

*SATCOM for Net-Centric Warfare*

# ***MilsatMagazine***

*February 2021*

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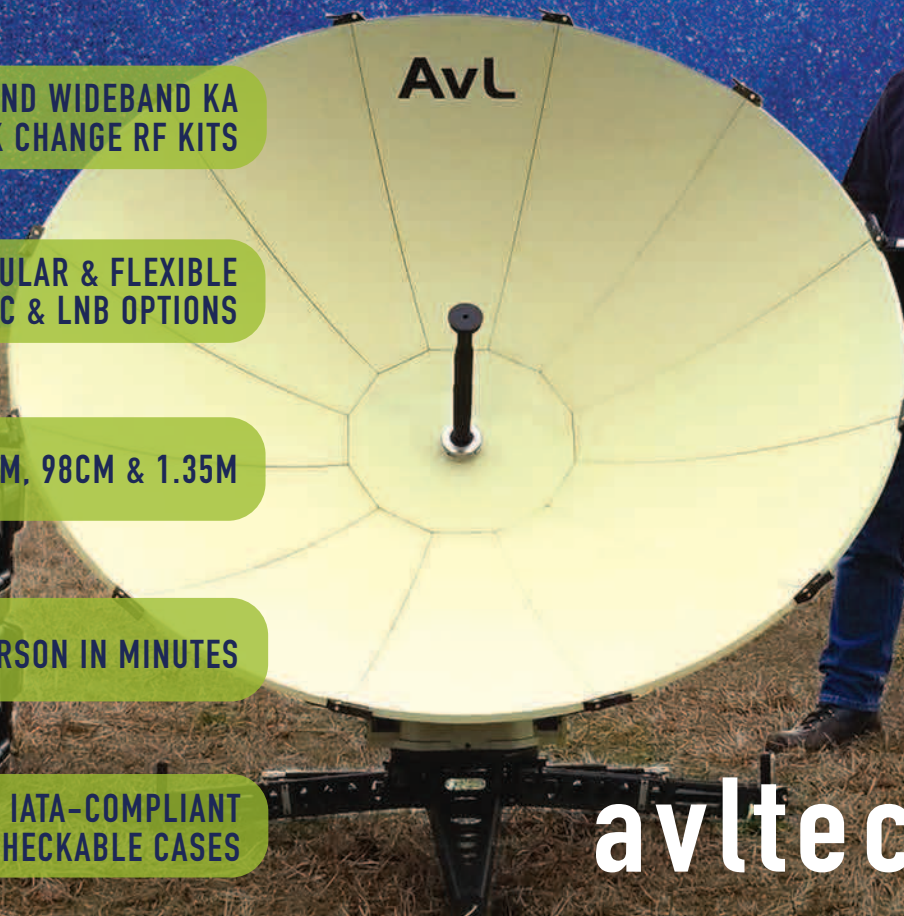
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## ARMY SATELLITE OPERATIONS BRIGADE PROVIDES COMMUNICATIONS ASSISTANCE FOR CYCLONE'S AFTERMATH



Wideband satellite communication planners from the Regional Satellite Communication Support Center-Pacific at Wheeler Army Air Field, Hawaii, discuss satellite planning options to support a customer's request for SATCOM resources in March 2020. The RSSC-Pacific belongs to the U.S. Army Satellite Operations Brigade, U.S. Army Space and Missile Defense Command. Photo courtesy of Iwalani Gutierrez — Photo By Staff Sgt. Aaron Rognstad)

### The U.S. Army Satellite Operations Brigade's Regional Satellite Support Center-Pacific, supported humanitarian assistance and disaster relief efforts for Cyclone Yasa, which battered Fiji's Vanua Levu Island, Dec. 17.

A team of Army Space Soldiers from RSSC-Pacific assisted with wideband satellite communications for the mission by processing satellite access requests, two of which went to the **Australian Defense Force** and two went to the **New Zealand Defense Force**.

"I can safely say on behalf of our entire team, it is very gratifying to support these humanitarian assistance/disaster relief efforts," said **Iwalani Gutierrez**, RSSC-Pacific director. "Knowing that what we do matters helps the team get through the long days of 12-hour shifts in our 24/7 operations. This Fiji relief effort happened during the holidays, and my team can be relied upon to stand watch ready to respond to any contingency in support of our customers."

Planning for satellite access solutions was primarily provided by two Soldiers, Sgt. **Ryan Chilton** of the Australian Defense Force and Staff Sgt. **Felix Loperena**, and one civilian contractor, **Joe Myers**, at the RSSC-Pacific located at **Wheeler Army Air Field** in Hawaii, December 19-21, 2020.

Chilton is attached to RSSC-Pacific as part of the **Australian Cooperative Partnership Program**.

"When you sign up for this job, you always think you might be involved in missions of these types," **Chilton** said. "Then something comes along like this where you ARE actually part of a real-world operation that really makes a difference in people's lives."

**Vince Street**, a civilian contractor, and Sgt. **Devon Lenz** also assisted with satellite operations for the mission.

"These (missions) are of the utmost priority," Lenz said. "Anytime you have a disaster of this magnitude and you're called upon to help out, you are going to do your part as best you can."

As many as 93,000 people were affected by the cyclone — a high-end category 5 storm that registered winds up to 214 mph according to the **Joint Typhoon Warning Center**. Four people were reported dead and the cyclone caused about \$1.4 billion in damage to health facilities, homes, schools, agriculture and infrastructure. The cyclone was one of the strongest storms ever recorded in the southern hemisphere.

The U.S. Army Satellite Operations Brigade's Satellite Communications Directorate executes **U.S. Space Command's** assigned mission for both wideband and narrowband SATCOM systems. The four RSSCs, which are located at Wheeler Army Airfield; Peterson Air Force Base, Colorado; MacDill Air Force Base, Florida; and Patch Barracks, Stuttgart, Germany, provide 24/7/365 SATCOM planning, engineering and satellite payload management for all Department of Defense (DoD) SATCOM systems.

The RSSCs work with regional SATCOM users planning and authorizing critically required connectivity for system users across the full range of military operations including diplomatic, humanitarian assistance, disaster relief and scientific missions in zones where the communications infrastructure can be destroyed, degraded or is simply non-existent.

The Satellite Operations Brigade belongs to the **U.S. Army Space and Missile Defense Command**.

Story by Sgt. 1st Class Aaron Rognstad  
U.S. Army Space and Missile Defense Command

## NEW AFRL COLLABORATION WITH NSF INTERN PROGRAM OPENS APERTURE FOR RECRUITING TOP TALENT

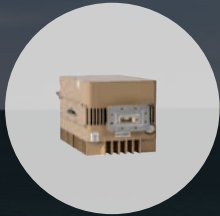
The Air and Space Forces will start 2021 with a fresh new partnership between the **Air Force Research Laboratory (AFRL)** and the **National Science Foundation (NSF)** designed to advance the scientific and innovation skills of the United States and draw a whole new generation of globally-competitive, diverse scientists and engineers into the AFRL innovation ecosystem.

The partnership formalizes an opportunity for current and future NSF-funded graduate students to participate in six-month internships onsite at any of eight AFRL technology directorates. There they will get access to professional development and practical work experience in Air and Space Force-related areas, also known as Core Technical Competencies.

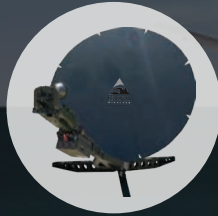
"We see this partnership as a real win-win for AFRL and NSF as it aligns with the strategic workforce development goals of both organizations," said AFRL Chief Technologist, Dr. **Timothy Bunning**.

AFRL is responsible for leading the discovery, development, and delivery of warfighting technologies for the air, space, and cyberspace domain. Its

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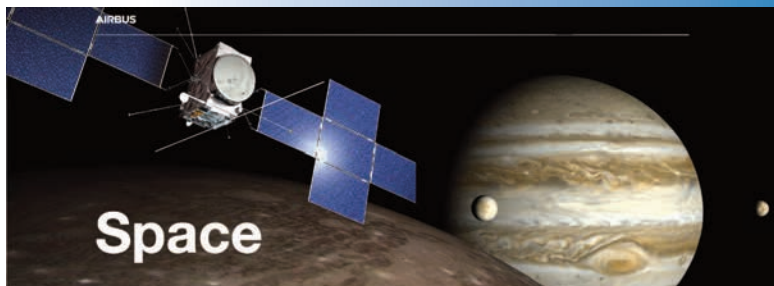
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success depends on a high-quality network of internal workforce and external partners who are knowledgeable of Air and Space Force science and technology challenges.

*“Strengthening and formalizing this partnership with NSF allows us to deepen and expand our ecosystem by fostering the training and preparation of a new generation of science and engineering talent to serve our strategic needs,”* added Bunning.

A long history of collaboration between the NSF and the **Air Force Office of Scientific Research (AFOSR)** — the AFRL technology directorate responsible for managing Department of the Air Force basic science funding—helped pave the way for this new partnership.

For nearly 70 years, AFOSR has worked in tandem with NSF and other fundamental science funding agencies in pursuit of new scientific knowledge largely found in the laboratories of U.S. and international universities. AFOSR then helps relay that knowledge to applied research projects in support of national defense.

Dr. **Prakash Balan**, Program Director at the NSF, worked closely with the AFRL/AFOSR team in shaping this opportunity. *“This partnership addresses the strategic workforce development objectives of the NSF. It provides a powerful opportunity for NSF supported graduate students to gain valuable experience and training, working closely with the scientists and technologists at the AFRL,”* he said.

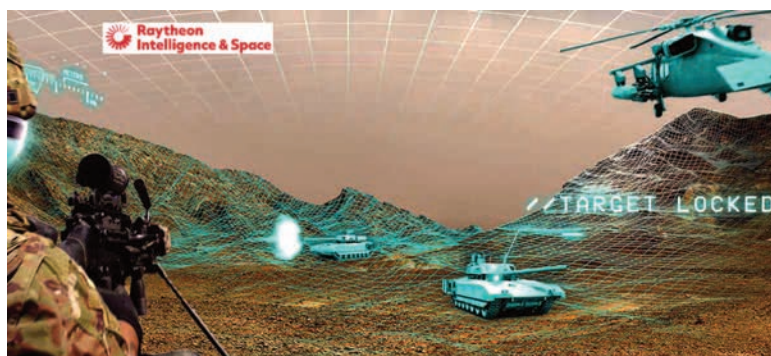
*“We already had so many instances of scientific and programmatic collaboration between AFOSR and NSF that serving as the liaison between the NSF INTERN program and the other AFRL technology directorates under the auspices of the AFRL Chief Technology Office fit well within our sphere of impact,”* said Dr. **Van Blackwood**, the AFOSR Science and Engineering Division Tech Advisor and key facilitator of the partnership. *“It was also a wonderful way for us to demonstrate our commitment to the objectives outlined in the U.S. Air Force 2030 Science and Technology Strategy.”*

The *Research Internships for Graduate Students at Air Force Research Laboratory (NSF-AFRL INTERN) Supplemental Funding Opportunity* went public on December 11, 2020, when NSF issued a NSF Dear Colleague letter explaining the new opportunity.

Read more about eligibility requirements and the broad AFRL opportunities available for graduate students at Dear Colleague Letter: [Research Internships for Graduate Students at Air Force Research Laboratory \(NSF-AFRL INTERN\) Supplemental Funding Opportunity](#) **at this direct infolink...**

## AI ASSISTS WITH BETTER BATTLEFIELD INTEL

**For future battlefield operations, speed is the name of the game. The side that can make decisions faster has the advantage.**



A new, AI-enabled effort by the U.S. Army can give operators the ability to detect, identify, process and engage targets quicker than ever and at longer ranges than before.

The **Tactical Intelligence Targeting Access Node**, or **TITAN**, from **Raytheon Intelligence & Space** offers frontline forces, as well as headquarter commanders, a resilient tactical ground station capable of rapidly sifting through massive amounts of incoming sensor data to find and track potential threats. TITAN can connect to the future **Joint All-Domain Operations** enterprise, an all-domain, interconnected network to plan and execute operations in a synchronized, collaborative and streamlined manner.

*“The goal of TITAN is to link Army commanders at all echelons to timely intelligence data, speeding up the data-to-decision timeline,”* said **David Appel**, Vice President for Defense and Civil Solutions for **Raytheon Intelligence & Space (RI&S)**, one of the four businesses that form Raytheon Technologies. *“Today’s systems limit timely access to the intelligence information needed to engage in the ‘deep fight’ – distances*



**U.S. Soldiers, assigned to the 2nd Cavalry Regiment, scan sectors of fire during the AH-64 Apache helicopter gunnery training in Grafenwoehr Training Area, Germany, in 2020.**  
U.S. Army photo by Sgt. LaShic Patterson.



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greater than 200 miles.”

RI&S is developing a TITAN solution that uses machine learning and AI to automate data processing that today is largely done manually. Integrating this technology into the process helps build a strong human-to-machine teaming relationship — reducing the mental strain placed on soldiers.

“Commanders on the front line need to quickly identify and assess threats to their forces,” said **Greg Hansel**, an RI&S business development manager. “To do that accurately, they need a system that can rapidly collect and fuse data gathered from every available sensor – regardless of domain – and quickly share the information with them. The goal is to speed up how fast data moves from sensor to the executing platforms, such as aircraft, artillery or jamming systems.”

RI&S’s TITAN system combines **Commercial Off-The-Shelf (COTS)** technologies with battle-proven defense technology to provide users with uninterrupted access to data in contested environments, and to give them a clear picture of threats that evolve constantly.

“The commercial companies we are partnering with are developing the software running in the background of products people use every day to navigate the digital world, but they’re not necessarily designed for military use,” said **Erik Grant**, Chief Engineer for Defense and Civil Solutions. “We work with them to adapt and harden their products, ensuring they can operate in very high-consequence environments on no-fail missions.”

To ensure the TITAN solution continues to be effective as the future Joint All-Domain battlefield evolves, RI&S designed the system for scalability using an open-architecture development approach. The standardized design keeps the cost of maintenance low while enabling upgrades to be rapidly pushed to the system and provide the flexibility needed to integrate future capabilities as new threats emerge.

“We have to find innovative ways to continuously deliver new technology that meets our customers’ mission needs, period,” Appel said. “We can’t get hung up on where the technology comes from, be it the traditional defense industry or commercial partnerships, we have an obligation to bring the best capability to the table. Ultimately, what we deliver is going to protect our service men and women.”

## COMTECH IS AWARDED MULTI-MILLION \$\$\$ BY U.S. NAVY FOR SATELLITE EARTH STATION EQUIPMENT



**Comtech Telecommunications Corp. (NASDAQ: CMTL)** has announced that during the firm’s second quarter of fiscal 2021, their Tempe, Arizona-based subsidiary — **Comtech EF Data Corp.**, which is part of Comtech’s Commercial Solutions segment — was awarded an \$11.4 million delivery order in support of a previously announced \$58.8 million indefinite delivery/indefinite quantity (“IDIQ”) contract from the U.S. Naval Information Warfare Systems Command — funded orders received to-date under this IDIQ contract now total \$42.1 million.



The delivery order specified Comtech EF Data’s SLM-5650B Satellite Modems and firmware upgrades. The SLM-5650B Satellite Modem is Comtech EF Data’s latest generation modem product targeted for critical commercial backhaul, government and military applications.

The SLM-5650B leverages the heritage and feature set of the SLM-5650A modem. The SLM-5650B supports backwards compatibility/interoperability for existing SLM-5650A networks while providing enhanced performance and an expanded feature set. The commercially available modems will support satellite communications and interoperability across the Navy’s platforms and shore sites.

“It is a privilege to have the continued opportunity to support the U.S. Navy’s satellite communications requirements with our latest generation solutions,” said **Fred Kornberg**, Chairman of the Board and Chief Executive Officer of Comtech Telecommunications Corp.



## USSF AWARDS LINQUEST WITH IDIQ CONTRACT FOR ANALYSIS SUPPORT WORK



Recently, **LinQuest** was awarded a \$500 million, 5-year indefinite delivery, indefinite quantity (IDIQ) contract to provide analysis support to the **U.S. Space Force (USSF)**.

This is the first enterprise contract awarded allowing USSF and other space analysis organizations to establish task orders promoting synergies and unity of effort.

The contract will be an extension of work originally performed by LinQuest's **Integrated Analytics & Support (IAS)** business unit under the **Department of Defense's (DoD) SBIR program** that identifies promising technologies and brings them to an operational level of maturity.

The USSF is charged with organizing, training, and equipping space forces in order to protect the United States and its allied interests in space, as well as providing space capabilities to the joint force.

"This award will allow us to expand the world-class support we're already providing across the LinQuest lines of business to our U.S. Space Force Guardians and the broader Space community," said **Greg Young**, LinQuest's Chief Operating Officer.

"We're proud of our IAS team," said **Tim Dills**, President and CEO of LinQuest. "And we're excited about this new growth opportunity to continue demonstrating our dedication to excellence – from concept to capability."



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*SMC memorial to General Bernard A. Schriever at Los Angeles Air Force Base, El Segundo, California, at sunrise. Schriever is considered to be the father of the Air Force's space and missile program. The statue was donated to SMC by the the Air Force Association's Schriever Chapter. Photo is by Van de Ha, SMC.*

## SEE YOURSELF AT SMC

**THE USSF SPACE AND MISSILE SYSTEMS CENTER IS HOME TO AN ARRAY OF CAREERS**

**Have you ever thought of having a career in national space defense? Imagine yourself as one of the Space and Missile Systems Center (SMC)'s 6,000 person team. As the center for acquiring and developing military space systems for the U.S. Space Force, do not self-limit — you can be a part of America's space renaissance even without a Science, Technology, Engineering, and Mathematics (STEM) degree.**

SMC at Los Angeles Air Force Base in El Segundo, California, has employed government civilian employees, government contractors and military members, for a host of space-related occupations for decades. While some may choose the traditional route of serving in the U.S. Air Force (USAF) or the U.S. Space Force (USSF), there are many other opportunities for people without a military background.

"People have this misconception that you have to join the military," said **Aine Nakai**, the Director of Talent Management at SMC. "You can serve your country as a civil servant or a contractor – you don't have to wear a uniform, you don't have to deploy."

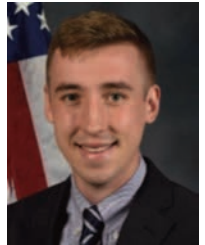
SMC's Talent Management team is responsible for overseeing the career development, training, recruitment, hiring, retention and branding for SMC and the Los Angeles Air Force base as well as units at **Peterson Air Force Base** in Colorado and **Kirtland Air Force Base** in New Mexico. Nakai monitors the careers of nearly 5,000 military, civilian and contractor personnel in the finance, program management, engineering, human resources, contracting, and logistics career fields.



**Aine Nakai**

"I am looking to hire from the entry-level mail room clerk to do sorting and collecting mail, to the Program Executive Officer level and other support in our senior ranks in program management, contracting, and finance management."

**Tucker White**, 25, was a sophomore studying aerospace engineering at **Embry-Riddle Aeronautical University** when he heard about a U.S. Department of Defense (DoD) scholarship, the **SMART** scholarship, that helped pay for his education in exchange for a three-year service commitment as a civilian.



**Tucker White**

He completed two summer internships at SMC and now, with his bachelor's and master's degrees in aerospace engineering, has been working fulltime at SMC for more than two years. He's now a deputy chief engineer in the **Production Corps**, where he works on the **Space-Based Infrared System (SBIRS)** program.

If he hadn't discovered SMC through the scholarship, "I probably would have looked to one of the prime contractors," White said. "They hire a lot of kids right out of college and I know some that have gotten great jobs. But I think when you start off with a prime, you don't have a lot of responsibility and you're working on small components that may or may not get into space someday. At SMC, I'm looking at the bigger picture — not just the individual screws and designing bits of satellites, but looking at the entire satellite, how does it fit into the space architecture and how does it help the warfighter?"



**Samantha Cox**

**Samantha Cox**, the Director of manpower and personnel at SMC, focuses on placement of senior military personnel and senior civilians at SMC. "There isn't a single path for civilian careers: someone might serve in the military, separate from the service and then take a job with a government contractor or elect to compete for a federal civilian job and then be hired at SMC," she explained. "We hire individuals from

other Government organizations as well as looking to bring in talent from industry — the corporate sector — that have relatable experience and can bring that experience to get the job done, but also a new perspective on how to get that job done, faster.

## The United States DoD workforce consists of military personnel, civilian employees and contractors.

### DoD Contractors

A defense contractor can be an individual, firm, corporation or other legal non-federal entity that enters into a contract directly with the DoD to furnish services, supplies or construction.

### Military: Enlisted, Officer, Reservist

Enlisted members sign a contract between them and the military and serve until their contract ends or they reenlist. Officers may join the military after college or the Air Force Academy. Reservists can be current military personnel who transition from active duty, former members of any branch of the United States military or even candidates with no prior military service.

### Government Civilian

Government civilians do not serve in the military, but are appointed to federal civil service.

"I get great mentorship here, not only from other civilians, but the Air Force instills a lot of discipline and you get to see the work ethic your coworkers have. In the Air Force, they really value the work/life balance: they want you to work hard, but also care for you as a person. They want to get to know you, and work with your career so you can be in a place where you're going to thrive the most."



**Lisa Prosser**

"People may not realize we have a lot of contractors who work here," said **Lisa Prosser**, Contracting Officer with **Atlas Corps' Directorate of Contracting**. "Los Angeles Air Force Base is what's called a systems acquisition base. You have the operations bases, where they fly the aircraft and conduct flight missions. SMC buys, builds and sustains satellites and the launch services that deliver them to orbit."

Prosser, who is also a disabled Air Force veteran who served as a K-9 handler, works in the **Specialized and Enterprise Contracting** division at SMC where they contract for **advisory and assistance services (A&AS)** to complement the military and civilian workforce in areas that are difficult to fill organically.

"Many are military veterans," said Prosser. "We consider our A&AS contractor workforce our wingmen as well. It takes a three-pronged approach – military, government civilians and contractors to have a complete workforce here." Prosser said.

**USAJobs.com** is the primary source for civilian employment at SMC. Many jobs require some sort of security clearance, so a clean record and ability to obtain a security clearance is important.

## Careers at SMC

Here are just a few of the career fields people can pursue at SMC.

<ul style="list-style-type: none"> <li>Program Management</li> <li>Human Resources</li> <li>Contracting</li> <li>Accounting</li> <li>Doctors/Nurses</li> <li>Strategic Communication</li> <li>Financial Management</li> <li>Engineering</li> <li>Logistics</li> <li>IT/Software Development</li> </ul>	<ul style="list-style-type: none"> <li>Cyberspace Operations</li> <li>Space Systems Operations</li> <li>Cyber Transport Systems</li> <li>Cable and Antennae Systems</li> <li>Fusion Analyst</li> <li>Acquisition Manager</li> <li>Targeting Analyst</li> <li>Signals Intelligence Analyst</li> <li>Intelligence Officer Developmental</li> <li>Cybersecurity</li> <li>Security/Police</li> </ul>
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Since September, SMC has participated in career fairs at numerous universities as well as a virtual hiring event in November 2020, due to COVID-19 restrictions. SMC has recruited via **LinkedIn** for some specific roles, as well.

"We had 1,100 resumes from interested folks — it was an overwhelming response and very inspiring," Nakai said of the November 2020 event. "We're still referring to resumes and conducting interviews. With the buzz surrounding standing up the Space Force, we want to ensure that talent management will support individual

## SMC Recruiting Events

Clarkson University	California State University, Chico, Spring Fair	San Jose State University	University of New Mexico Los Alamos	University of Southern California Spring Career Fair
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development needs rather than a one-size-fits-all approach to make the Space Force an employer of choice."

Both the USAF and the USSF are fully supportive of Airmen, Guardians and all employees' desires to continue to develop professionally after they're hired, which is why SMC has created and implemented initiatives such as **SMC Management and Resourcing Tool (SMART)** for paperless in-processing, and the **Strategic Career Action Plan Tool**, to make Airmen and Guardians aware of training and other opportunities to advance their careers, Nakai added.

People who can think on their feet and show initiative are likely to do well working with the government, Prosser said. "It's up to you to take control of your career; the government doesn't spoon-feed."

"What you need to be is adventurous, which means open to new experiences," Cox said. "We just iterated into the U.S. Space Force so we're doing things differently, we're shaking things up. People often say employees need to be 'flexible' and 'agile' but that's too simple. We need people who aren't afraid to make mistakes, to learn at risk."

"Too often in the history of government employment, you're working from a continuity binder and you're going to get step-by-step instructions on how to get from Point A to the signature at the end of the line to take action," Cox said. "But we need people who can challenge that continuity binder and say 'This is great, but this way might be faster.' Maybe they learn that we're doing it this way for a good reason, so let's keep it. But we're leaning toward people who are emboldened, empowered and experienced to make the choices that they're authorized to make at the appropriate level; the GS-11 Buyer is not making choices your three-star general is accountable for."

It's not enough to have a great-looking resume, Nakai said. SMC needs people with solid "soft skills" to work well in a team environment.

"We want people who have a passion to be something greater than themselves, the desire to join a dynamic team and to be excited to execute the mission," Nakai said. "It's important to be a team player — we have a lot of integrated product teams — program management, engineering, finance, logistics and contracting all coming together to acquire systems to deliver to the warfighter."

"SMC is a place where you can grow and develop, just like you can at a Google or a Microsoft or SpaceX — give a chance to the government," Cox said. "We're not the stodgy employer of the past — you can work here and touch space today."

To learn more about careers at SMC and the USSF, visit

**Space Force Careers**

or <https://www.losangeles.spaceforce.mil/>

# DEFENDING SPACE SINCE 1954

1954

The Western Development Division (WDD) of the Air Research and Development Command (ARDC) was established in Los Angeles to accelerate the development of the Atlas intercontinental ballistic missile (ICBM.)

1957

Construction of the space and missile launch facilities at Cooke Air Force Base (later renamed Vandenberg AFB) began.

1958

SMC (as WDD) was a part of the first successful Air Force space launch -- the three-stage Thor-Able rocket, which carried the Pioneer 1 lunar probe. Months later, SMC had a hand in the launch of the world's first communications satellite with the first successful use of a converted Atlas rocket as a space launch vehicle.

1961

WDD becomes the Space Systems Division.

1963

First successful infrared early warning satellite -- MIDAS 7 -- launched, with the first detection of missile launches from space.

1967

Space Systems Division becomes Space and Missile Systems Organization. First use of the space-based communications in military operations -- the Vietnam War.

1978

First GPS 1 satellite was successfully launched.

1979

Space and Missile Systems Organization becomes the Space Division.

1990

Space Division becomes the Space Systems Division.

1992

Space Systems Division becomes the Space and Missile Systems Center

# SMC HAS BEEN A PIONEER IN THE SPACE ECOSYSTEM AND HELPS KEEP THE U.S. SAFE

## SMC's Partners Include:

Allied International Countries  
Global Space and  
Technology Organizations  
Military  
Commercial  
Small Business  
Academia  
Community  
Congress

*The U.S. Space Force recently celebrated its first anniversary as a separate military service, but the Space and Missile Systems Center (SMC) at Los Angeles Air Force Base in El Segundo, California, has been providing military*

*space systems research and development for the United States for decades.*

*Today, the more than 6,000 men and women who work for SMC — military, government civilians and contractors — are working to develop and acquire the best in GPS, military satellite communications, defense meteorological satellites, space launch and range systems, satellite control networks, space based infrared systems and space situational awareness capabilities.*

*Imagine a day without space capabilities. From the GPS signals that enable our smartphones and Google Maps; to the satellite communication links between our banks and ATMs and to the internet, all relayed through space -- space is an integral part of daily life, and SMC will continue to play an important part in making that possible.*



## #DiscoverSMCToday at the following industry events.

2021 Aerospace Warfare Symposium  
Ground Systems Architecture Workshop (GSAW)  
Rocky Mountain Cyberspace Symposium (Rocky Mtn. AFCEA Chapter)

Feb 24
March 1
March 10

*Over the years, we've seen our technology and capabilities change from the first-generation of operational intermediate range ballistic missiles (IRBM), intercontinental ballistic missiles (ICBM), and military satellite systems to ever more sophisticated launch vehicles with reusable segments and the ability to place multiple payloads into multiple and different orbits on a single launch.*

*We've sought out new partnerships with non-military space industry businesses as well as international partners, broadening our access to the latest, most-innovative ideas and the best in cutting-edge technology. SMC can proudly boast of 81 successful National Security Space Launches in the past 20 years, and saving taxpayers more than \$22 billion through competitive bidding. And we're just getting started.*

*Why? Space is no longer a benign environment, and free and secure access to space is no longer guaranteed. Space is increasingly competitive, congested and contested.*

*Space debris from previous launches poses a problem to on-orbit assets and future launches.*

*Russia and China have both aggressively pursued systems with the ability to deny, degrade, disrupt or destroy our national assets on orbit.*

*The United States must be ready to defend access to space for our country and our allies, and also build a space economy that encourages a free and open market, safe behavior on-orbit, and*

## Space Challenge: Start the Conversation

*Get excited about national defense in space and your role in helping protect the global commons*

Want to learn more to understand what space does for the world, how it enriches our daily lives, and why allied space power and international norms in this domain are critical to securing our freedom? Here are some resources:

How did Southern California become the aerospace capital of the world? Watch *Blue Sky Metropolis*  
<https://www.pbs.org/show/blue-sky-metropolis/>

[RAND Corp: Enhancing Assessments of Space Mission Assurance](#)

[CSIS: Space Threat Assessment 2020](#)

[Artemis: NASA's Program to Return Humans to the Moon](#)

Congressional Research Service: [National Security Space Launch](#)

Congressional Research Service: [Challenges to the United States in Space](#)

[The Aerospace Corporation: Forging Resiliency for the Future](#)

### For Kids:

[NASA's Kids' Club](#)

[Vivify STEM: Mission to Moon](#)

“At SMC, I’m looking at the bigger picture, not just the individual screws and designing bits of satellites, but looking at the entire satellite. How does it fit into the space architecture and how does it help the warfighter?” — Tucker White

*respects the rights of all members of the space-faring community.*

*More than one million enlisted U.S. military personnel rely heavily on SMC’s work in space to relay and receive critical information to warfighters at sea, in the air, and in*

*the field. The next chapter of our continuing work promises to be just as exciting, but it’s important to note that the work we do benefits everyone, not just the military*

*Many of the technological advances that make our life so much richer now started out as technology invented for - and proven and tested by - warfighters in the field. GPS may be a global public utility now, but it began as military research.*

*When SMC looks to recruit new space industry partners through such events as Space Pitch Days, very often the technology we’re looking for is dual-use: technology that can help the USSF accomplish its mission, but also with the potential for commercial applications.*

*The USSF gains access to new technology and new ideas; our space industry partners gain a stable source of funding that in turn helps them innovate faster. Space underpins all of our instruments of national power: it provides tremendous economic, scientific and military opportunity... the next technological wonder may be just around the corner!*

*The USSF’s Space and Missile Systems Center, located at the Los Angeles Air Force Base in El Segundo, California, is the center of excellence for acquiring and developing military space systems. SMC’s portfolio includes space launch, global positioning systems, military satellite communications, a defense meteorological satellite control network, range systems, space-based infrared systems, and space situational awareness capabilities.*



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## IS LEO THE REAL GAME CHANGER IN SPACE-BASED OPS?

By Michael Young, Senior Director of Advanced Programs, Envistacom

**Since at least the 2011 Budget Control Act and the continued looming specter of sequestration, military planning has centered on a potentially decreased or flat defense budget. In practice, this has included contingency plans for how the Department of Defense (DoD) might balance military lethality and operations with investment in innovation, research and development (R&D). One strategy is leveraging industry's investments in R&D and their commercial technologies to meet unique mission needs.**

Commercial satellite communications (SATCOM) companies are often poised to innovate and produce faster, making them valuable partners to the federal government. As federal leaders look to harness more commercial satcom to accelerate progress in lethality, operations and cutting-edge capabilities, the SATCOM industry has an opportunity not only to provide valuable innovation and technologies but also to work alongside the government in developing policies, standards and advancements that benefit the broader DoD community and shape the satellite and space industries for years to come.

### THE PROMISE OF LEO

Currently, one of the largest areas of development in SATCOM is Low Earth Orbit, or LEO. The industry is seeing the rise of large LEO constellations and the launch of thousands of satellites — more than some previous decades combined.

Commercial LEO architectures are a critical part of the new, proliferated national security space. They offer the ability to distribute military communications through a variety of pathways, spacecraft and mesh networks, which are resistant to single point of failure.

Furthermore, these architectures offer an inherent low probability of intercepted communications. LEO systems use smaller and more isolated spot beams, each of which — and there can be hundreds, or more, in one LEO network — is harder to interfere with than traditional GEO spot beams.



LEO satellites portend a multitude of benefits for both the government and the commercial marketplace. In addition to providing a greater level of security, LEO satellites are integral to the development of emerging technologies, including 5G and edge capabilities.

LEO satellites would support terrestrial 5G infrastructure by providing coverage to remote areas not covered by towers or networks, as well as to hard-to-reach, moving targets — think airplanes, ships and other vehicles. LEO satellites would also act as a backup to the broader 5G network, stepping in to cover areas in the event that towers are damaged or otherwise suddenly inoperable.

With LEO satellites supporting and extending 5G, similarly, these satellites would be critical to the development of edge computing capabilities. LEO satellites will gather and deliver data in addition to running any supporting applications or analysis at the edge — a tremendous asset to widely dispersed troops and other deployed operators needing data-enabled functionality in the field.

## TAMING THE LEO WILD WEST

LEO, in many ways, is being referred to as the new frontier of space: The developments within LEO are exciting and hold significant potential for both commercial and government military missions.

However, there is an urgent need for regulations and “official” guidance when it comes to rapidly evolving LEO operations — and those in the broader space domain.

The government, satellite providers and the wider satellite industry should first impose self-regulatory practices to ensure that LEO remains operational and secure as it continues to develop at a clip. In the coming months, the **United States Space Force** (USSF) may take a strong leadership role in this capacity.

Until then, however, as thousands of satellites are being launched within the next decade, there will be an increase in proprietary networks. With hundreds or thousands of proprietary networks in LEO, there will be an exponential increase in issues with jamming, deconfliction and spectrum demand. More satellites in LEO can be compared to more cars on a highway — at some point, there will be a crash.

The good news is the technology exists to get many of the various satellites, networks and operators to “play nicely” in LEO and help realize, and continue to expand its promising capabilities. A new emerging technology holds promise in preventing a LEO disaster and supporting regulation: virtualization.

### THE INTEGRATION OF TRANSPORT VIRTUALIZATION

We’ve already seen the increased reliance of military systems on information networks, whether for command and control, logistics, targeting, reconnaissance or navigation. The demand for connectivity has exploded.

The reliance on these networks combined with the geographic unpredictability of military engagements means that military commanders need access to connectivity anywhere on Earth at a moment’s notice.

Today, maintaining control visibility around ground forces and resilient communications requires commanders to navigate multiple disparate and often proprietary systems to ensure mission success. The virtualization of communications waveforms unlocks the power of virtual modems and their utility in cloud-based and tactical-edge environments. This in turn supports the military’s multi-domain operations and enables resilient network transport.

Virtualization allows for real-time, continuing process applications — mitigating interference, unleashing **Artificial Intelligence (AI)** and **Machine Learning (ML)**, bolstering cryptology and catalyzing data analytics, among other uses. Combined with innovative antenna systems, the complete terminal solution would be able to provide an unparalleled multi-band, multi-waveform, single-solution support for GEO, MEO and LEO applications.

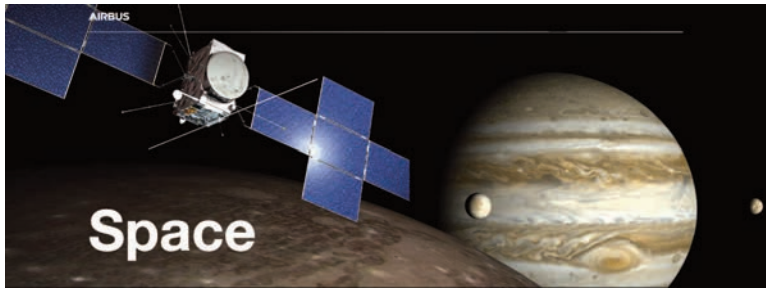
A transport virtualization ecosystem archetype allows any qualified organization to deliver products into a growing, structured network. This is accomplished by using open standard development techniques for open-standard and/or proprietary waveforms as software applications for implementation in virtual modems. This eliminates the challenge of implementing new waveforms in purpose-built modems and tailoring code to specific hardware. It provides benefits to the government in the form of streamlining the process needed to support growth in user demand, including for additional modems or additional waveforms.

Today, the satellite industry has an opportunity to lead and be forward-thinking in solving future challenges. Industry leaders should continue to work on integration efforts in LEO, MEO and GEO to provide solutions to the government while maintaining high standards of operation and security. By leading the way and infusing innovation into operations, this not only improves so many aspects of operational functionality and security — it positions trailblazers to be ready to meet whatever regulations or standards come down the pipeline.

*Michael Young has more than 24 years of leadership and management experience in the communications and network management fields. He holds an MBA from the University of Virginia Darden School of Business and was the program manager and technical lead on numerous satellite communications programs during his military career in the Army. Michael is the Senior Director of Advanced Programs at Envistacom where his duties include leading capture and proposal team activities, performing profit and loss analysis, identifying potential business development opportunities, supporting M&A activities, supporting strategic long-range planning, market analyses, and forecasting data for Government and Commercial market sectors. Prior to Envistacom, Michael was responsible for the L-band Tactical (L-TAC) capability and its fielding by the U.S. DoD for use in augmenting UHF/VHF LOS radio capability, and he was one of the original members that stood up a Satellite Communications section within a Special Missions Unit in the Department of the Army.*



## AIRBUS MEETS MILESTONE, ONE STEP CLOSER TO BUILDING NEXT GEN MILITARY SATELLITE



**Airbus was awarded the Skynet 6A contract in July 2020 and teams across its sites in Stevenage, Portsmouth and Hawthorn have been working on the program to achieve this key milestone. Meetings with the UK Ministry of Defence (MOD) were held virtually enabling the review board to take place in October and the PDR being achieved in November.**

*Richard Franklin*, Managing Director of Airbus Defence and Space UK said, "This is excellent news and demonstrates our joint commitment to work in partnership to achieve the program schedule. The progress we are making in building the UK MOD's next generation military satellite and getting to this stage, despite current restrictions, really highlights the flexible and strong working relationship we have built with the Defence Digital team. Skynet 6A, to be built entirely in the UK, will significantly enhance the UK's miltatcoms capability, building on the heritage of the four Skynet 5 satellites which were also built by Airbus, and which are all still operating perfectly in orbit."

Teams from across the space and ground segments in Airbus worked closely with their MOD counterparts to keep the program on track.

**Skynet 6A** will extend and enhance the Skynet fleet. The contract signed with the UK MOD in July 2020 involves the development, manufacture, cyber protection, assembly, integration, test and launch, of a military communications satellite, Skynet 6A, planned for launch in 2025. The contract also covers technology development programs, new secure telemetry, tracking and command systems, launch, in-orbit testing and ground segment updates to the current Skynet 5 system. The value of the contract is more than £500 million.

The **Skynet 5** program, provided by Airbus as a full service outsource contract, has provided the UK MOD with a suite of highly robust, reliable and secure military communications services, supporting global operations since 2003. Airbus has been involved in all Skynet phases since 1974 and this phase builds on a strong UK commitment to space manufacturing in the UK. The program commenced by using the legacy Skynet 4 satellites and then augmenting them with a fully refurbished ground network before launching the Skynet 5A, 5B, 5C and 5D satellites between 2007 and 2012.



**Artistic rendition of Skynet satellite.**

The Skynet 5 program has reduced or removed many of the technical and service risks for the MOD, while ensuring unrivaled secure satcoms and innovation to UK forces. Through the many years of delivering an exceptionally reliable Skynet service the Airbus teams have managed to significantly extend the lifespan of the Skynet satellites many years beyond their design life, offering significant additional value for money and capability to the UK.

The Skynet 6A satellite is based on Airbus' Eurostar Neo telecommunications satellite platform. It will use more of the radio frequency spectrum available for satellite communications and the latest digital processing to provide both more capacity and greater versatility than Skynet 5 satellites.

The satellite will feature electric orbit raising propulsion as well as electric station keeping systems for maximum cost effectiveness. Complete satellite integration will occur at Airbus facilities in the UK followed by testing using **RAL Space** testing facilities at Harwell in Oxfordshire supporting the **UK Space Agency** initiative for sovereign UK end-to-end satellite production and support.

[www.airbus.com/space.html](http://www.airbus.com/space.html)



## HOW DO WE TACKLE RADAR INTERFERENCE?

*By Joakim Espeland, Chief Executive Officer, QuadSAT*

**Radar interference has been a steadily growing problem for satellite communications (SATCOM) and one that seems to have little chance of resolution. With services degraded, satellite operators are often forced to relocate them to other satellite capacities. With those costs involved, is this challenge something that the satellite industry can afford to ignore?**

### THE CHALLENGE OF RADAR INTERFERENCE

The biggest challenges with radar interference are in the complexity to solve it and the resolution once you that has been accomplished. How do you find the source when it is generally not knowingly transmitting to the satellite?

Add to that the fact that often it will be transmitting only to the ground equipment, meaning that any tests by the satellite operator will not reveal the problem being experienced by the user. Radar interference generally happens in very short bursts, which makes it really challenging to geolocate. The fact that radar is often used in maritime applications further complicates matters, with operators looking for an interference source that is on the move.

Finding the source, therefore, involves a combination of science and engineering teams, coupled with many man hours using complex techniques, such as beam scanning and looking at pulse characteristics to determine the type of system being deployed.

Even if an operator does locate the source, resolution is not simple. Being mission critical means that it cannot simply be disabled. In some cases, it could, of course, be down to equipment failure. In those cases, repairing or upgrading that equipment may of course resolve the issue but in the meantime, the radar needs to continue to operate.

This means that very often, even if the satellite operator is able to locate the source, the resolution will still be moving satellite services. As the battle for spectrum continues to grow, finding replacement capacity once services are impacted is becoming increasingly difficult for operators.

### GETTING PROACTIVE

Satellite interference, whatever the source, is either solved reactively or proactively. The reactive measures will always be important because no matter how many proactive methods are in place, there will always be some level of interference and operators need tools at the ready to

tackle those. That said, the reactive measures work best in those scenarios where finding the source can lead to relatively easy resolution.

For example, if the interference is deliberate, the jammer can be blocked. If it is caused by human error, that can also normally be resolved quickly.

Proactive measures aimed at stopping interference before it happens are always a good strategy to have, especially in the case of radar interference where resolution comes with so many challenges. How can we proactively prevent this from occurring?

## RAISING AWARENESS

The majority of satellite interference is caused by human error. Over recent years, the satellite industry has worked to raise awareness of satellite interference, the causes as well as the tools to mitigate it. The same should be addressed for radar interference. There are a few important areas when it comes to awareness:

- **Awareness of satellite operators regarding the affected frequency ranges.** Operators are generally aware that in those frequency ranges where radar systems have priority, there could be interference. Mitigating that when using those comes down to careful planning as some services would be hugely impacted whereas others could continue in these bands unaffected.
- **Awareness of radar operators concerning how radar interference occurs** and how to prevent it would dramatically reduce the instances of accidental transmission to a satellite or ground station.
- **Awareness of regulators** ensures that other options can be explored such as zones around teleports being kept clear of interference-causing systems. This needs to be organised locally by the ground station operator.

## COMPLIANCE WITH RSEC

One of the biggest tools in the proactive fight against satellite interference is that of type approvals. Another major cause of interference is equipment failure that can be greatly reduced if all satellite equipment has to meet a certain standard before being deployed on a network. The Radar Spectrum Engineering Criteria (RSEC) is intended to ensure that radar systems meet an acceptable degree of electromagnetic compatibility, ensuring that possible interference is limited as much as possible.

Most cases of radar interference occur because the equipment being used does not meet RSEC criteria. If regulators were to ensure more widespread compliance with the standard, the instances of interference would dramatically reduce.

## TESTING

While compliance with standards and best practices is important, checking that each radar system does comply is simply not feasible currently. Testing is complex, made more so because radar systems themselves have become more complex over recent years. Testing usually occurs on a test range, which is extremely time-consuming and



costly, or by the way of computer simulations and laboratory-generated measurements of radar performance, which are extremely useful but have their limitations.

Toward the end of last year, we conducted tests together with **Terma** to determine whether our RF-testing drone could also test and validate radar system performance at the site where the radar is deployed. For the purpose of the demonstration, two radar systems were used. One deployed on land and one at the coast. We then measured the radar systems to validate the simulations done by Terma showing how the radar systems are affected by multipath lobing, such as reflections from ground and water.

The tests were successful, meaning we can provide insights from on-site measurements of radars in its operational environment anywhere in the world. This enables a wide range of use-cases that can assist in ensuring radar system performance in a way that has not been possible before. This would of course be a critical response to ensuring they don't cause interference, but it could also be applicable to a wide-range of use-cases, such as measuring the effect of buildings and topography surrounding a radar, or even how the radome covering the radar antenna might change characteristics over time.

## THE WAY FORWARD

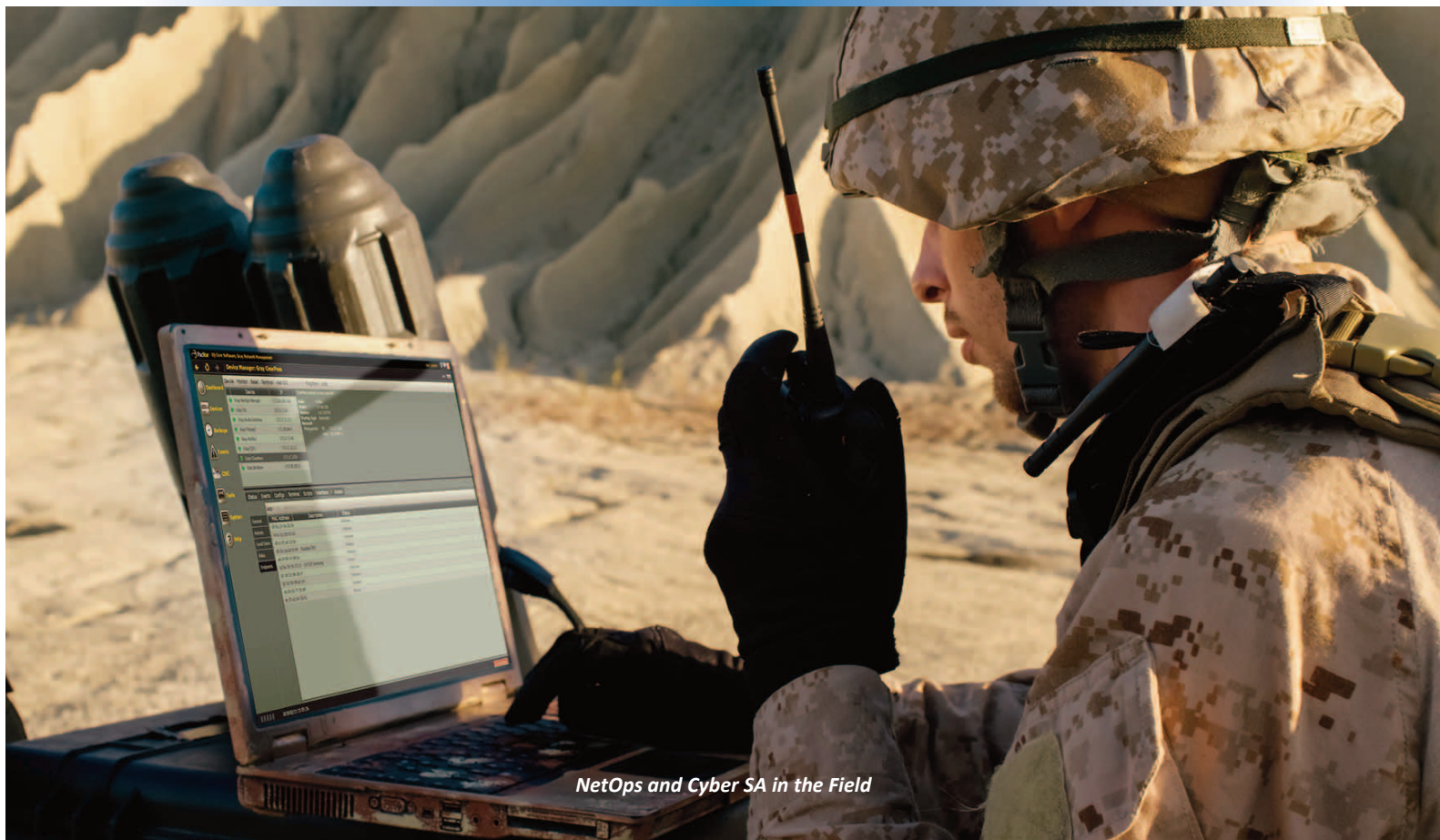
Radar interference is a complex challenge that cannot be easily resolved. There will always be instances when it occurs and the resolution will remain a case of moving other satellite capacity. However, through a combination of raising awareness, ensuring compliance, and testing performance, we can start to reduce instances and mitigate the effects.

[www.quadsat.com](http://www.quadsat.com)



Author Joakim Espeland is the Chief Executive Officer at QuadSAT.





*NetOps and Cyber SA in the Field*

## A SINGLE PANE OF GLASS APPROACH FOR MANAGING NETWORK COMMS AT THE EDGE OF THE BATTLEFIELD

*By Charlie Kawasaki, Chief Technical Officer, PacStar*

**The promise of the networked battlefield is now a reality. Actionable intelligence can be shared over the network in real-time, from the command post to ground vehicles on the move, to ships at sea, to the manned and unmanned aircraft and satellites above, and to the warfighter at the edge of network.**

Meanwhile, the setup and management of deployed military networks becomes more complex as they leverage mature commercial enterprise technologies, and in some cases even use unsecured in-country cellular and telecommunication systems. It often takes days to get a battlefield network up and running, but U.S. Army leaders believe that in future operating environments, against a peer threat, forces will have to move on an hourly basis.

Stationary bases like those established in Iraq and Afghanistan won't meet requirements. What's more, warfighters need **Cyber Situational Awareness (SA)** capabilities that deliver comprehensive information about the status of the network and the digital ecosystem it supports. Battlefield networking is a mission-critical service, but cyber is now a

contested domain. Commanders rely on the network for visibility into all facets of battle, so networking programs must ensure network availability and defense against cyber attack.

The goal for next generation Army command posts programs is for networks to be powered up and receiving live feeds in five minutes. Wireless networking capabilities will be key to meeting this goal, making it possible to set up and tear down the network in only minutes, instead of hours or days after warfighters establish operations in a new location. The simplification of battlefield **information technology (IT)** and cybersecurity will be essential so that lightly trained personnel can rapidly set up a network in the field. Likewise, network management must be simplified to ensure that the battlefield network stays up and running and commanders have a single, clear view of the network's health and status at all times.

Gaps in understanding tactical network architecture, network status, cyber posture, and the spectrum/EW environment can hamper a commander's ability to make fully informed decisions at the tactical edge. U.S. DoD must retool its management of network, communications, and

spectrum to maintain tactical overmatch in the cyber warfighting domain. Programs advancing concepts such as Joint All Domain Command and Control (JADC2) and Cyber Situational Understanding are beginning pilots to address subsets of well-known challenges in these spaces. The complexity of gathering and fusing data from multiple sources — particularly in disconnected, intermittent and limited (DIL) environments — necessitates progressing towards the ultimate vision of a unified network, one step at a time.

Today, tactical programs have a critical need for Cyber SA across defense information systems. Cyber SA enables cyber professionals and decision makers to gain a clearer picture

of what is happening across DoD networks, and ultimately, a bird's-eye view of the entire digital ecosystem. Network operations (NetOps) encompasses not only Cyber SA, but also a broader operational framework that includes network planning, management, configuration, and monitoring to operate, manage, and defend defense networks.

Tactical NetOps programs can play a key role in enabling mission success for warfighting in the cyber domain. They have access to the network architecture, network health data, and the 'pipes' to distribute that data to commanders wherever they are. Advances in NetOps tools hold the key to providing understanding in the cyber domain, enabling commanders in the future to have complete cyber understanding.

The goals and gaps outlined above apply to vehicle-based networks, in addition to command post networks. The Department of Defense (DoD) is currently making major efforts to develop comprehensive "standards-based communication" for these platforms, such as the U.S. Army's Vehicular Integration for C4ISR/EW Interoperability (VICTORY) initiative. While the resulting standards help improve interoperability, data bus functionality and messaging services within ground vehicles, there are few solutions to the challenges involved in configuring and managing the overall theater and battlefield networks that connect all the platforms and warfighters.

## COMMS MANAGEMENT CHALLENGES

Today's deployable comms teams use "best of breed" solutions, including a large number of satellite and radio technologies from multiple vendors. These teams have to deal with multiple vendor user interfaces, extensive training requirements, complex and error-prone



Addressing Communications Management Challenges.

configuration and long setup times. Associated with these challenges was the need for multiple IT professionals to deploy in the field, and high training expense for users.

NetOps and Cyber SA demand rapid and continuous innovation to meet evolving threats to DoD information dominance, as well as to address the key challenges that program managers and technical operations personnel face with network management, including:

- **DoD overwhelmed by NetOps tools:** Achieving its strategic vision for network management requires DoD to address the proliferation of NetOps tools. By some estimates, one DoD organization alone is using more than 140 NetOps tools, and in some cases, these solutions are duplicative. Simplifying network management requires a more unified, intuitive experience that has not existed in the past. At the same time, these tools should leverage open standards able to deliver a common look and feel so that new capabilities can be easily integrated and used with minimum training.
- **Staffing and Training:** The volume and sophistication of tools require network specialists capable of managing networks. These specialists are difficult to recruit, train, and retain.
- **Pace of innovation:** DoD is excelling at rapidly fielding high-impact technology and leveraging the pace of innovation from the commercial sector. The flip side is that rapid adoption of new network technologies creates integration challenges and increases the network management learning curve. No one network vendor has all of the solutions, which results in the use of multiple user interfaces and disparate tools that drive up complexity.
- **Expanded network:** Increased automation to manage network operations and manage cyber vulnerabilities is required as networks and their attack surfaces grow with the addition of more sensors and IoT devices.

## NETWORK MANAGEMENT SOLUTIONS FOR NETOPS + CYBER SA REQUIREMENTS

Network management solutions that unify NetOps and Cyber SA capabilities should be able to deliver on several key requirements:

- *Use open or industry-recognized standards for network management and data storage; examples include, but are not limited to, Simple Network Management Protocol (SNMP), Secure Shell (SSH), flow data, logging (SYSLOG), JSON, SOAP*
- *Provide a configurable GUI (drag/drop, drop-down menus, etc.), visual map of network and services*
- *Provide visual fault indication with context available surrounding the fault (location, device, interface, service, IP, etc.)*
- *Provide configuration management functions (baseline, backup, and alerts of configuration change)*
- *Provide the ability to assess the security posture of network devices and remediate deficiencies (i.e., OS versioning, deviation from a previously determined security template)*
- *Work in a hierarchical model construct (company, brigade, battalion, etc.) which can be configured to restrict or delegate read/write functions of the tool*

## AUTOMATING NETOPS AND CYBER SA

Fulfilling the vision of converging NetOps requires a solution that offers the ability to view the entire network through a single pane of glass while sharing access with deployed operators at any echelon. Such a solution should provide the following benefits:

- *Ease and Speed Setup Time — Provide an intuitive user interface, making communications set-up and operation quick, easy to learn, and recall. Solutions should include customizable user interfaces and roles-based access control — with tailorable access to features, depending on user experience level — to reduce training time and costs.*
- *Reduce Configuration Errors — Significantly reduce configuration errors and assist organizations to maintain uptime, performance, and compliance with cybersecurity requirements.*
- *Simplify Troubleshooting — Simplify troubleshooting through integrated tools for both entry-level and advanced network administrators, to reduce reliance on contract Field Service Reps.*
- *Save Time — Automate complex, time consuming and error-prone tasks with powerful wizards, using common user interfaces across hardware and software components.*
- *Provide Cyber Situational Awareness — Deliver enhanced network and cyber SA at the core and edge of the network with extensive real-time status, alerts, and auditing.*
- *Facilitate Remote and Distributed Management — Facilitate remote management with the ability to monitor and change device configurations and troubleshoot from anywhere in the world.*
- *Streamline Innovation — Interoperate with a broad range of the most popular tactical and enterprise communications hardware, systems, and protocols- to streamline upgrades and adoption of new COTS technologies at the edge of the battlefield.*
- *Field Proven — Reduce acquisition risk because widely deployed, proven, and certified for DoD use.*

An example of a single pane of glass solution for managing and automating NetOps and Cyber SA that is available today is provided by **Curtiss-Wright's PacStar IQ-Core Software**. This software, which is currently being integrated into the Army's tactical network, addresses the growing problem of communication system management complexity.

IQ-Core Software is a comprehensive secure-communications management software that is designed to manage enterprise mobility solutions, tactical networks, and remote communications solutions, including supporting operations in disconnected, intermittent, and limited environments.

[pacstar.com/](http://pacstar.com/)



Charlie Kawasaki joined PacStar in early 2005 to lead the company's technology strategy and future product roadmap for its proprietary product lines. Charlie current leads PacStar strategic initiatives – investigating and developing new integrated solutions and technologies to meet customer needs, in particular, focused on areas such as Commercial Solutions for Classified (CSfC), Cybersecurity, and Edge Computing. Charlie works closely with technology and product teams from our largest partners to create joint solutions, leveraging PacStar core technologies to create optimal tactical and expeditionary solutions. Charlie also serves as a technical and product evangelist raising awareness for PacStar solutions in our target markets and customers.



Charlie has extensive experience in product development, software engineering, technology licensing, patent development, business development, product marketing, general management and M&A. Charlie has over 35 years experience in early stage technology companies, creating dozens of software products for Internet infrastructure, cybersecurity, PC management, and relational databases. Charlie served as CEO of RuleSpace, Inc., which created AI-based Internet parental controls applications used by companies such as AOL, Yahoo and Microsoft. Before RuleSpace, he held product development and engineering management roles at companies including The Palace, Inc., Creative Multimedia Corp., Central Point Software, Inc., Asymetrix Corp. and Microrim, Inc. In 2019, he was named Outstanding Industry Collaborator by Oregon State University.



**The Norwegian Space Agency (NOSA) has enlisted Canada's Space Flight Laboratory (SFL) to develop the NorSat Technology Demonstrator (TD) smallsat. With a primary mission of testing out new technologies in space, NorSat-TD will validate payloads and concepts from Norway, the Netherlands, France, and Italy.**

SFL, which developed the operational NorSat-1 and -2 smallsats launched in 2017, as well as NorSat-3 that is expected to launch in Q2 2021, has been contracted to design and build the NorSat-TD spacecraft and perform integration and testing of all systems and payloads. NorSat-TD has completed its final design review and been slated for launch in 2022.

*"The Norwegian Coastal Administration relies on NorSat-1 and -2 to accurately track large commercial vessels in its territorial waters and beyond,"* said SFL Director, Dr. **Robert E. Zee**. *"NorSat-TD will fly technology that is planned to augment the ship tracking capability of Norway with a miniaturized AIS-receiver and aims to expand the technology available for future missions, including micropropulsion, precise point positioning and laser-based communications."*

NorSat-1, -2 and -3 were built on SFL's 15-kg NEMO microsatellite platform, measuring 20x20x40 cm. Due to the additional payloads planned for NorSat-TD, the demonstration satellite will be developed using SFL's larger 30x30x40-cm DEFIANT microsatellite bus with a mass of 35 kg.

*"You can think of DEFIANT as a NEMO platform that doesn't require a dispenser,"* said Zee.

NorSat-TD represents impressive technological collaboration among European nations. Multiple advanced or experimental payloads will see their first applications on-orbit aboard the smallsat:

**Fifth Generation AIS Receiver** — *An advanced version of the Automatic Identification System (AIS) receivers developed by Kongsberg Seatex of Trondheim, Norway, as primary instruments for the first three NorSats, this miniaturized device with CubeSat form factor will receive AIS signals broadcast by large commercial maritime vessels. AIS enables the locations and status of ships to be tracked and monitored. The new NorSat-TD receiver will also be used to test the Internet of Things in the Arctic, according to NOSA.*

**Small Communication Active Terminal (SmallCAT)** — *Developed by TNO, the Netherlands Organization for Applied Scientific Research, this instrument is also intended to support the Norwegian Defence Research Establishment's experiments with laser communications between the satellite their ground station, a potential gamechanger in the data volume that is possible from microsatellites in orbit.*

**VHF Data Exchange System (VDES)** — *From Space Norway, an advanced communication system that first flew on NorSat-2 has been improved to enable higher bandwidth, more reliable two-way communications among and between satellites, ships, and land. Working together, NorSat-2 and NorSat-TD will provide greater communication capacity for ships in Norwegian waters, according to NOSA.*

**Onboard Laser Reflector** — *A miniaturized laser reflector developed by the Italian INRI SCF research laboratory will be used to track NorSat-TD with ground-based lasers in Norway, France, and Italy.*

**Satellite Collision Avoidance** — *Space Star, a space-based GPS instrument developed by Fugro will be tested as a highly accurate means of determining a satellite's position in orbit for improved situational awareness.*

**Iodine-Fueled Electric Propulsion - ThrustMe**, *a French startup, has developed a new thruster designed to change a satellite's orbit, which will be tested on NorSat-TD. One potential future use of the thruster will be to move a spent satellite to a lower orbit, so it burns up in the Earth's atmosphere rather than leaving behind space debris.*

NorSat-TD will be the seventh satellite developed by SFL for Norway. SFL built and integrated the AISSat-1 nanosatellite launched in 2010 to determine if reception of AIS signals in orbit was feasible. AISSat-1 proved so robust that Norway soon commissioned it as an operational ship-tracking mission. Subsequently, additional AISSats were built and launched and a new line of higher capacity microsatellites, the NorSats, were developed.

*"NOSA is glad to be working with SFL on this demanding project. The flexibility of SFL and their micro-satellite platforms have met the varied and demanding challenges of this multi-mission technology demonstrator. We feel that this mission is again pushing the envelope for what we are able accomplish with these fast-paced low footprint projects,"* said NorSat-TD Project Manager, **Tyler Jones**.

SFL offers a complete suite of smallsats that satisfy the needs of a broad range of mission types from 3 to 500 kilograms. Dating from 1998, SFL's heritage of on-orbit successes includes 65 distinct missions related to Earth observation, atmospheric monitoring, ship tracking, communication, radio frequency (RF) geolocation, technology demonstration, space astronomy, solar physics, space plasma, and other scientific research.

In its 23-year history, SFL has developed smallsats that have achieved more than 135 cumulative years of operation on-orbit. These missions have included SFL's attitude control and, in some cases, formation-flying capabilities. Other core SFL-developed components include modular (scalable) power systems, onboard radios, flight computers, and control software.

# LAUNCHING TOWARD A RESILIENT SPACE INDUSTRY: THE DIRE NEED FOR INCREASED FLEXIBILITY

By Grant Bonin, Senior Vice President of Business Development, Spaceflight

**During 2020, the pandemic created massive disruptions, halting access to space by causing launch delays, inhibiting teams from progressing the production of satellites and limiting access to launch sites across the globe.**

While COVID-19 has generated plenty of unique circumstances, many of the challenges it's created are similar to those that frequently hinder the prosperity of the space industry. The pandemic simply exacerbated these challenges, generating increased determination to uncover innovative approaches to the launch experience that improve flexibility.

Before the pandemic, a **Bryce** report found that 100 percent of smallsats on commercial launches during the last five years experienced launch delays in some form. Delays leave satellite developers incapable of getting revenue-generating assets in space on time and unable to validate a satellite's capabilities, curbing future funding opportunities. No company is immune to delays, so it is critical to establish processes and services that enable flexibility to address these delays.

The space industry has matured with the prevalence of commercial companies, but now problems, such as the impacts of delays, have arisen and there's a need to innovate further to address these challenges. By leaning into remanifestation, subscription pricing models and on-orbit transportation services, the flexibility required to minimize the impact of unpredictability can be achieved.

## PREPARE TO REMANIFEST

As the Bryce report makes apparent, delays are inevitable. By not putting all the eggs in one (launch) basket, satellites aren't bound to a particular vehicle and this is valuable in the case of a delay.

Whether the delay is related to satellite or launch provider readiness, quickly remanifesting to another launch can cut down on delay time and enable satellite developers to manifest a mission that is as close to their desired launch window as possible. The process of moving to a different vehicle swiftly can decrease the unproductive down time on the ground and better protect satellite companies from the uncertainties of the launch market.

In the event that a mission needs to be remanifested, it goes without saying it's crucial to work with a team of mission management experts who have years of first-hand experience working with a variety of launch vehicles, site locations, and processes.





*Spaceflight's Sherpa-FX OTV.*

### CONSIDER THE SUBSCRIPTION MODEL

Cash is king across all businesses in every industry. In an industry that is blighted with unpredictability and uncertainty, it is important to seek opportunities that establish consistency when possible. New deal structures that have proven successful in other industries can be applied to space companies. The model that is most likely to see success and provide maximum flexibility is the subscription model.

Leveraging a subscription model provides launchers with predictable visibility into their cash flow and helps them profit from the compounding benefit of customer relationships and commit to exceptional service.

For satellite developers, subscriptions can help preserve a level of schedule stability and certainty. Satellite companies secure a layer of flexibility by obtaining space on various missions rather than just one, permitting the payloads to easily spread across multiple missions to lessen risks. In an industry as unpredictable and uncertain as the space industry, subscription models can provide major benefits to all parties affected by delays.

### USE ON-ORBIT TRANSPORTATION VEHICLES

Flexibility can go beyond the booking and launch process and extend to on-orbit transportation in space. There is new hardware that enhances flexibility, even after a successful launch.

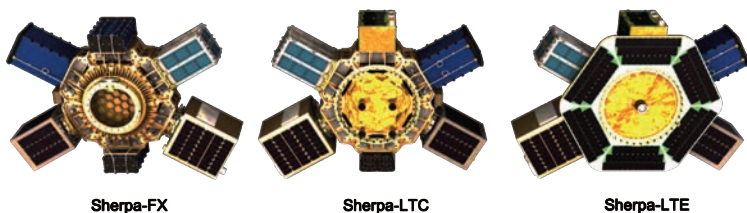
Orbital transfer vehicles (OTVs) are spacecraft that provide on-orbit transportation and can act as smallsat deployers designed to modify orbit coordinates. Generally, launches that cater to a satellite developer's uncommon orbit destination don't exist at an affordable price because they need to purchase an entire rocket.

OTVs are suited to enable flexible manifest changes, execute deployment to multiple altitudes and orbital planes, and offer rapid launch solutions. This new, innovative in-space transportation will revolutionize launch options available to the industry, expanding services and capabilities offered while increasing affordability, mission assurance and flexibility.

While launch delays will never disappear completely, flexibility can mitigate the negative impacts they create. Flexibility encompasses a number of moving pieces that have the potential to revolutionize the industry and launch experience.

By planning and preparing for a range of challenges and delays, the industry will be better shielded from the ambiguities and disruptions experienced while trying to get spacecraft on orbit.

[spaceflight.com](http://spaceflight.com)



*Spaceflight's trio of OTV spacecraft.*

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## IS AI THE ANSWER TO INTERFERENCE PROBLEMS?

By Helen Weedon, Managing Director, Satcoms Innovation Group (SIG)

**Over the years, the SATCOM and MILSATCOM market segments have developed a whole host of tools and processes for dealing with satellite interference. These range from proactive measures such as employee training, bilateral coordination and antenna type approvals, to reactive and proactive measures that enable operators to detect and resolve the interference once it occurs.**

Interference has certainly not gone away; however, operators are better equipped to manage it than they were just a few years ago. That said, it continues to cause service degradation and cost operators precious time and resources. How do we get better? Could Artificial Intelligence (AI) be the answer?

### THE POTENTIAL OF AI

AI has long been touted as the next best thing for many applications, from resolving issues to creating efficiencies. While many people have seen its potential for a number of years, the technology is steadily improving, thus increasing its value as a tool for various applications.

According to an article in *Information Age*, 2021 will see some significant developments with AI being used especially in construction, to fight climate change, and in medical applications. But what about the satellite industry?

To date, the satellite industry has not really fully embraced the potential of AI. I find that surprising in many ways, because if there is one thing you need for AI to work well, it is good data, and that is something the SATCOM industry has in abundance, but perhaps that lies in the complexity and sensitivity of the data. As the technology improves, maybe that is starting to shift.

There is certainly movement in the correct direction. Toward the end of last year, **CGI** was awarded a contract by **ESA** to develop an AI enabled platform for global SATCOM.

There have already been a number of research projects undertaken looking at its potential for SATCOM. I personally remember a number of presentations at our various workshops with research into applications, mainly focused on error resolution. For example, the **Centre Tecnològic de Telecomunicacions de Catalunya (CTTC)** presented how it has been using *Signal Correlation*, *Machine Learning (ML)* and AI to compare RF signals for interference detection.

## AI TO RESOLVE INTERFERENCE

When it comes to resolving interference, AI can have two major uses to help operators. On the one hand, it can be used for interference prediction. This is about using data from both operations measurements or alarm systems and many external sources such as certain calendar events or decision making outside of SATCOM related topics to classify interference scenarios.

As such, the system can raise an alert when the probability of a certain event is imminent. Of course, this all starts with having usable data (past and present) in the first place, analysing that data then using machine learning to build an interference scenario repository. It is at that point we get to apply AI to resolve the probabilities of scenarios occurring and thus create an advanced warning system.

All over, we need to tell the AI algorithm what it shall look for and let it learn with that to answer further questions — but never fully autonomously as we need to check upon the quality of decision making. This could go a step further and suggest possible ways to resolve a particular interference scenario.

Such an approach has been successfully demonstrated by CTTC. It began by demonstrating automated GSM interference retransmission detection based on I/Q samples and has since carried out projects to identify other types of interference correlation, such as ASI and XPOL. This means that interference detection and analysis can be done in the background without needing human intervention at that initial stage.

While being able to predict interference issues faster is certainly going to help reducing any impact and being able to proactively allow advanced warning of any likely situations from occurring in the first place. For example, by correlation of the current situation with past similar events, looking at potentially probable future fixed events in the calendar.

Pilot projects have already been started to find the right mathematical correlation functions using the right input data we have. With enhanced techniques as ML, we are ready to take AI a step further. To get to that point, how do we translate those initial steps into reality now?

## THE MUST HAVES

It is not enough to do AI for the sake of AI. There are a number of key factors that need to be carefully considered before embarking on such a project.

1. Does the person operating the AI tool understand the manual process?

*It is absolutely critical that the operator knows what they are doing manually. If that is not the case, they will not be able to easily spot any errors with the AI tool and they will not be able to react and manually carry out the process being automated without that. AI is the “digital assistant” to any operations. It is only useful if it is eventually used more often than it is ignored.*

2. Can the AI be manually overridden?

*The idea of AI being used in space and not being able to be overridden is quite frankly very scary. As well as ensuring the person operating the AI tool understands the manual process, it is important to have an infrastructure in place to enable manual intervention. If we push automation so far that decision making is revoked, then the potential for it to go wrong is huge, and that is something we can ill afford in the satellite environment.*

3. Is the data quality good enough?

*As mentioned above, in the satellite environment we certainly have a lot of data. The data used must be processed to produce reliable scenarios so an AI system can produce well qualified results, thereby giving accurate and high probability of future events. For AI to be useful we need to avoid too much manual interaction — by definition for what ever reason. Once it could be that the input data is of poor quality and the AI process can't find a solution automatically, another time, it could be that the AI algorithm is not performant enough for the issue in which we want AI to help us.*

4. Does AI make the process more efficient?

*Ultimately the entire point of using automation and AI is to make processes more efficient, free up time from your staff dealing with those difficult cases and save costs. It is important, therefore, to assess and compare how much efficiency is gained. If the increase is not significant, there is not enough value to warrant the time and expense to implement an AI system.*

## THE FUTURE OF INTERFERENCE MITIGATION

There is certainly a great deal of potential for AI in interference scenario detection and prediction. Any tools developed must ensure maximum efficiency without removing human intervention. If we can harvest the huge volumes of data available of interference instances, we can eventually train AI algorithms to be extremely effective at spotting those future event pattern probabilities by their own mathematics.

satig.space



Author Helen Weedon is the Managing Director of the Satcoms Innovation Group (SIG)





## GOVERNMENT SATELLITE REPORT

COULD MWR VIA SATELLITES HELP SOLVE MILITARY RECRUITMENT AND RETENTION?

By Ryan Schradin, Executive Editor

**The ongoing COVID-19 pandemic has been incredibly difficult and trying on the American people. Despite some businesses, schools, and offices reopening, Americans have been mostly sequestered in their own homes since March — going out only when necessary, forsaking public gatherings, and keeping their distance from friends, family, and loved ones.**

While this has been hard on everyone, technology has been there to help somewhat soften the blow.

*Netflix, Hulu, HBO Max, Peacock*, and every other online video streaming service — with the exception of maybe *Quibi* — have helped to keep people entertained. *Zoom, Microsoft Teams* and other online collaboration and video conferencing solutions have helped us see our distant loved-ones face-to-face.

They've also kept us connected and collaborating with our coworkers. Cloud-based applications and virtual desktops have made remote work both possible and effective. And a combination of delivery services and dedicated essential workers have kept us fed and supplied.

But what would happen if we didn't have access to these services, tools, and capabilities? It's an almost unfathomable scenario to consider for many of us that simply take these things — smart devices, online services, and the prevalent bandwidth that enables them — for granted in our everyday lives.

However, there is a large population of our fellow Americans that don't have access to the modern conveniences and capabilities that ubiquitous broadband connectivity and highspeed terrestrial cellular networks have delivered to much of our country. That group includes deployed soldiers — many of whom are stationed in places where



terrestrial networks are either untrusted or denied. Or, in some extreme cases — such as with U.S. Navy personnel stationed on ships-at-sea — those terrestrial networks are simply unavailable.

As [Nicole Robinson](#), the SVP of Global Government at **SES**, recently explained during a webinar for press and satellite industry experts entitled, *“The Government Network Architecture of the Future,”* this is creating a serious personnel problem for today’s military.

*“New generations of warfighters are growing up with [smart devices]. They have access to social media tools and different ways to connect with friends and loved ones,”* she explained. *“When they forward deploy, they’re expecting access to those devices and services, but that’s not currently the case.”*

This problem has only worsened during the global COVID-19 pandemic as it’s keeping soldiers and sailors deployed and quarantined from their loved ones. As the **USO** recently explained on their website:

*“...because of the COVID-19 pandemic, many Navy ships have been ordered not to come into port, meaning that service members currently aboard these ships have been stuck at sea for months. Some*



*Hospitalman Maria Perez has her temperature taken as she enters the Naval Support Activity (NSA) Bethesda Fitness Center. Connectivity and MWR were challenges for the military prior to COVID-19 that have only been exasperated by the ongoing pandemic. (Image courtesy of U.S. Navy Mass Communication Specialist 2nd Class Julio Martinez.)*



Liftoff of O3b satellites is courtesy of Launch Provider Arianespace.

have been at sea for nearly half a year. Of the Navy ships that do come into port, their visit is far from normal. Service members must stay quarantined, away from contact with others, to ensure no exposure and spread of COVID-19 on the ship...”

How can we keep deployed or geographically-isolated soldiers and sailors connected to their loved ones? How can we keep them engaged and entertained at a time when a global pandemic has extended deployments and demanded quarantining? And how can we keep the morale of our warfighters high before it starts to impact retention and future recruitment?

The use of satellite solutions for morale, welfare, and recreation (MWR) could provide the answer.

### SATELLITE AS AN MWR SOLUTION

The military has long relied on satellite communications in places where terrestrial networks are unavailable, untrusted or otherwise denied. The same commercial satellite connectivity that has been relied on for communications in theater can be used for military MWR initiatives to deliver connectivity to soldiers and sailors stuck at-sea and overseas.

In fact, with today's advanced commercial satellite solutions — including **High Throughput Satellites (HTS)** in orbits that are closer to Earth than **Geostationary Orbit (GEO)** — such as **Lower Earth Orbit (LEO)** and **Medium Earth Orbit (MEO)** — they could deliver even more services to military users.

The low-latency, high-throughput capability of HTS satellites in LEO and MEO orbits — including the SES **O3b MEO** satellite constellation — is capable of delivering fiber-like connectivity to practically anywhere on the planet. That means that the same highspeed, high-bandwidth connection that today's next generation of warfighters have been raised with and rely on can be delivered to them, regardless of where they are located on Earth.

This isn't a revolutionary idea. It's something that is widely used in private industry. This was well illustrated by **Brad Grady**, a Principal Analyst at space and satellite industry analyst firm, **Northern Sky Research (NSR)**, when he asked, “Why can my family go on a cruise ship and get [an] incredible connection, and then I can go on an [aircraft] carrier and the connection is terrible?”





As the next generation of warfighter enters the military — individuals that were raised with mobile devices in their pockets and who consider connectivity more than just a convenience — this disparity is quickly becoming a problem. This is a problem that is being exacerbated by the global pandemic that has, quite literally, left American warfighters stranded overseas and at-sea.

This lack of connectivity couldn't be happening at a worse time, when the U.S. military is actively seeking to recruit and retain troops as part of larger efforts to increase military readiness.

"A small number of Americans serve in our armed forces and they have growing expectations," explained Rep. [Jackie Speier](#) at a recent House Armed Services Committee subpanel examining military recruitment and retention, "The competition for the limited talent is fierce."

According to [Nicole Robinson](#), part of the solution could involve putting a piece of home in the pockets of servicemen and women. "The

military needs to improve retention for soldiers, sailors, and airmen," she explained. "Part of that is having access to data – having access to creature comforts when they're deployed."

Commerical Satellite Communications (COMSATCOM) solutions — especially HTS constellations at LEO and MEO — could make that a reality for the military, both during the ongoing pandemic and well into the future.

This article first appeared on [GovSat](#) and is reprinted with permission by GSR and [SES GS](#).

Opening image is by [Chris Henry](#).

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