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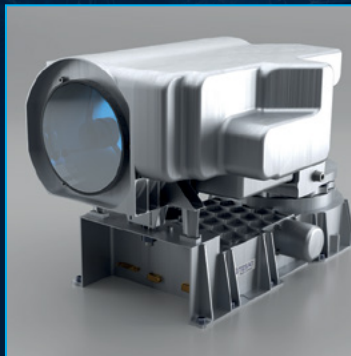
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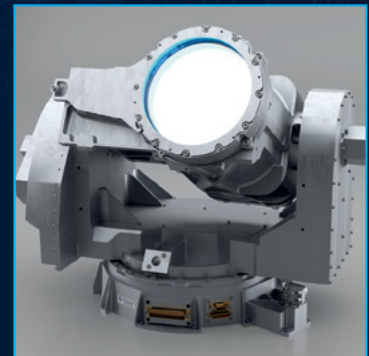
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COMMAND CENTER: TIM WINTER

President, iDirect Government



Tim Winter is the President of *iDirect Government*, and he oversees the corporate strategy and leads the company to bring solutions to the MILSATCOM arena.

Winter brings more than 20 years of experience in the SATCOM arena. Prior to joining *iDirect Government*, Winter served as Vice President of Global Accounts and Global Government and Defense at parent company, *ST Engineering iDirect*. Winter managed all strategic global account engagements and capture pursuits for International Defense opportunities.

Previously, he managed the satellite networks division at *L-3 Communications*, where he led all sales and business development efforts for managed satellite communication, data networks and operational field services.

Winter served in the U.S. Navy and flew P-3 Orion aircraft as a Naval flight officer on active duty for eight years. He continued his service in the United States Navy Reserves, flying P-3 aircraft and the BAMS-D UAV through 2022. He recently retired from the U.S. Navy with the rank of commander.



Photo of the P-3 Orion aircraft, courtesy of the U.S. Navy.

He has a Masters' degree in business administration from Georgetown University, Washington, DC, and a Bachelor of Science degree as a Trident Scholar from the United States Naval Academy, Annapolis, Maryland. He is chairman of the board for the *Minerallac Company*.



Good day, Mr. Winter. As the new president for *iDirect Government* this year, what is your vision for *iDirectGov* moving forward and what is the roadmap for the company?

TIM WINTER

First and foremost, we continue to be focused on being the best SATCOM ground service provider and partner to the U.S. government, agencies and Allies. This will be achieved through roadmap execution bringing forth the most resilient and dynamic ground ecosystem — one that embraces multilayered security with *Transmission Security (TRANSEC)*, *Federal Information Processing Standards (FIPS)*, *Communication Signal Interference Removal (CSIR™)* and future developments, and one that provides an unparalleled *multi-orbit/multi-waveform/multi-mission capability* to the end-user.

Internally, we will continue to have a “second to none” culture that promotes personal and professional growth for our employees and provides outstanding solutions and service to our customers.

We are proud of all our employees and salute our military veterans, who comprise one-third of our team. No one knows better what our troops need to accomplish mission success than those who have served. Our veteran team members bring valuable first-hand, real-world experience to the engineering table. They contribute to the integrity and features of our solutions for the warfighter.

Thank you for your service to the nation in your flight and command positions with the United States Navy. Speaking of your military service and the foundation such cemented into place for your career, was the transition from the Navy to the commercial front difficult to accomplish?

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TIM WINTER

It was an honor to serve in the United States Navy where I flew P-3 Orion aircraft as a Naval Flight Officer on active duty for eight years and retired as commander out of the Navy Reserves with more than 27 years of service. In the Navy, I flew P-3 aircraft and the BAMS-D UAV through 2022.

The transition from the Navy to the “commercial world” certainly comes with some challenges. That being said, success in both arenas is built on similar foundational elements.

Accountability, integrity, leadership, teamwork and empathy are just some of the common characteristics that can drive group and individual successes in the armed services as well as in commercial activities

Additionally, mentors — those who have gone before through the transition process — are usually ample and incredibly helpful throughout the process. Really, the hardest part can be figuring out what to wear every day without having a uniform!

How is developing defense communications solutions different from commercial products?

TIM WINTER

Security and resiliency must be **THE** priorities in defense communications. Defense-based networks must work in contested environments and when “the shooting starts.”

A ground SATCOM solution **must** be designed and developed with resiliency in mind. These capabilities must be at the core of the platform.



Such platforms must provide critical secure connectivity to those deployed by land, at sea and in the air for reliable anytime and anywhere communications in the field.

Commercial platforms usually provide initial building blocks and foundational technical elements to the ultimate design of such platforms. Cost efficiency, dynamic bandwidth allocation, virtualization, orchestration and cloud native capabilities will all be qualifying criteria for next-generation platforms.

These criteria must be coupled with capabilities that provide enhanced security and resiliency to meet the needs, requirements and demands of the warfighter. Additionally, interoperability will be very important to MILSATCOM networks in the future. The end-user desire to use multiple space assets and constellations — to include both government assets and commercial — is here to stay and will be a requirement going forward

Interoperability between orbits to include “orbit zero” (terrestrial) and 5G integration will also be desired. Interoperability is also important to the multi-national community. Most forces will operate as part of coalitions or joint efforts in the future. Agreed upon standards, security regimes and common architecture will all be important in our efforts with our Allies in the days to come.

What will iDirectGov’s next-gen product portfolio resemble?

TIM WINTER

Our next-gen platform will bring forth advanced capabilities to provide end-users with the most secure and resilient solution to their SATCOM needs and requirements. It will allow operational and deployed flexibility by being “cloud native” and deliver support for multi-mission, multi-waveform and multi-orbit needs, all within a multi-layered, secure and resilient environment.

The platform will provide an easy and seamless migration path from our current [Evolution Defense](#) offering and interoperability with the largest Velocity-based commercial networks in the world.





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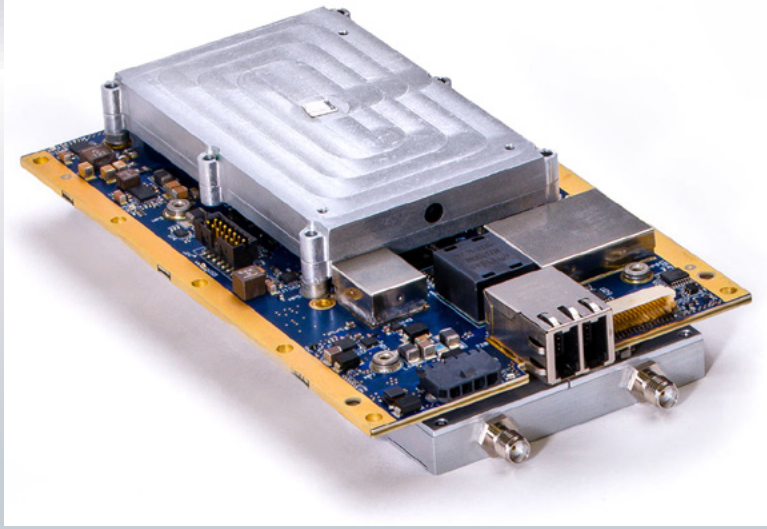


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iDirectGov's 450 SDR.

Cybersecurity is of great concern to government agencies and all military fields of endeavor... what role does iDirectGov play in suppressing hostile threats to these agencies and organizations? What advice can you offer to commanders and organization leaders regarding their roles with these substantial challenges?

TIM WINTER

Cybersecurity challenges are real, complex and often asymmetrical. The ability to prevent such cyber-attacks should be pursued by all those in leadership positions at agencies, government organizations and the military. All the tools and capabilities offered to the warfighter today must work in contested and cyber-challenged environments.

The security of the networks — data, command and control, and voice — must be prioritized, not only in operation, but at the time of design.

iDirect Government provides multi-layered secure communication solutions to include **TRANSEC** and **CSIR (signal interference mitigation)** that aid in the defense of communication networks.

Probably my best piece of advice is to have a focus toward security and cyber defense at the time of communications system design — hardware and software. It is often too hard to implement these capabilities after system design and build.

What are some of the challenges and opportunities for MILSATCOM in today's environment, and what role will MILSATCOM play in the battlefield?

TIM WINTER

MILSATCOM challenges include security, standards-based interoperability and enabling a single ground platform to provide a multi-mission and multi-constellation (*orbit, space asset, etc.*) capability.

The opportunities include technology advances that will allow for flexible deployments of ground systems (*cloud and on-premise, etc.*). Standards and interoperability advances will allow for easier use of multi-orbit and multi-constellations, etc. New orbit/constellation offerings will allow for mission-specific “*best available*” and “*most resilient*” SATCOM networks.

What are some trends you see in MILSATCOM now and in the future?

TIM WINTER

MILSATCOM trends include the acceleration of development and commercial offerings (*Starlink, etc.*) pushing the pace of development. There exists a need for interoperability across orbits and constellations and a need for interoperability across MILSATCOM assets and commercial solutions. MILSATCOM networks should be designed with a consideration to both commercial and military constellations.

The need for resilient solutions is a continuing — and strengthening — trend. If networks do not work in contested environments, then the industry has failed. The industry must stay ahead of the adversaries regarding security and resiliency.

As you review your successful career, what projects truly bring a sense of satisfaction to you?

TIM WINTER

Obviously, my service as a naval aviator in the **United States Navy** and the greatest fighting force in the world will always be incredibly important to me — and it played a pivotal role in who I am. The idea of service has carried through all my positions outside of the Navy, allowing me to keep the people I work with — both employees and customers — as my priority.

This military service has been the foundation for everything that I have accomplished in my career following my time in the Navy.

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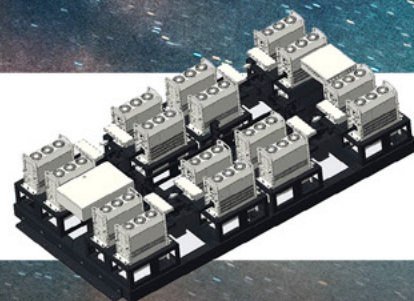
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I thrive on doing amazing things with great people — and sometimes doing things that you didn't think could be done. True success is only special when it is shared. This is why I advocate that service goes beyond career. I believe in supporting charities not only with monetary funds but with volunteer work — getting your hands in the action. I am proud of the many iDirect Government-supported philanthropic participation events, including *Wreaths Across America*, *Association of the United States Army's Fisher House* and *Patriot Foundation*, to name a few.

With MILSATCOM so crucial to the nation's and our Allies' national defense missions, how do you see Artificial Intelligence (AI) that you mentioned in the upcoming technology forefront answer playing a role in for military missions? Is the possibility of AI influencing the projection of power of concern to you? How can AI be cautiously used within MILSATCOM to the benefit of warfighters?

TIM WINTER

AI and *Machine Learning (ML)* are going to be extremely important to the warfighter in the days to come. Specifically, regarding SATCOM, AI and ML can allow for networks to be more dynamic and fit for mission. Whether these missions incorporate real-time bandwidth allocation, most resilient routing or auto-hopping from space asset to space asset or orbit to orbit, these satellite technology exchanges could all be influenced and automated by AI.

AI may lend itself to very dynamic security response regimes to bad actors. Systems could “learn” how an adversary is hacking or interfering with a particular network and respond accordingly and potentially in real time.

However, as noted, AI and ML will be tools deployed by adversaries as well. Security and resiliency are important today, and they will be even more so going forward. The capabilities of AI and ML are great, but they will be equally met by the many associated risks — both known and unknown.

How does iDirectGov view the Remote Piloted Aircraft (RPA)/Unmanned Aircraft Vehicle (UAV)/HAPS (High-Altitude Platform Station) products within the MAG world, and does the firm have any plans to support these technologies? If so, how?



BAMS-D UAV, photo courtesy of U.S. Navy.

TIM WINTER

RPA/UAV/HAPS provide an incredible capability to many at a very reasonable ROI. Whether it is long dwell ISR, comms relay or those that are involved in the kill chain, unmanned aerial assets are very effective. However, all that they do rely on secure and redundant communication links. These links — whether they are for takeoff and landing and line of sight or for data transmittal and beyond line of sight — are vital to the ability of these assets to perform their mission requirements.

iDirect Government offers communications suite hardware and software to enable these platforms and their associated SATCOM links while providing leading anti-jam and anti-interference capabilities to ensure their operation. iDirect Government stands ready to support all these platforms and users in the growing RPA/UAV/HAPS market.

What is your personal outlook for MILSATCOM in 2024? What technologies do you believe will come to the forefront in 2024?

TIM WINTER

I am bullish on all things SATCOM for 2024. It continues to be a very exciting and vibrant time in our industry. Multi-orbit, dynamic capabilities to support advanced mobility requirements and operational efficiencies will continue to be developed by the industry to provide the warfighter with advanced interoperable solutions. However, a robust approach to resiliency and security will continue to be “center stage” and a “must have” for all next-gen platforms and ecosystems.

I think we will see advanced AJ/AI/LPI/LPX resilient and secure solutions to continue to come to the forefront in 2024. These are absolute musts for the warfighter and are required to ensure survivability of SATCOM networks in the field. iDirectGov continues to work on the most advanced resilient SATCOM capabilities and looks forward to bringing them to the warfighter in the very near-term future.

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SPACE SYSTEMS COMMAND (SSC): INTERNATIONAL AFFAIRS

USSF/SSC's Space 'Renaissance' Means More Capable International Partners

Author: Lisa Sodders, Space Systems Command



The rapid pace of technological advancements that have made space operations more affordable and accessible for everyone has yielded an exciting benefit for the [U.S. Space Force \(USSF\)](#): more allies who can be partners in the space enterprise.

While [Space Systems Command \(SSC\)](#) and its predecessor organizations have long upheld allied partnerships, the field command has taken international relations to a new level through its **"Allied by Design"** guiding principle, said **Dr. Steve Pluntze**, Executive Director of SSC's *International Affairs Office (SSC/IA)*.



Dr. Steve Pluntze

"The words 'by design' mean 'on purpose' and 'methodical'," Pluntze said. "We want to normalize the inclusion of allied development into the acquisition mindset. 'Allied by Design' is to focus people's attention on doing this systemically."

Decades ago, it was only large governments such as the United States that could afford space programs; however, "technology is moving so quickly today, it enables so many new opportunities for (other) countries," Pluntze said.

"Now that it's within the reach of these newer-to-space countries, they are jumping on it because they understand the power, the force-multiplying effect of operating from space and deciding, 'We need to be a part of this, what are our priorities, and how do we partner with each other?'" Pluntze said.

"We're changing the way allies are introduced within our processes," Pluntze added. "If you bake something in from the start, it's much easier to include its capabilities with your own. The airplane was invented in 1903 and every country kind of built their own and brought them together when we needed to fight and then we figured it out. But if we had all developed from the beginning, together, think of how much more effective it would have been. So now everyone is going to be part of the solution from the start."

One example of this is how SSC/IA is supporting [Space Warfighting Analysis Center](#)'s space data transport force designs by leading **International Partner Working Groups** on their behalf to ensure allies are included in the space architectural design process — in this case, how data flows around the space network — from the beginning, Pluntze said. SSC/IA plans to do more of this in the future with other force designs.



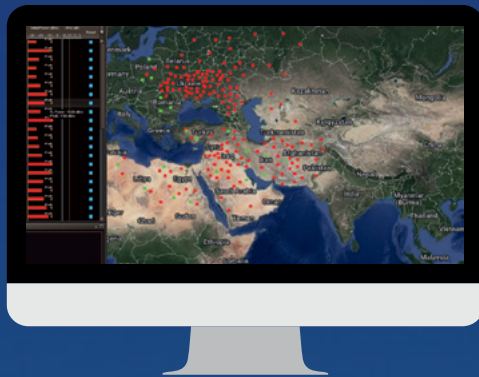
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Artistic rendition of the WGS 11+ satellite, courtesy of Boeing.

SSC/IA currently has established working relationships with 28 different countries. Many of these relationships go back decades, when SSC's predecessor organizations' earliest partnerships included selling Global Positioning System user equipment, and then MILSATCOM international partnerships for the **Wideband Global SATCOM (WGS)** satellite and the Advanced Extremely High Frequency System, Pluntze said.

Other partnerships are more recent, developed through a variety of engagement methods, from various working groups, memorandums of agreement or understanding, distinguished visitor meetings, exchange programs and other projects.



European Command and their support to Ukraine, which includes collaboration with SSC's **Commercial Space Office** to assist with securing alternate SATCOM capabilities for Ukraine and fielding requests for Foreign Military Sales from other partners in the area of responsibility for sovereign space capabilities.

SSC/IA is supporting several activities on behalf of **United States**

SSC/IA also has established the **Allied SATCOM Future Architecture Working Group**. Sixteen nations (*Australia, Belgium, Canada, the Czech Republic, Denmark, France, Germany, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Spain, United Kingdom, and United States*) are designing an integrated SATCOM network that will enable interoperability across national systems.

"Integration is very difficult in this business because the capabilities are so complex and widespread," Pluntze said. *"Being able to include allies and think of things from the start removes some of those integration headaches and mistakes, although adding partners can require more stringent integration discipline."*

Another partnership opportunity is using **Joint Task Force Space Defense Commercial Operations Cell (JCO)** as an entry point for new partners in the **Space Domain Awareness (SDA)** mission area. As there are many commercial companies who



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already have imaging capabilities from space, using a JCO is a way to combine and task the ability that's already up in space to start practicing space domain awareness with allied partners now, while sensitive elements of international agreements — such as intelligence sharing — are being worked out, Pluntze said.

In addition to tapping into innovative new developments from allies, partnerships also can help nations save money by pooling together to achieve common goals, Pluntze said. One nation might build a communications satellite, another country could launch it and both countries could share in the bandwidth that satellite provides.

However, saving money is only one short-term benefit, Pluntze said, adding, *"You're addressing the threat, increasing resiliency and deterrence and bringing new capabilities to the fight as well as building relationships."*

Pluntze said a large measure of SSC/IA's success is due to the [Secretary of the Air Force International Affairs Office \(SAF/IA\)](#), which has led the way by establishing partnership strategies, policies, and direction related to space technology exports. Current foreign military sales value at SSC is \$570 million and growing.



The U.S. and other countries are also working together to establish norms for international cooperation in space, and the responsible use of space, which could lead to some important breakthroughs in the realms of orbital debris removal, on-orbit servicing of space vehicles, rocket cargo and agile and flexible launch services, Pluntze said. All of these developments could lead to more space industry jobs for the countries that develop and perfect these services, potentially benefitting everyone.

"SAF/IA and Space Force S5P (Directorate of Strategic Plans, Programs, Requirements and Analysis) have been excellent leaders and teammates in forming the foundation of space international partnering," Pluntze said. *"Remember — this is new. Space is a new domain; the Space Force is a new service. And so, how we handle and include international partners in space is new as well. And it's new for our partners; they are working through similar issues."*

Pluntze said SSC, USSF, SAF/IA, and other U.S. Department of Defense partners are continually working together to identify and work out impediments to international partnerships *"and these are being solved and discussed at the highest levels of government, because leadership is very serious about bringing on these partners. They understand that long-term vision, even though sometimes the short-term hassles get in the way."*

"They have their eyes firmly fixed on that long-term result: seamless integration and use of partner capability at all levels of the space enterprise from development all the way out to operations and, if need be, warfighting. It's a very exciting future for space."

Space Systems Command (SSC) is the U.S. Space Force Field Command responsible for acquiring and delivering resilient war fighting capabilities to protect our nation's strategic advantage in and from space. SSC manages a \$15 billion space acquisition budget for the Department of Defense and works in partnership with joint forces, industry, government agencies, academic and allied organizations to accelerate innovation and outpace emerging threats. Our actions today are making the world a better space for tomorrow.

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SPACE CAPABILITIES VS. SPACE TECHNOLOGIES WHAT'S THE DIFFERENCE?

In the space acquisitions world, some of the terminology can be confusing. For example, what is a “space capability” and what is a “space technology”?

Loretta Childers, who supports *Space Systems Command's (SSC) Front Door* gateway for commercial collaboration, said it's useful to think of “capabilities” more as a verb: the ability to do or accomplish something. Technologies can be thought of as a noun: that which applies or furthers an industry.

A good example that illustrates the difference in regard to space is with *Position, Navigation, and Timing (PNT)*.

“SSC's Global Positioning System (GPS) provides capabilities that the military and civilians depend upon,” Childers said. “GPS is the technology; it's on our phones and in our cars. Improved anti-jamming and advanced timing are additional capabilities that SSC and the U.S. Space Force (USSF) need to improve performance.”

“Many (commercial vendors) will pitch their innovative solutions to the government,” Childers said. “Front Door is figuring out, ‘How can an idea, product, or service contribute to addressing a capability needed by the Space Force and the warfighter?’

“This requires a paradigm shift. Instead of focusing on the technology, we're focusing on what its capabilities can do and how they can be applied to getting after the threat in 2026 and beyond,” Childers said.

She added that technology is still important, “but it's not just ‘How do we take a pre-existing technology and advance it?’”

As the acquisition arm of the USSF, SSC has focused on managing the cost, schedule

SSC's 2nd anniversary in August: we need to think differently,’ Childers said. “A lot of that has to do with how we incentivize our people and our contractors. Managing our current technologies and programs



is important, but we also need to identify and close gaps in our capabilities.

“There does appear to be some confusion about the different between ‘technologies’ and ‘capabilities,’” said Dr. Claire Leon, director of SSC's Space Systems Integration Office (SSIO). “To some level, technologies enable capabilities.”



Dr. Claire Leon

“The capabilities the government has today are the assets we have in space, on the ground, in the cloud – we're using them to support mission operations,” Leon said. “For example, we have the capability to move data through a network and support in-theater operations because we have satellites and ground systems and software; we have the ability to accurately locate targets because there's a GPS system.”

and performance of Programs of Record, Childers said, but “we're also focusing more on identifying and fostering capabilities, innovation and ‘the art of the possible.’ This is a different, more dynamic way of looking at space and who we partner with to achieve that.”

“Every capability is based in technology,” Leon said. “Companies develop technologies, but they don't become capabilities until we exploit, buy or build and use them in specific mission scenarios.”

“A key focus area for SSIO is ‘capability integration,’ leveraging the capabilities of multiple mission partners,” Leon said. “It can be challenging because we often have different lexicons. We have to spend some time just on definitions. For example, the definition of ‘command and control’ is not always the same. In some worlds, it's

“As (SSC Commander) Lt. Gen. Guetlein said during a briefing on



At the 2023 Space Tech Expo in California, Space Systems Command's Loretta Childers (right) discusses the paradigm shift from technology to capabilities — what can they do and how they can be applied to offsetting the threat in 2026 and beyond. U.S. Space Force Photos / Van De Ha.

sending commands to a satellite and getting telemetry back from a satellite; in others, it's the commander of a team giving commands to a team."

Another focus for the SSIO mission is the transition to resilient space systems. Resilience is the ability to operate through a contested environment. Resilience can be accomplished by increasing the robustness of the design — cyber resilience, for example — or through proliferation.

"We're supporting the transition from programs that are stove-piped, high-value assets to having much more integrated and proliferated systems," Leon said. "The legacy systems for missile warning for OPIR (Overhead Persistent Infrared) are the SBIRS (Space Based InfraRed System) and the Next Generation GEO system and the Next Generation Polar System, all with very capable satellites. These assets are considered to be 'high value assets' that could be vulnerable in a contested environment. If any one satellite is lost, there would be a significant degradation in system performance.

"The future system for missile warning/missile tracking is an SDA (Space Development Agency) system for proliferated Low Earth Orbit combined with an SSC system at Medium Earth Orbit, and the combination of the two will provide tremendous resilience. If you lose one satellite or a few satellites in the system, the system will still be able to operate effectively.

"Spacecraft are still expensive to launch; there is a tradeoff — 'Do you build more smaller satellites or fewer large satellites?' The value proposition of the past was to make them as big and as capable as possible, but given the current threat environment, proliferated systems make a lot of sense."

SSC's Front Door is the first point of contact for early-stage start-ups and innovative commercial enterprises that want to connect with the USSF, but may be unsure how, Childers said.

"Front Door can help guide companies to better understand how and where their idea, product or service may be leveraged," Childers said. "We can encourage these companies in the right direction and help them with 'next steps.'"

Front Door also is now a part of SSC's *Commercial Space Office* (COMSO), which was created this year to deliver effective, efficient and resilient capabilities to the warfighter quickly and affordably through partnering with the commercial space industry. In addition to Front Door, it is comprised of the *Commercial Satellite Communications Office* (CSCO), the *Space Domain Awareness Marketplace*, *SpaceWERX* and the *Commercial Augmented Space Reserve* (CASR) program.

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SECURING CRITICAL COMMUNICATIONS IN HOSTILE ENVIRONMENTS

The Imperative of RF Interference (RFI) cancellation

Author: Alvaro Sanchez, Chief Executive Officer, INTEGRASYS

*In today's fast-paced
and ever-changing
global landscape,
the imperative of
establishing resilient
communication infrastructures*

has transcended from being merely a priority — it has become an indispensable and mandatory requirement for militaries, agencies and governments.

Recent conflicts that have unfolded across the globe serve as stark and sobering reminders of the pivotal role secure and interference-free communication plays in determining the success of critical operations as well as ensuring the safety of those involved. In an era where information flow often dictates the outcomes of significant events, the consequences of a communication breakdown caused by **Radio Frequency (RF) Interference** can reverberate profoundly and extend far beyond immediate circumstances.

There are numerous, multifaceted challenges posed by RF interference in hostile environments and such reinforces the vital importance of real-time interference cancellation technologies as well as the pursuit of resilient

communication infrastructures to fortify mission assurance and critical communications.

The Challenge of RF Interference in Hostile Environments

RF interference stands as a formidable adversary within hostile environments and has the potential to disrupt critical communication channels in ways that extend far beyond just mere inconvenience. The consequences can be severe and far-reaching, encompassing everything from data corruption to signal loss and, in the direst scenarios, mission failure.



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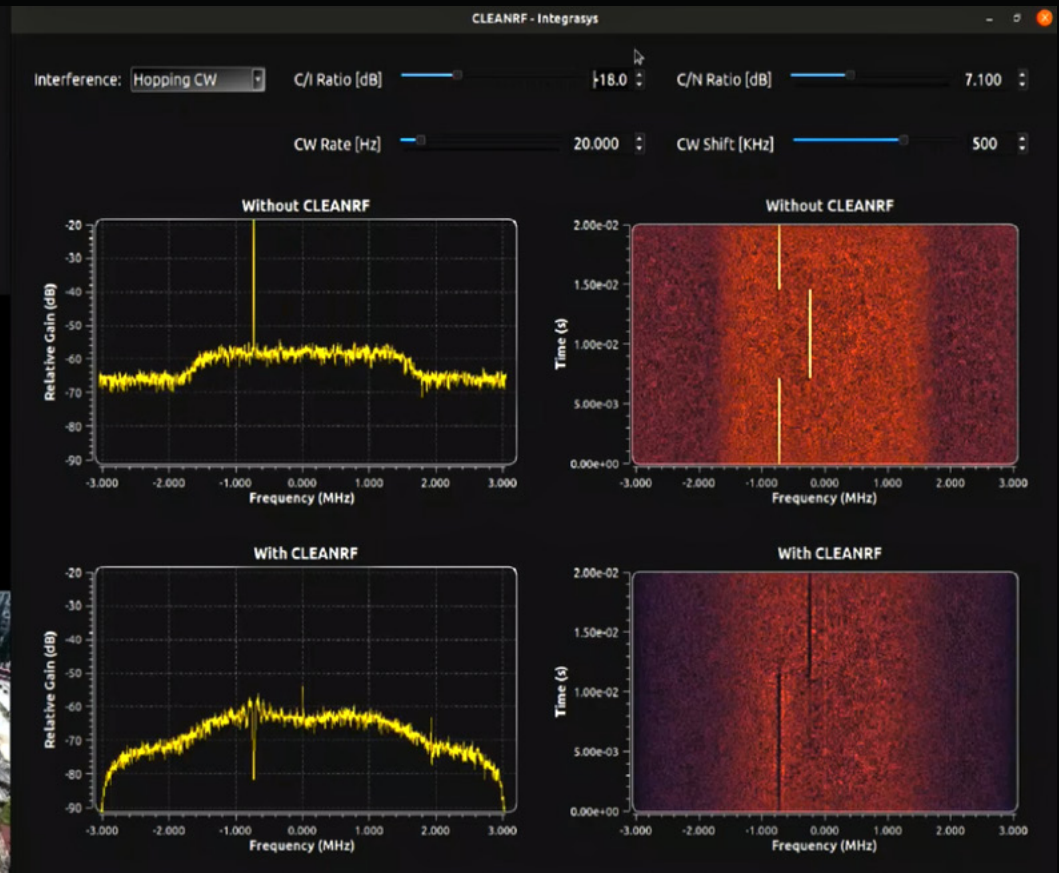
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In military operations, where split-second decisions and precise coordination are the keys to success, the disruption of communication channels can lead to chaos on the battlefield, endangering the lives of personnel and the overall success of the mission.

Similarly, in the realm of government functions and emergency response efforts, RF interference can have devastating implications. During times of crisis, reliable communication is essential for disseminating critical information, coordinating resources and making informed decisions.

In these contexts, any disruption or compromise in communication networks can have cascading consequences, potentially impeding the ability to respond effectively to threats, natural or man-made disasters, or other emergencies.

The Ukraine-Russia conflict serves as a poignant example of the real-world impact of RF interference on mission assurance and critical communications. Both sides in this protracted conflict rely heavily on secure communication networks to coordinate military operations, gather intelligence and disseminate orders.

In such a dynamic and adversarial environment, the ability to communicate securely and without interference is a strategic advantage and is truly a matter of life and death. Any breakdown in these networks, whether due to electronic warfare tactics or other forms of RF interference, can tip the balance of power and influence the outcome of events in critically significant ways.

Combatting RF Interference Challenges with Cancelling Technologies

To address these formidable challenges posed by RF interference within hostile environments, innovative cancelling techniques and technologies have emerged as indispensable tools in the arsenal of mission assurance and critical communications.

These technologies are designed to detect and mitigate interference in real time, ensuring that communication remains uninterrupted and secure, even in the face of adversarial tactics or unintentional interference.

Real-time interference cancellation technologies analyze incoming signals, identifying interference patterns and neutralizing disruptive elements. This capability is paramount in scenarios where swift decisions and precise



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Military operations using CleanRF.

CleanRF's ability to cancel interference in real time ensures that mission assurance is upheld, and critical communications proceed smoothly and securely in the face of ever-evolving electronic threats.

Conclusion

The imperative of securing critical communications is not just a priority — it is an absolute necessity. Advanced solutions exemplify the kind of technology that can help governments, defense agencies, and organizations achieve this goal.

By canceling interference in real time, these technologies provide a layer of resilience to communication infrastructure,

coordination are imperative, such as military operations or emergency response efforts. These technologies provide a layer of resilience to communication infrastructure, safeguarding against the risk of data corruption, signal loss, and mission failure.

Among the innovative solutions available, ***CleanRF*** by INTEGRASYS stands out as the most efficient RFI canceller in the market. CleanRF employs advanced algorithms and cutting-edge signal processing techniques to pinpoint and eliminate interference with unrivaled precision.

In an era where secure, interference-free communication is non-negotiable, CleanRF offers governments, defense agencies, and organizations a reliable and robust solution to counteract RF interference effectively.

safeguarding against the risk of data corruption, signal loss as well as mission failure.

In an interconnected world where the flow of information is paramount, these solutions ensure that critical communications proceed smoothly and securely, even in the most challenging and dynamic circumstances.

www.integrasys-space.com/cleanrf-interference-cancelation-system

Author Alvaro Sanchez is the Chief Executive Officer at INTEGRASYS



Alvaro Sanchez





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U.S. ARMY: HADES MODERNIZES AERIAL MILITARY INTEL

Author: Staff Sergeant Jacob Kohrs, Army News Service



The Airborne Reconnaissance and Electronic Warfare System (ARES) is an aerial-intelligence, surveillance and reconnaissance (A-ISR) aircraft that Army is contracting as a service to test which airframes will work best for the mission requirements. It is part of the High Accuracy Detection and Exploitation System, or HADES program and currently deployed in the Indo-Pacific Command's Area of Operation.

Photo is courtesy of the U.S. Army.

During the Civil War, the Army used aerial technology, such as balloons, kites and pigeons, to gather intelligence and to survey the battlefield giving ground commanders the ability to make informed decisions on how to maneuver into advantageous positions.

Today, the Army's ***aerial-intelligence, surveillance and reconnaissance, or A-ISR***, community still has the same mission of providing timely, relevant, and accurate intelligence to tactical, operational, and strategic commanders, but it uses airplanes instead of balloons and birds. Yet, the current fleet of more than 60 ISR aircraft are remnants of the Cold War.

Originally built for Cold War and counter-terrorism threats, current and future multidomain operations, as well as geographical and geopolitical changes create challenges with the old fleet. Threats to assured communications are increasing, resulting in a need to design a concept and build material solutions for likely scenarios that do not rely on access to allied military installations to continue the mission.

The solution to these challenges is the ***High Accuracy Detection and Exploitation System, or HADES.***

"It will possess speed, range, endurance-at-range, and altitude for deep sensing, all culminating in its ability to overcome the physical challenges encountered by legacy airborne ISR aircraft, without sacrificing the unique quality and capability of collection that airborne ISR provides to Army and joint force commanders around the world. With exceptional payload capacity, it will offer convergence options that occur on or off-board the aircraft to cover assured, denied, or degraded communication environments." — Lt. Col. Matt Paladino, ISR Task Force aerial chief for the Army Military Intelligence Staff

To help bridge the gap between decommissioning the old fleet and commissioning the new fleet, the ISR Task Force is using ***Aerial Technology Demonstrators, or ATD.*** ATDs are aircraft that Army is contracting as a service to test which airframes will work best for the mission requirements.

The ISR Task Force started by looking at all joint, interagency and allies' ISR programs and compared them to the Army's priorities. When the Task Force was finished, they decided on a large-cab business jet. This gave the Army the ability to group all the sensors on one plane with the ability to upgrade and/or add to those systems without losing performance.

jet to see how that was employed, and we put it in the [Indo-Pacific Command's Area of Operation] to see what it could do," Magee said. "All of it was good at the end of the day. It's informing the HADES POR, program of record, for what we need in the end."

During the first ATD tests, the ISR Task Force learned that the jets had longer flight times than the turboprops, which only had a five-to-six-hour flight time. The ATDs had a faster deployment capability and could travel anywhere in the world within 24 hours. They also flew higher and faster while allowing deeper sensor penetration.

"When you sync all of those together, you then build a program that is now contributing to the joint fight rather than just the Army's fight," Magee said.

After ARTEMIS's success in the Pacific, it was moved to the [U.S. Army Europe and Africa](#). Here ARTEMIS showed its value.

"ARTEMIS demonstrated both the operational and financial value of the Army's future ISR concept, providing cross-combatant command support for

its relatively new four-star theater commander with responsibilities that span tremendous geography across two continents," Paladino said. "No longer will the Army require multiple bed-down locations to access regional hotspots. A single aircraft with the speed and range of HADES can provide thousands of miles of reach from a single bed-down site, forward deployed."

In 2022, an additional ATD, **Airborne Reconnaissance and Electronic Warfare System** or **ARES**, was deployed to the **INDO-PACOM Area of Responsibility**. This aircraft was larger and closer to the HADES project's long-term goals.

"ARES revolutionized the Army's contribution to a joint fight in that theater," Paladino said. "ARES provides the [U.S. Army Pacific Command] an organic deep sensing capability with relevant collection capability for the modern battlefield. Adding additional altitude and persistence over ARTEMIS, ARES is competing nearly every day with the nation's most advanced adversaries. Just like with ARTEMIS, Army Soldiers operating in concert with the defense industry are providing this support to both Army and joint force commanders today."

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The Airborne Reconnaissance and Target Exploitation Multi-mission System (ARTEMIS) is an aerial-intelligence, surveillance and reconnaissance (A-ISR) aircraft that Army is contracting as a service to test which airframes will work best for the mission requirements. It is part of the High Accuracy Detection and Exploitation System, or HADES program and currently deployed in the European and African Command's Area of Operation. Photo is courtesy of the U.S. Army.



Outside of the physical aspects of the jets being able to fly faster, longer and higher, there has been some changes to the internal configurations the HADES project has built compared to the old turboprops.

"The one thing that I'm noticing is ... the ability to add different capabilities if necessary and being able to tailor them to whatever theaters we're in, which isn't really something we're able to do with the older platform. Some of the signals we are going after on an unclassified level in specific theaters, we weren't able to detect with the older platform.



With these newer [platforms], just being able to go after those combatant commanders' top priorities has been one of the biggest game changers: especially going from a tactical focus to a more strategic focus."

— **Chief Warrant Officer 2 Amber Cornelius**, the ARES processing, exploitation and dissemination officer in charge with the **104th Military Intelligence Company**; Processing, Exploitation and Dissemination Battalion, **116th Military Intelligence Brigade**.

With the diversity of the newer platforms, the PED Battalion had to change up their operations a little bit because going from a tactical focus to a strategic focus, the authority piece is different. Yet, it has allowed the Army to pick up the sensitive reconnaissance operations.



Now the PED is supporting the direct combatant commanders on the ground as well as gathering for other government agencies, such as the **National Security Agency**, Cornelius said.

Overall, the new ATDs have added capabilities that have helped make Army intelligence even more accurate.

“With the ability to fly higher, farther and faster in the various target areas that we’re looking at, we get vast amounts of data every mission that we fly. It is vastly different because we are able to stay in an area for a longer dwell time. These capabilities allow us to provide things like pattern-of-life; it allows us to see up and down time locations, potential troop movement or anything else you can think of.” As for building this fleet after the demonstration phase: *“Being able to relay that information is mind-boggling to me.”* — **Sergeant Bryden Jones**, a mission manager for ARES with the **104th Military Intelligence Company**, PED Battalion, 116th Military Intelligence Brigade

ARTEMIS and ARES have the ability to see these things and push the information out to commanders in real time. Having instant and relevant intelligence, Sergeant Jones added.

The Army plans to make the first purchases in fiscal year 2024 and expects the first of the new aircraft to be delivered within 2027, Magee said.

The plan is to have at least 14 aircrafts in as few geographic locations as possible to improve on training and force generation mission command, instead of the multiple locations where the turboprops are stationed now. By 2035, the PED unit will be fully equipped with Soldiers fully controlling operations.

As the Army builds the Army of 2030 by developing new equipment and adopting new concepts on how to fight the nation’s wars, the HADES modernization efforts will take the Army into the new decade.

“This modernization effort, going from our legacy platforms to our current modern platforms, is absolutely a step in the right direction,” Sergeant Jones said. *“We have stepped away from the counterterrorism operations and started looking at a bigger, wider, more strategic objectives in order to effectively provide intelligence to the people that need the information to win the nation’s wars. I never in my wildest dreams thought I would be a part of anything like this.”*

LIGHT

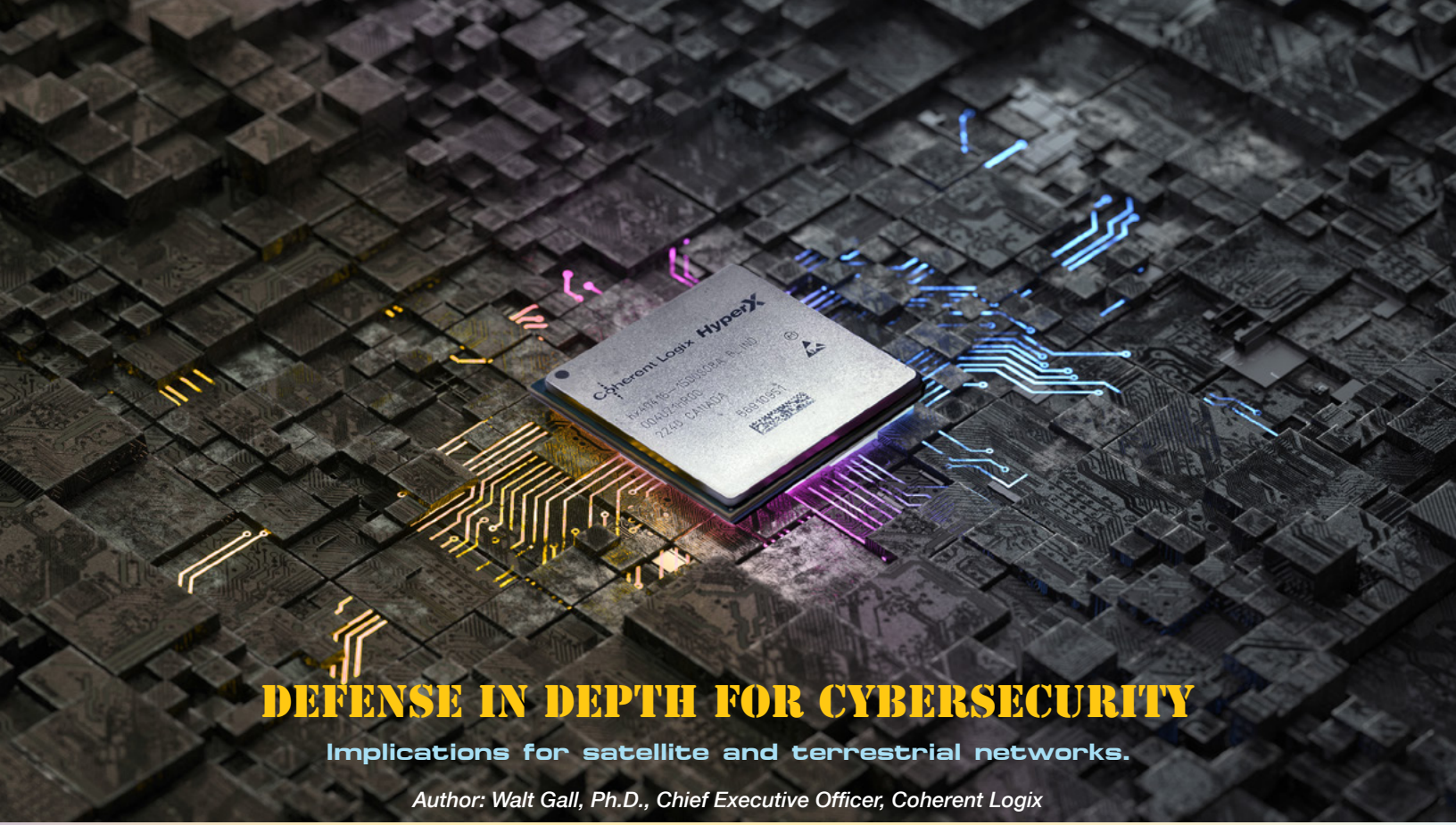


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The bee hummingbird is the smallest living bird. Females weight **2.6 g (0.092 oz)** and are 6.1 cm (2+3/8 in) long, and are slightly larger than males, which have an average weight of **1.95 g (0.069 oz)** and length of 5.5 cm (2+1/8 in). Like all hummingbirds, it is a swift, strong flier.





DEFENSE IN DEPTH FOR CYBERSECURITY

Implications for satellite and terrestrial networks.

Author: Walt Gall, Ph.D., Chief Executive Officer, Coherent Logix

Traditional perimeter and edge-based cybersecurity deployment architectures have long been the bedrock of digital defense strategies. These systems have been effective in creating a protective boundary around an organization's network, akin to building walls and moats around a castle to keep out intruders. However, the landscape of cyber threats has evolved significantly over the years, and just like walls in the face of modern warfare, these traditional approaches are struggling to keep up.

Cyber threats are becoming increasingly sophisticated and adaptive in today's digital age. Hackers and malicious actors continually devise new techniques and tools to breach network defenses. From phishing attacks to ***advanced persistent threats (APTs)***, the arsenal of cyber threats has expanded exponentially.

Moreover, the threat surface has expanded well beyond the coverage of perimeter-based cybersecurity and will only continue to expand with the proliferation of connected devices, making it even more challenging to protect against intrusions.

Adding to this complexity is the aging infrastructure of many large connected industrial systems. These systems, which are the backbone of critical sectors

such as energy, manufacturing, and transportation, were designed in an era when cybersecurity was not a primary concern.

As a result, they often lack the necessary security features to withstand modern cyber threats. Their outdated components and protocols make them vulnerable targets for attackers looking to exploit weaknesses in these systems.

A defense-in-depth approach is required for today's threat landscape. Instead of relying solely on perimeter defenses, this approach advocates multiple layers of security measures throughout the network architecture. Traditional firewalls, intrusion detection systems, robust authentication mechanisms, encryption, continuous monitoring, and incident response plans are still required, but they are no longer sufficient to meet the threat.

In the context of satellite and terrestrial systems, this shift requires a fundamental rethink of how these systems are designed and constructed. It means integrating security features from the ground up rather than tacking them on as an afterthought. It involves considering security implications at every stage of system development, from hardware and software design to data transmission and storage.



Coherent cyber network security.

The Challenge

The contemporary cybersecurity landscape is marked by a daunting set of challenges, primarily driven by the sheer scale of distributed networked endpoints, users, systems, cloud workloads, and data communications that require protection. This complexity is further compounded by the relentless evolution of multi-layered cyberattacks. Consequently, there is an urgent need for a fresh and adaptive approach to cybersecurity that can effectively contend with these rapidly changing dynamics.

One significant catalyst for this shift has been the post-COVID-19 era, which witnessed a seismic transformation in organizations' operations. Remote work and mobility have become the norm, affecting not only commercial enterprises but also government and military entities. This fundamental change has expanded the attack surface exponentially. With employees accessing corporate networks and sensitive data from various locations and devices, the traditional security perimeter has become porous and difficult to defend.

Consider the scenario where a trusted employee's laptop becomes infected with ransomware while working remotely or on the road. Initially, this infection may go unnoticed, lying dormant within the device. However, when the employee eventually returns to the office and

connects to the corporate network, they inadvertently bring the infection behind the organization's firewall. Suddenly, the organization finds itself penetrated and paralyzed, with critical data encrypted and inaccessible.

Defense In Depth

The concept of defense in depth is a strategy deeply ingrained in the mindset of any seasoned warfighter. It draws upon a fundamental principle of warfare: to protect and secure one's assets effectively, you must layer your defenses, enable these layers to support one another, and plan for resilience that extends beyond the initial breach.

This approach recognizes the inherent limitations of relying on a single defensive measure and underscores the importance of adopting a multi-layered, holistic strategy to ensure robust and comprehensive protection. In the realm of cybersecurity, this strategy is equally critical. Relying solely on a single security measure, such as a perimeter firewall, is akin to leaving a single wall to protect a castle. It is insufficient to provide adequate protection in today's dynamic threat landscape. Instead, the defense in depth approach advocates for a multifaceted defense system that combines various security controls and defensive technologies.



In contrast to traditional cybersecurity approaches that primarily focus on measures like perimeter firewalls, intrusion detection systems, encryption, access controls, and regular security audits, the defense in depth approach takes a more comprehensive and proactive stance. It extends protection beyond the network perimeter and strongly emphasizes safeguarding each individual asset within the organization.

Resilience is achieved as/when these new lines of defense take up the load and ideally confound the adversary with unexpected challenges.

Defense in depth involves augmenting existing security approaches by deploying specialized security software for each asset, adding in-built remediation capabilities to enable continued operations in the presence of a threat or in a post-threat environment, and establishing a framework for cooperative defense across assets. This approach addresses the reality of threat surface expansion, and proactively equips our technology assets to survive and respond.

Inevitably, even the most robust defenses may be breached at some point. When this occurs, our technology assets must have pre-programmed recovery or contingency operations in place to ensure that their mission can continue, largely uncompromised.

Implications For Satellite Network Design

The implications for satellite network design when implementing a defense in depth strategy are far-reaching and reflective of the evolving nature of cybersecurity threats. This strategy calls for integrating robust cybersecurity and attack remediation functions within each satellite network component, including both ground terminals and satellites themselves.

First and foremost, implementing cybersecurity functions within the satellite's internal network architecture is essential. These cybersecurity functions are best integrated as additional software within the networking subsystem with coverage for both up/downlink and satellite-to-satellite communications.

Conclusion

Some existing satellite systems will have processing power and resource limitations that preclude this, but this capability should become a standard requirement in new builds. In such cases, dedicated additional processors may be necessary to handle the demands of cybersecurity functions, ensuring that security remains an integral part of the network's design.

In addition to cybersecurity measures, the strategy emphasizes the importance of attack remediation logic. The location of this logic may vary depending on the approach, and it can be integrated into the network subsystem or be a core function of the satellite's overall operation. Regardless of its placement, the effectiveness of attack remediation logic is contingent on being onboard the satellite and built into the ground terminals, allowing for a swift response to detected threats.

A significant challenge in implementing a defense in depth strategy for satellite networks is the rapidly evolving state of cybersecurity. New threats and vulnerabilities emerge daily, necessitating continuous improvements to defensive systems. This involves both incorporating the latest threat signatures and enhancing and improving detection capabilities to adapt to the evolving threat surface.

To address this challenge effectively, the software responsible for cybersecurity must run on fully reprogrammable and reconfigurable processors optimized for high-speed processing of streaming data. Given the rate and type of changes, executing cybersecurity in an ASIC or even an FPGA will be impractical.

While implementing these changes may be difficult or even impossible for existing satellite fleets, they should be considered baseline requirements for new satellite launches. Fortunately, there is good news on the horizon. Software-defined satellites based on reprogrammable and reconfigurable processors are becoming increasingly common.

This trend is driven by the need to continuously evolve capabilities, extend mission lifetimes, and to adapt to changing mission requirements. In such software-defined satellite architectures, cybersecurity measures can be treated as just another application in the satellite's software ecosystem, running side-by-side with existing network and control software.

This adaptability and agility offer a promising path forward for enhancing the security of satellite networks in the face of evolving cybersecurity challenges.

The concept of defense in depth, inspired by military strategies, underscores the importance of layering defenses, mutual support among these layers, and planning for resilience beyond the initial breach. In the context of satellite network design, this strategy demands a holistic approach to security.

Cybersecurity functions must be integrated at various levels, including ground terminals and onboard satellites. It's essential to cover all communication channels, encompassing uplink and downlink communications and satellite-to-satellite exchanges. Attack remediation logic is critical and should be onboard for swift threat response.

However, a significant challenge arises from the dynamic nature of cybersecurity threats. Defensive systems must continuously adapt and update, incorporating the latest threat signatures and enhanced detection capabilities. Reprogrammable and reconfigurable processors, rather than fixed ASICs or FPGAs, are essential for this adaptability.

While implementing these changes may be challenging for existing satellite fleets, they are becoming baseline requirements for new satellite launches. The advent of software-defined satellites, based on reprogrammable processors, offers a promising solution. In these architectures, cybersecurity measures can be seamlessly integrated as one more application, running alongside existing software.

This adaptability ensures that satellite networks can stay ahead of evolving threats and continue to provide reliable and secure communication services in our increasingly interconnected world.

www.coherentlogix.com



Author Walt Gall, Ph.D., is the Chief Executive Officer at Coherent Logix.



Walt Gall



ISR PRECISION — FROM SPACE

How satellites are feeding algorithms to accelerate decisions

Author: Rory Welch, Vice President, International Government Services, Intelsat

The cornerstone of today's multi-domain warfare concept is the ability to collect and use Intelligence, Surveillance, and Reconnaissance (ISR) data quickly and efficiently to accelerate decision capability.

While modern militaries have become incredibly adept at generating data, and are making leaps and bounds in their ability to process it, there are still significant limitations in the end-to-end process of turning data into actionable information, including the actual transmission of data.

Satellite networking has been a trusted method of connecting military operators in remote locations and austere environments, and now nexgen advancements are removing one of the key bottlenecks to faster decision capability.

The Challenge

Military and intelligence agencies around the world have placed a high priority on improving their ability to gather and analyze critical data to enhance situational awareness, improve command and control capabilities, and expedite the decision-making process.

To accomplish the aforementioned tasks, the defence industry has progressed along the data value chain with several disruptive technologies that, individually, have created bespoke solutions. Rapid advancements were made in the ability to collect data from drones and satellites deploying systems, such as **Gorgon Stare**, that is able to collect several gigabytes of data a minute.



An MQ-9 Reaper with Gorgon Stare prior to a sortie at Kandahar Airfield, Afghanistan. Photo is courtesy of [U.S. Air Forces Central](#).

Then the focus became advancing big data and analytics functions to process and exploit the massive amounts of resulting information. This led to prioritization and rapid development of AI and machine learning functions to help convert this information into valuable insights.

Collectively, these capabilities have vastly accelerated the ability to convert data into actionable intelligence, however, the heavy lifting is still largely done at the data center level. The next step in accelerating the full ISR ecosystem needs to be the data transport that feeds the algorithms and shares the resulting insights with operators at the network edge.

Information Dissemination Redefining the Network Edge

In spite of major advancements in data processing, the ability to exploit ISR data at the network edge is still quite limited, relative to the data collection capacity.

While advancements in edge processing are enabling specialized hardware to run algorithms at the edge, limitations in **Size, Weight and Power (SWaP)** in remote, austere environments will necessitate a balance between what can be done at the edge and what must be done at the data center level.

In other words, the facilities with the processing power to handle the largest algorithms and reference data sets (*that potentially offer the most valuable insights*) may be time zones or even continents away from the operator in the field. Getting the “correct” answer is only valuable if such is obtained before the adversaries.

Satellite Communications Enabling ISR

Satellite communications infrastructure plays a critical role in enabling the seamless collection and transmission of ISR data by drones and other platforms for *Beyond Line of Sight* (BLOS) connectivity.

Satellites serve as a vital link in the ISR chain, facilitating the timely and secure transmission of information from remote areas to decision-makers located elsewhere. Not surprisingly, the satellite industry has undergone several technical innovations to help support the data value chain as well.

Today's commercial satellite providers are integrating software-defined networking and SD-WAN to enable dynamic and efficient resource allocation, multi-orbit satellite constellations that expand coverage and reduce latency, and high-throughput satellites that deliver the data speeds and capacity necessary to support ISR data transmission.

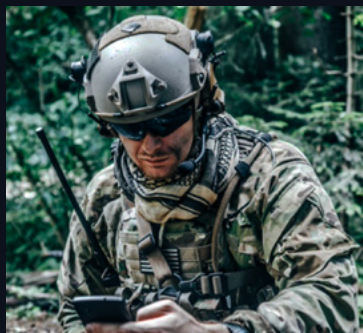
The Intelsat high-throughput satellites deliver higher power signals for sensor data, video transmission, and communication relay which allows higher COTM data rates that use a smaller antenna.

At the edge, a host of new smart edge devices, including flat panel antennas, edge computing, and software-defined modems, enable the extension of 5G networking to the user, and local deployment of high-value applications.

Video compression technology has emerged as a game-changer in expediting the processing and analysis of ISR data. By compressing image and video feeds, the size of the files transmitted through satellite communications networks can be reduced significantly, ensuring faster delivery to locations with various analytical options

for image analysis and exploitation.

Together, these network advancements are accelerating both the flow of data to the algorithms and the processed insights



"We must become data-centric and exploit the data that we collect."

General Sir Patrick Sanders Commander Strategic Command, Ministry of Defence — Data Strategy for Defence

"So, a large part of our job is figuring out the ways to manage that data, so that the data that's effective for decision making is front and center for decision-makers when they need it."

Craig Martell, U.S. DoD Chief Digital and Artificial Intelligence Officer — 2022 DODIIS Conference

to the operator in the field. Combining these smart edge devices with advanced, multi-orbit, high throughput satellite networks, providers such as Intelsat are increasing their ability to disseminate critical intel to the warfighter, with greater speed, resilience, and security. Ultimately, this enables data analysts to better use video content, and provide insights to help operators at the network edge

make better, more informed decisions faster.

Additionally, satellite transmission delivers the data via a private network offering continuous vulnerability scanning,

intrusion detection, and encryption all while ensuring your data never touches the public network.

Conclusion

Real-time data collection and transmission enable swift and accurate responses to emerging threats or changing circumstances. ISR capabilities, supported by advanced satellite communications infrastructure and video compression technology, are indispensable in enhancing situational awareness, improving command and control capabilities, and expediting the decision-making processes.

The fusion of these elements empowers military, security, and emergency response personnel with real-time insights, enabling them

to respond effectively to evolving operational scenarios. By leveraging the power of these technologies, decision-makers can reduce response times, enhance operational effectiveness, and increase the safety and security of personnel on the ground.

As technology continues to advance, the synergy between ISR, satellite communications, and smart edge devices will undoubtedly play a pivotal role in achieving superior outcomes and ensuring mission success in an increasingly complex and interconnected world.

www.intelsat.com/governments-ngos

Author Rory Welch is the Vice President of International Government Services at Intelsat



Rory Welch

APPLYING COMBINED SPACE ASSETS + DATA CAPABILITIES

Space Systems Command (SSC) Surveillance and Tracking team participates in a real-world, multi-national exercise

Author: Lisa Sadders, Space Systems Command

RESOLUTE SENTINEL 23

A small team of Surveillance, Reconnaissance and Tracking (SRT) Guardians from [Space Systems Command](#) (SSC) recently participated in a real-world multi-national training exercise in South America that included some very real-life operations.



The SRT team was invited by the **U. S. Space Command's Joint Task Force-Space Defense Commercial Operations Cell (JCO)** to Lima, Peru, to take part in **RESOLUTE SENTINEL 23 (RS23)**, a **U.S. Southern Command** multi-national exercise, held earlier this year at the [Centro Nacional de Operaciones de Imagenes Satelitales \(CNOIS\)](#) from June 28th through July 8th.



Resolute Sentinel is a **12th Air Force** (Air Force Southern)-led **U.S. Southern Command** (SOUTHCOM) exercise that was first held in 2021. Resolute Sentinel evolved out of the longstanding New Horizons and Beyond the Horizons, annual joint humanitarian assistance exercises in Latin America or the Caribbean.

Resolute Sentinel provides joint training and improved readiness of U.S. and partner nation civil engineers, medical professionals and support personnel through humanitarian assistance activities. Resolute Sentinel 23 was held in Peru and integrated combat interoperability and disaster response training, in addition to medical exchanges, training and aid and construction projects.

"I am overwhelmed by the professionalism of the combined joint space team," said **Lt. Col. Jonathan Whitaker**, USSOUTHCOM Director of Space Forces. "Our hosts in Peru and Colombia gave us a worldclass opportunity to test operational aspects of the future Space Forces Southern Component Field Command. We exceeded every goal for this exercise."

The four-member SRT team from SSC was joined by their counterparts from six allied nations — Peru, Colombia, Chile, Ecuador, Brazil, and the United Kingdom — for a total of 28 people participating, said **Lt. McKenna G. Medina**, SSC's SRT site lead.

SSC's SRT team used the exercise as a "sandbox" to test their ability to deliver useful **Operational Planning Products (OPPs)** to unified combatant command users at relevant timelines.

Currently, OPPs are commercially developed products that answer operational questions generated by the combatant commands. These products can be used to identify environments, such as maritime awareness, illegal fishing/resource extraction, or to highlight humanitarian issues.

“The best part about Operational Planning Products is that they’re non-classified,” Medina said. “They give users the flexibility to share commercial data with international partners.”

The SSC team contributed to two, real-world operations during the exercise. First, the team identified and geo-located a vessel suspected of illegally fishing in Peruvian waters. This led to SOUTHCOM tasking a **USAF C-130** to over-fly the vessel and enabled **Peruvian Coast Guard** members to train on locating and identifying potential illegal fishing in their waters, said **Lt. Col. Vinny Pande**, SSC’s persistent tactical surveillance branch chief and a member of SSC’s SRT team. The illegal fishing OPP included historical tracks of potentially illegal fishing boats: ships that had turned off their radar and gone “dark,” among other details, Medina said.

Second, the team supported disaster planning by imaging a volcano that showed signs of a impending eruption in Columbia. SRT delivered commercial SAR-sensing products (a measure of radio frequency) to the Colombian government in support of humanitarian response planning. The team provided data from space showing status conditions of the **Nevado del Ruiz volcano** in Colombia compared side-by-side to data from a Peruvian volcano that had recently erupted, Medina said.

“This demonstrates real-world scenarios of space assets and commercial data capabilities to defend and protect land, sea and orbital,” Medina said. “Some of these countries are in the initial phases of using space to help them out. Helping them recognize that maybe we could was really cool.”

Capt. Benjamin L. Berezin, SSC deputy branch chief and SRT team member, added that it was eye-opening to see partner nation imagery applications as it gave the team’s analysts new avenues to work with partners.

The multi-national aspect of the exercise was ideal for validating that the OPPs could be released to partner nations in support of SOUTHCOM’s objectives, Medina said. Berezin noted that the facilities were state-of-the-art and allowed the SSC team to showcase their capabilities.



The CNOIS itself was built in the shape of the cupola, the **European Space Agency**-built observatory module of the **International Space Station**.

“I thought that was really cool and how we’re helping to provide that window into commercial space for the other nations,” Berezin said.

“They welcomed us with open arms,” Medina said. “It was really just a melting pot of everyone’s space expertise and gave us a good understanding of the use cases that we may support in the future.”

“This effort truly showcases the benefit of commercial technology to Combatant Commands and partner nations,” said **Col. Minpo “Po” Shiu**, Director, SSC’s Warfighter Integration Office. “As the news of SRT’s success spreads, we expect all Combatant Commands to seek out this capability. INDOPACOM has already expressed an interest to be the focus AOR (Area of Responsibility) for the next SRT effort.”

The SRT team, part of SSC’s Space Sensing program executive office, is now working on developing a six-month pilot program to assess **AFRICOM**’s needs for commercial sensing and analytics products.

“This is designed to help the combatant commands with their geographic priorities,” Pande said.

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SPACE SITUATIONAL AWARENESS

Creating a safer space for satellites

Author: Editorial team, StratView Research



When we look back half a century, the Soviet Union and the United States were the only players operating within the realm of space exploration. Fast forward to the present day and we can see more than 80 nations making efforts to enter space.

As exploration continues, the world's reliance on space is growing ever more pronounced, as it has yielded a plethora of innovations, including breakthroughs in telecommunications and critical applications for applications in national security. Space technology has also found its way into everyday life.

By the second quarter of 2023, there were >11,000 individual satellites orbiting the Earth that have been launched since the international foray into space started — however, out of this number, >3000 (according to the [Union of Concerned Scientists](#) - UCS) are inactive, useless hunk of metals that are posing risks to space assets as well as human life.

The sheer volume of the objects in space, coupled with the increasing congestion in space, has sparked the urgency of developing and maintaining reliable *Space Situational Awareness (SSA)* — or *Space Domain Awareness (SDA)* — capabilities.

What Is SSA?

Space Situational Awareness involves tracking and maintaining complete data on all space objects, understanding their activities, monitoring space weather events, identifying potential threats, and more.

SSA needs are growing as nations continue to develop and launch more objects into space. *(Please see Figure 1 on the following article page.)*

This surveillance includes active space objects as well as other types of debris. The role of SSA behind the collection all this crucial information cannot be ignored, as the gathering of this important data from space is an exceptionally challenging task.

Objects in the Space Force Satellite Catalog (2014-2022)

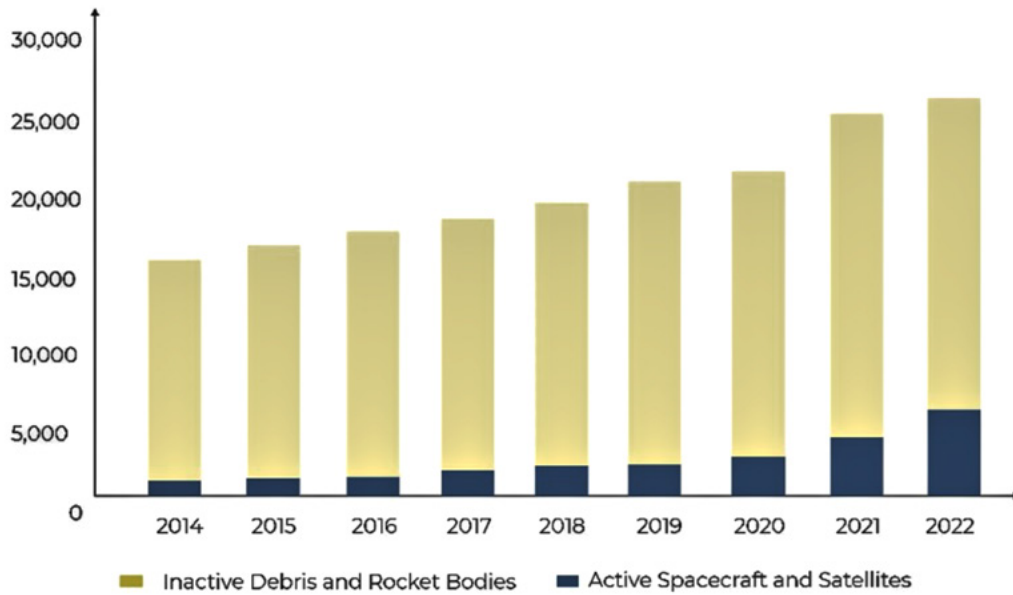


Figure 1. SSA capabilities and solutions.

Source - GAO Analysis of Space Force Data



Increased Space Traffic and Congestion

Global dependency on space has been growing rapidly over the years. Over the past 5 years, the number of active satellites has seen a meteoric rise from just over 2,000 in 2018 to nearly 7,000 in 2023. (See Figure 2 on the following article page.)

When it comes to space traffic, the largest number of satellites launched were by the U.S., followed by China, UK, and Russia (acc. to the data till 2022). The U.S. holds the top position in the field of space exploration, as

SSA requires a network of globally distributed radars, sensors and many other device types.

Ground-based radars consist of at least one transmitter that emits radio waves at a particular frequency and are measured by the receiver, which calculates the location of the targeted object.

Advanced ground-based radars can track many objects simultaneously, detecting their motion, shape, and so on. Due to their complexity, these radars are quite costly and their size is also a disadvantage.

Optical telescopes are also widely used for SSA purposes. These telescopes collect light or emitted electromagnetic radiation or reflection from objects in space using lenses, mirrors, or both.

They can cover a large area easily and quickly — specifically, they can track objects above 5,000 km. in altitude. To provide high-resolution images, these telescopes require specific lighting conditions and clear skies.

Different types of sensors are also used for SSA purposes. These sensors detect radio frequencies or other signals from the satellites and this data enables them to accurately measure the distance or range of the objects.

The use of lasers for SSA is another option as they are able to precisely measure the distance of a satellite.

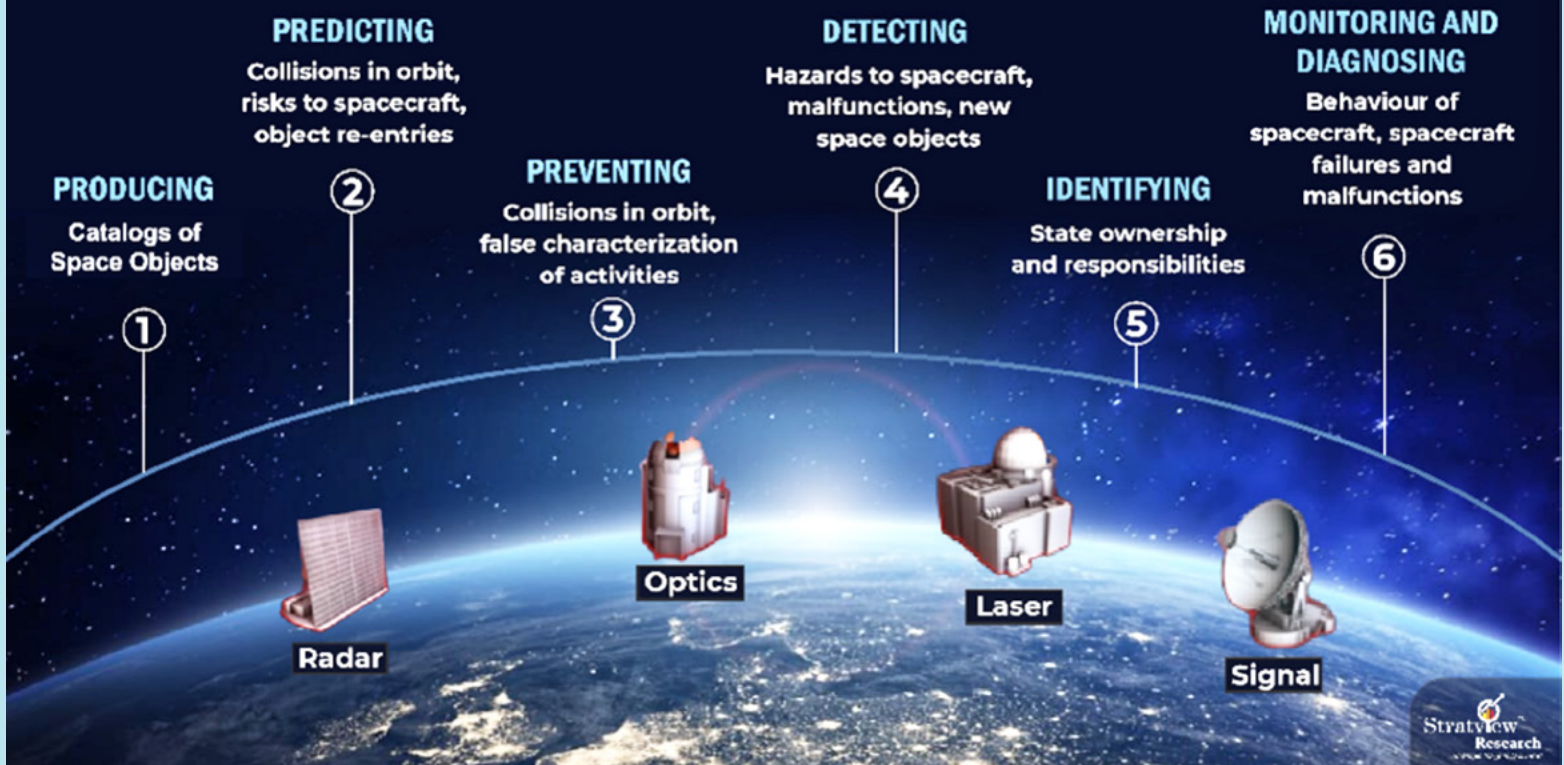
evidenced by its extensive *military / agency / government (MAG)* and commercial satellite launches, as well as the nation's significant influence over key, space technology companies.

In numbers, through the end of 2022, the U.S. was at the forefront, with more than half of the total satellite fleet.

Countries	No. of Satellites
United States	4511
China	586
United Kingdom	561
Russia	177
India	62
Canada	56
Germany	48
Luxembourg	45
Argentina	38
Israel	27

Space Situational Awareness Capabilities

Figure 2. Objects in the USSF satellite catalog.



No doubt that the U.S. boasts the highest number of satellites due to the [SpaceX](#) constellations.

Similarly, the [OneWeb](#) constellation is the reason behind the UK's satellite count.

Argentina owes its satellite numbers to [Satellogic](#) satellites, and Luxembourg's satellite count can be attributed to the [SES](#) communication satellites.

The Threat

When it comes to space congestion, "what goes up, doesn't always come down," often proves to be correct.

With the launch of the first satellite into space, human-manufactured debris started to compile in various orbits. The worst event that created a huge debris field was in 2007, when China intentionally destroyed their own weather satellite. This action added more than 3,500 pieces of large, trackable debris and far more smaller fragments to the space junk.

Debris in space travels at roughly 10 kilometers/second. A collision with any object moving that fast is obviously in danger. Even a pencil-point-sized piece of junk (*about a millimeter in size*) can destroy a spacecraft's mobility or even the unit itself.

In 2021, a two inch piece of space junk punched a tiny hole into the *International Space Station (ISS)*, damaging one of the station's robotic arms.

That incident was described as a near miss, but as the debris count increases, so does the possibility of many more future collisions.

The *Department of Defense's Space Surveillance Network (SSN)* tracks more than 27,000 pieces of orbital debris. However, there exists far more debris that is too small to be tracked, but large enough to threaten human space missions. Various estimates suggest presence of at least 100 million pieces of useless space waste between one millimeter and ten centimeters.

As both governments and the private sector ramp up their continued space explorations, governments are focusing on cleaning the debris fields.

Entities such as the **European Space Agency (ESA)** established guidelines for space debris mitigation and junk removal. ESA also plans to remove junk by using a **ClearSpace** spacecraft by 2025.

The United States' **National Orbital Debris Implementation Plan** categorizes measures to mitigate the risks associated with debris into three main areas:

1. **Minimizing the generation of new debris**
2. **Monitoring and characterizing existing debris**
3. **Developing methods to address and remove existing debris.**

Apart from government bodies, there are other institutes and commercial players that are stepping up for clean-space mission.

One example is AstroScale's ADRAS-J RemoveDEBRIS mission aims to capture ~40,000 pieces of space debris and is scheduled to embark on its space-cleaning mission in 2025.

Developing SSA Capabilities

According to Stratview Research, the worldwide SSA market is estimated to reach \$2 billion by 2028, experiencing an annual growth of more than 5% during the next five years.

At present, the U.S. military has the most advanced SSA capabilities, using radar and a number of tracking devices that track even small objects in **Low Earth Orbit (LEO)**.

The Russian civilian space agency **Roscosmos** operates the **Automated Warning System on Hazardous Situations in Outer Space**, using data from the **International Scientific Optical Network (ISON)** and other Russian SSA assets.

Countries such as China, Japan and India also have significant satellite tracking, telemetry, and control assets and are investing in significant, new, SSA capabilities and data-sharing programs.

For instance, India uses a **Multi Object Tracking Radar** for SSA purpose. As it covers only a limited range, the nation seeks data assistance from **NORAD (North American Aerospace Defence Command)** and other resources that are available in the public domain.

The U.S. and South Korea have agreed to cooperate on SSA for military purposes and there are countries that are moving forward to achieve 'no-dependency' and strategic autonomy in space traffic management. During a session at the 15th European Space Conference held in January of 2023, the ESA stated that they are working on reducing reliance on the U.S. for SSA solutions.

Over the past few years, a major portion of launched satellites were tasked for communication capabilities.

With the robust growth in new-age technologies such as 5G, **Artificial Intelligence (AI)**, and **Internet of Things (IoT)**, there will be even more satellites on-orbit during the next decade to serve global communication requirements. Some experts cite the potential of 58,000 additional active satellites will be launched by 2030.

Launching a single satellite into space costs millions of dollars and can require several months (*sometimes years*) for the design, development and manufacturing to be completed.

After a satellite has reached its orbital slot, a collision with any space debris could eliminate that spacecraft's ability to correctly function — that satellite could then be of no use to anyone.

If an encounter with debris occurs, the entire process of launching another satellite will have to be repeated at additional cost and loss of time and data reception and such could be both economically and technologically disastrous.

As an old adage states, "*Prevention is better than the cure.*" SSA is in dire need and is far more than simply a choice for nations — SSA is critically important to ensure MAG and commercial capabilities remain fully functional by the spacecraft on-orbit to improve, as well as save, human life.

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