorities include accurate and rapid threat characterization, as well as leveraging resources to improve agreements and education with allies, particularly those in the Five Eyes alliance.

In support of these goals, Space Force is developing the National Space Intelligence Center (NSIC), grown out of the space analysis and counter space analysis squadrons currently under the National Air and Space Intelligence Center (NASIC). [2]

SATELLITES

Low earth orbit (LEO) satellites are key tools for both military and commercial operations. For example, the Electro-Optical/Infrared Weather System (EWS) is pioneering a cutting-edge design of LEO sensors that have major potential to help decision-makers rapidly assess environmental threats. EWS is a “distributed constellation” of small satellites that allow an almost immediate look at anywhere on the globe in under an hour. “The U.S. Space Force is leveraging competitive rapid-prototyping strategies for the sensors, giving the warfighter top capabilities sooner. In contrast to DMSP, the small satellite design is less expensive to build and launch, and it will be refreshed more often, allowing a continuous infusion of new technology into the constellation,” said retired Air Force Major General Lawrence Stutzriem. Set to launch in 2025, EWS will provide “an assured source of high-fidelity intelligence about the environment [at] a pace critically needed for modern combat operations.” [3]

This type of innovation has potential beyond the weather. Low-orbiting sensors with the rapid ability to pinpoint any part of the globe are a natural fit for intelligence-gathering missions. These satellites immediately relay and analyze information, allowing the IC to access the data they need to potentially anticipate threats before they arrive.

What’s Threatening Us?

1. Interference
2. Radio jamming
3. Lasers used to blind or burn electronics
4. Data corruption and interception
5. Physical damage to technology
6. Anti-satellite weapons
7. Space debris
8. Space radiation environment

RESILIENCY: TECHNOLOGY IS “INDISPENSABLE BUT VULNERABLE”

Resiliency: robustness and survivability, i.e. the ability of a system to continue to operate or to rapidly recover after a disturbance of any kind and from any source to an acceptable level of service. [4]

Space assets are critical to modern warfighting and everyday life. They are also very expensive, subject to the harsh elements of space, and make attractive targets for adversarial attack. Satellites are particularly vulnerable — difficult to defend, naturally fragile and expensive to replace. Adversaries are not the only source of possible attacks; an environment becoming more crowded by the day with debris, radiation, and hardware sets a stage for unintended (and consequential) collisions. Building resiliency into space assets is one of the best ways to ensure mission is maintained and data is protected, even in the event of damage or loss of the technology.

RESILIENCY CAN TAKE SEVERAL FORMS:

DISAGGREGATION: allocation of different missions or functions across separate subsystems, so that an attack on one sector will not affect overall functionality.

DISTRIBUTION: all subsystems provide the same function, collectively behaving as a single system. Attacking a single part slightly decreases overall performance, but the system remains functional (graceful degradation).

DIVERSIFICATION: more focused on preserving resilience of service, rather than one system. Different platforms or solutions, including alternative or cross-domain solutions, can be substituted in and out as needed to fulfil functional needs.

PROLIFERATION: distribution of multiple units of the same system for technical redundancy; if one goes down, another is ready to take its place.

PROTECTION: all passive measures that ensure resiliency of the satellite itself, including physical or electromagnetic hardening, encryption of communication channel and built-in capabilities that prevent attack. [5]

Agencies or organizations can use more than one of these strategies, though many must be initiated in the design phase before satellites are launched. These strategies also invite crossover with commercial enterprises that have specialized expertise or innovative tools and technology. Partnerships and collaborations between government and industry are becoming increasingly key to staying at the forefront of space innovation.

COMMERCIAL CROWDING

Civilian and commercial use of space technology is not new — television, cell phones, and even radio all rely on commercial satellites, some of which have been orbiting (if not functional) since 1962. New and growing industries, such as the space tourism industry and the commercial recovery of space resources (also known as asteroid mining), are further crowding this arena. This raises concerns about traffic, collisions with space debris and even pathways for new rockets. "Kessler Syndrome," the 1978 theory that space could become so polluted that new endeavours would become impossible, is rapidly seeming more realistic — and the consequences could be dire. Even the International Space Station had to dodge orbital debris three times in 2020, an unprecedentedly high rate, and in 2021 the ISS's robotic arm was damaged.[6] Space remains largely unregulated, with few international treaties. As the intelligence community looks to continue to launch and operate its own satellites, and more commercial and national actors move action into space, growing congestion will likely remain a significant challenge.[7]

SpaceX and the NRO

In December of 2020, the National Reconnaissance Office (NRO) partnered with SpaceX to launch a classified payload using their commercial launch service, in a break with standard practice. The rocket was the NRO's sixth launch of 2020, procured under the Rapid Acquisition of a Small Rocket (RASR) initiative. This initiative allows small NRO missions to use light-class commercial launchers instead of the National Security Space Launch program. Will this commercial-government crossover become standard?

WHAT'S NEXT?

As the world becomes more connected than ever, and commercial ventures make space ever more accessible, technology is growing to meet demand. For both the intelligence and defense communities, building resiliency through cutting-edge technology is the best way to protect assets and stay ahead of adversaries.

ARTIFICIAL INTELLIGENCE

Rapidly assessing and analyzing threats is at the core of intelligence work, and machine learning and artificial intelligence are already doing their part. AI is already used throughout the IC. For instance, the National Geospatial-Intelligence Agency uses AI to notify mariners around the world of imminent threats such as pirates or storms.[8] Autonomous, real-time data interpretation — such as software that immediately tallies containers on cargo ships from pictures taken from space — can analyze movements and patterns much faster than human analysts. The Sentient initiative, developed by the NRO sometime after 2010, is one example of AI that could help "connect the dots" by absorbing and analyzing enormous volumes of data almost instantaneously.[9] The implications of swift machine learning in space could mean faster and more accurate intelligence gathering and analysis.

WHAT'S NEXT?

DIGITAL TWINS

Digital twins, a concept pioneered by NASA for spacecraft and now applicable to a multitude of other things, consists of two identical systems — one physical, one digital. A constant stream of data keeps the digital twin updated on the condition of the physical twin, using Internet of Things (IOT) sensors. This allows operators on the ground to maintain and repair systems that are in space. The implications behind this technology go beyond space. Using real-time data to inform a machine learning algorithm has implications for healthcare, manufacturing, city planning and even intelligence gathering.

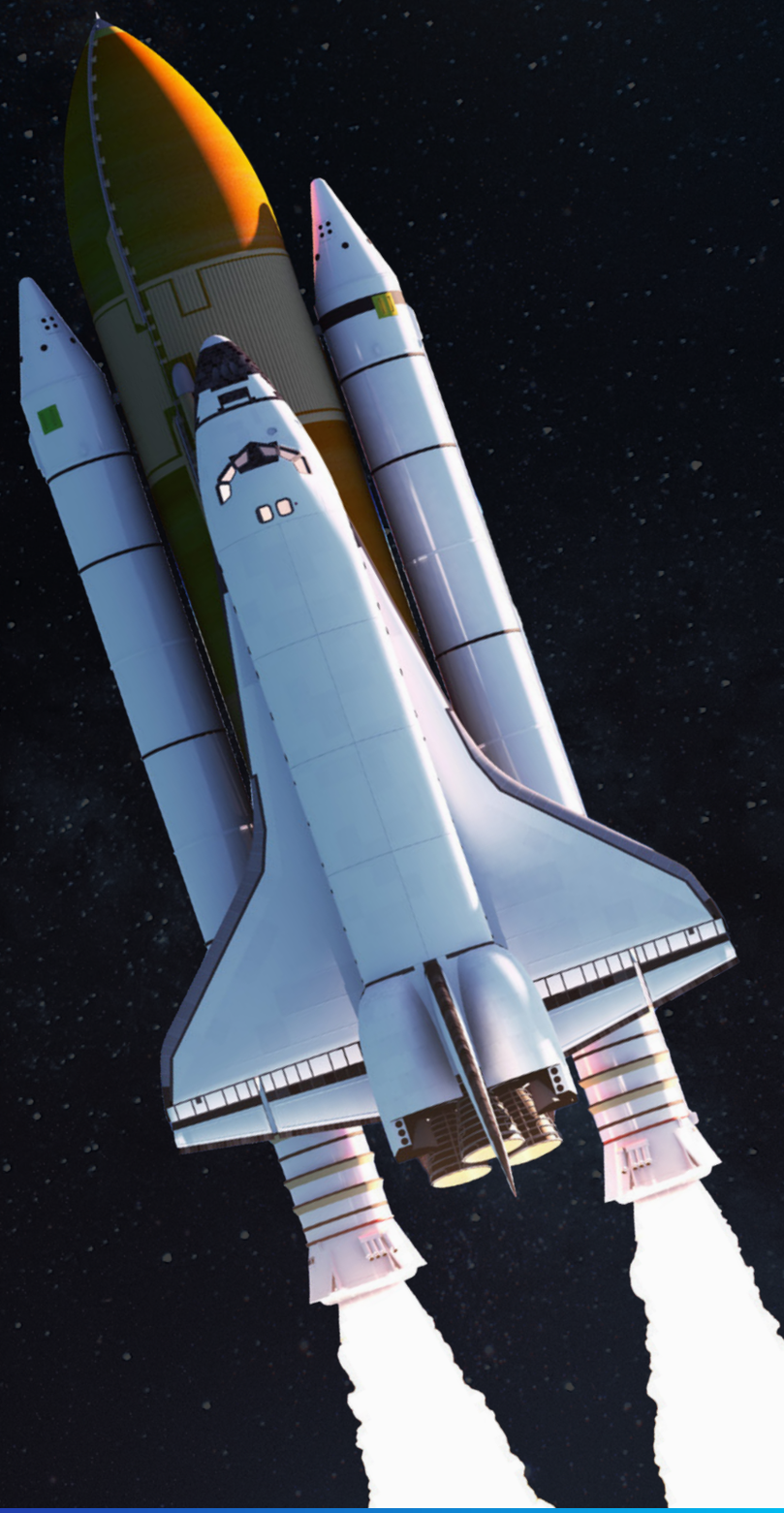
5G

The advent of 5G has been a fraught one for the IC, with allegations of Chinese intelligence gatherings through telecom giant Huawei's 5G network. Nevertheless, the future will include 5G, and with it the challenges and opportunities that lightning-speed data collection from decentralized sources brings. Artificial intelligence, machine learning, intelligence gathering and military communications will all be strengthened by 5G. However, establishing dominance in this field is key to the IC. As seen with Huawei, the strategic and intelligence implications of who owns and operates 5G infrastructure underscore the national security importance of developing this network.[10]

CONCLUSION

The intelligence community has been a major player in space since the first satellite went into orbit, continuously evolving to take advantage of new technologies that keep them at the tactical forefront. Rapidly expanding capacities for defense and intelligence agencies present new challenges and opportunities. With new technologies and architectures offering more capabilities and assured services than ever before, as well as rising concerns about the physical conditions of space, the community has a vested interest in incorporating resilience into their technological strategy. How can the IC leverage new providers and tools to secure the next arena of intelligence operations? How will the community look to protect its “invaluable but vulnerable” assets?

Defense and intelligence agencies are working to maintain the tactical advantage in a space arena that’s becoming both critically connected and increasingly crowded. Working to incorporate resilience as a technological strategy will protect valuable assets and support the critical role of the intelligence community in protecting national security.



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ENDNOTES

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