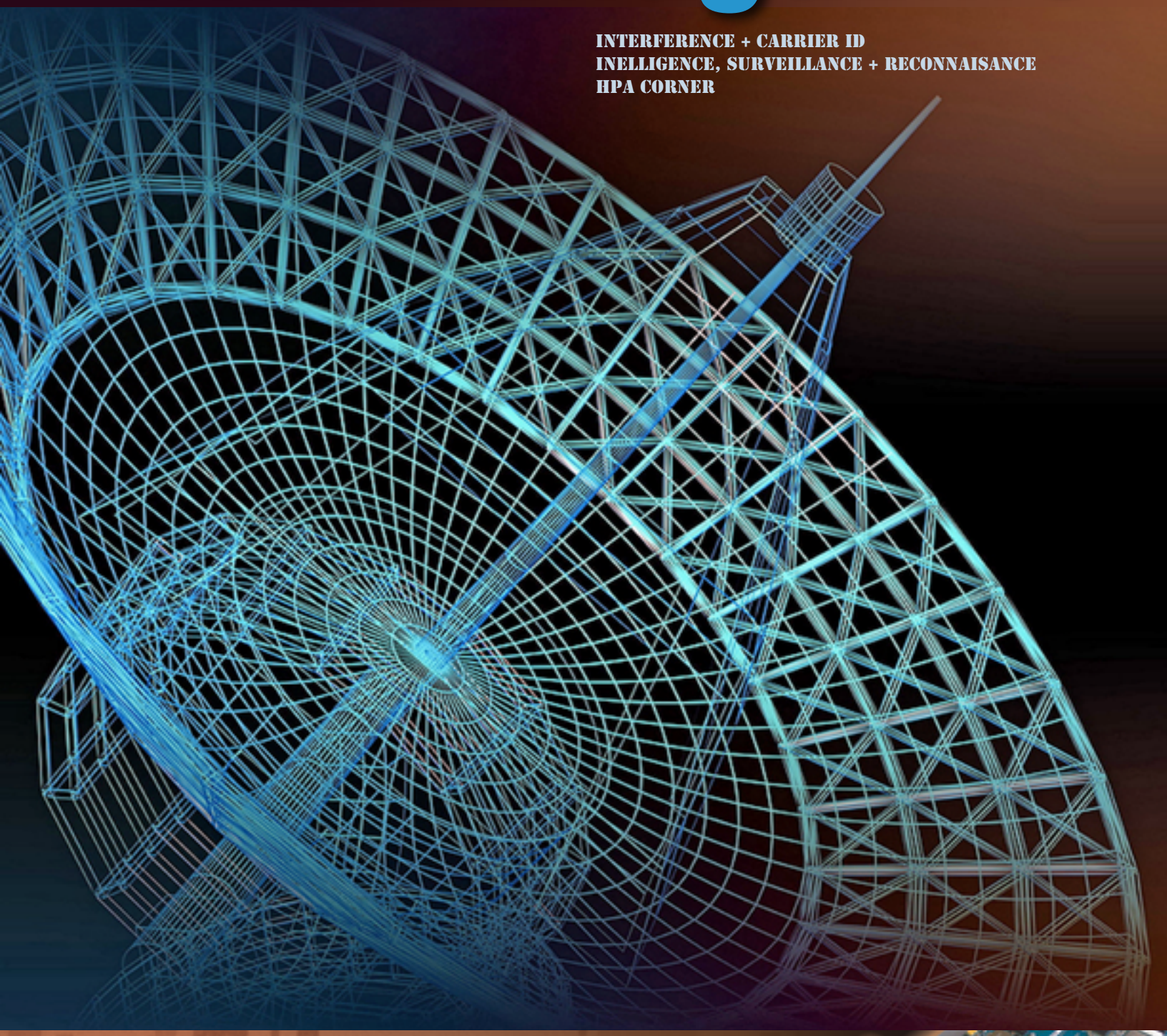
SATCOM For Net-Centric Warfare

January 2016

MilsatMagazine

INTERFERENCE + CARRIER ID
INELLIGENCE, SURVEILLANCE + RECONNAISANCE
HPA CORNER



MilsatMagazine

January 2016

PUBLISHING OPERATIONS

Silvano Payne, Publisher + Writer
Hartley G. Lesser, Editorial Director
Pattie Waldt, Executive Editor
Jill Durfee, Sales Director, Editorial Assistant
Simon Payne, Development Director
Donald McGee, Production Manager
Dan Makinster, Technical Advisor
Sean Payne, Small Satellite Specialist

SENIOR CONTRIBUTORS

Tony Bardo, Hughes
Richard Dutchik, Dutchik Communications
Chris Forrester, Broadgate Publications
Karl Fuchs, iDirect Government Services
Bob Gough, Carrick Communications
Jos Heyman, TIROS Space Information
Carlos Placido, Placido Consulting
Giles Peeters, Track24 Defence
Koen Willems, Newtec

AUTHORS

Petter Amundsen
Matthew Bearzotti
Glenn Colby
Martin Coleman
Roger Franklin
Eric Hall
Christopher M. Hudson
Rick Lober
Capt. Nicholas Mercurio
Nancy Rey Nolting
Tech. Sgt. Paul Rider
Nicole Robinson
Amy Walker
Rory Welch
Mark Wiggins
Koen Willems
1st. Lt. Hans Zeiger

ADVERTISER INDEX

DISPATCHES

FEATURES

MilsatMagazine is published 11 times a year by Satnews Publishers, 800 Siesta Way, Sonoma, CA 95476 USA,
Phone: (707) 939-9306, Fax: (707) 939-9235

Advantech Wireless | SMARTER SOLUTIONS, GLOBAL REACH.

GOVERNMENT & MILITARY SOLUTIONS

ENABLING FASTER & MORE SECURE COMMUNICATONS FOR MILITARY & GOVERNMENT LEADERS

- Complete Military SATCOM Solutions
- Advanced GaN for Radar Applications
- Second Generation GaN Troposcatter Amplifiers

At Advantech Wireless, we have over 25 years of experience in helping military special forces and government agencies by delivering cutting-edge innovations in communications that solve mission critical communications challenges.

We understand the challenges that government & military forces face and our technologies bring them the freedom to communicate beyond line of sight quickly, reliably and securely.

WGS CERTIFIED

Multi Services
VSAT Solution

Second Generation
GaN based SSPAs/SSPBs

TROPOSCATTER Modular
Solid State GaN Power Amplifiers

Higher Power and higher Information rates for Mission Critical Operations

sales@advantechwireless.com

www.advantechwireless.com/gov

DISPATCHES

Space & Missile Systems Center's GPS III Satellite Build Invitation

The Space and Missile Systems Center released a solicitation on January 8 seeking proposals for the Global Positioning System's GPS III Space Vehicles 11+ Phase 1 Production Readiness Feasibility Assessment contract.

This solicitation is for a competitive, firm-fixed-price acquisition with up to three contracts not to exceed $6 million, with a base contract of $5 million and a 26 month period of performance, plus two $0.5 million options with a six month period of performance for each option awarded, for a total possible period of performance of 38 months. SMC's GPS Directorate intends to award the GPS III Phase 1 contract in the third quarter of fiscal year 2016.

The scope of this effort includes insight to the contractor's readiness efforts in preparation for the Phase 2 competition for production SVs and includes access to design artifacts as well as a demonstration of navigation payload capability.

GPS III SV11+ will use the current GPS III SV01-08 requirements baseline with the addition of a redesigned Nuclear Detonation Detection System Government Furnished Equipment (GFE) hosted payload, a Search and Rescue/GPS GFE hosted payload, a Laser Retro-reflector Array GFE hosted payload, Unified S-Band compliance capability, and a regional military protection capability.

No changes are allowed to the GPS Next Generation Operational Control System or Military GPS User Equipment interfaces.

Operated by U.S. Air Force Space Command, the GPS constellation provides precise positioning, navigation and timing services worldwide seven days a week, 24-hours a day.

"*Industry told us they were ready to compete for the GPS III space vehicles. We listened and are looking forward to working with industry to assess the feasibility of a follow-on, competitive production contract*," said Col. Steve Whitney, director of SMC's GPS Directorate.

Joint Fires Teamwork Model Tested By National Guard

Members of the Army and Air National Guard from Washington state, California and Oregon joined in a test of battle communications and force integration at Camp Murray, Washington over a few days last November.

This was the first ever squadron-level joint live, virtual and constructive joint fires training event that tied digital simulations involving air support operations squadrons, an air support operations center and tactical operations centers into live field training.

Led by the Washington Air National Guard's 116th Air Support Operations Squadron and 111th Air Support Operations Squadron, Exercise Cascade Warrior 2015 drew participation from the California Army National Guard's 40th Infantry Division, the Oregon Army National Guard's 41st Brigade Combat Team and Washington's 81st Brigade Combat Team.

A tactical air control party specialist from the 116th Air Support Operations Squadron assesses the exercise battlefield during Exercise Cascade Warrior at Joint Base Lewis-McChord. Photo by Tech. Sgt. Paul Rider.

Cascade Warrior included core joint terminal attack controller (JTAC) teams operating in a close air support simulator alongside two brigade tactical operations centers (TOCs) at the 116th ASOS, a new prototype simulator system running at the 111th Air Support Operations Center with 40th Infantry fires staff integration—all connected digitally and via radios and satellite to 116th ASOS JTACs in the field.

The ASOC simulator is a "*prototype for a system of record*" for Air Combat Command, said Senior Master Sgt. Greg Kassa, simulations operations chief for the 111th ASOC.

A separate simulator at the 116th is a pre-cursor for a large-scale 270-degree dome simulator that is set to be built in 2016 as part of larger Washington Air National Guard Close Air Support Simulations Center of Excellence at Camp Murray.

The exercise was the culmination of "*several years of hard work and progressive steps that started very simply on a bar napkin, and [it] has grown in scope each year*," Lt. Col. Raed Gyekis, commander of the 116th ASOS. "*It has now successfully expanded to include amazing out-of-state support by the entire Joint team from Washington, California, Oregon and agencies in the DoD.*"

The U.S. Air Force Research Laboratory provided support and equipment for the simulation. It was "*the first time ever for an ASOC to be using AFRL equipment in a real-world exercise*," said Dr. Leah Rowe, a senior research psychologist at AFRL, headquartered at Wright-Patterson Air Force Base, Ohio.

"*From a research perspective, allowing operators to use the system we designed in a real world scenario allows for better operational alignment for R&D*," said Rowe. "*It allows us to design training like we would use in the real world, to train like we go to war. We're able to harvest data from the system to make it more applicable to warfighting. Partnering with the Washington Air National Guard here has been a tremendous win for us. It's a win-win. They get training. I get research.*"

The AFRL simulator at the ASOC, with the help of several Washington Air National Guard communications experts and a lot of troubleshooting, vastly improved communications with participants throughout the simulation, said Gyekis.

"*This is a huge step forward, connecting our entire joint fires team in a Washington Air Guard exercise. Like we have in the past, we will continue to build on this year's success, as we link the new CAS Dome Simulator with the improved ASOC Sim and an even more robust training presence from our partners at the 40th Infantry Division, 81st BCT and 41st BCT*," said Gyekis.

At both of the Tactical Operations Center tents set up in the 116th ASOS compound during the exercise, a team worked to integrate the ASOC system. "*We try to mimic the machine at the ASOC*," said Staff Sgt. Justin Fajardo, of the 111th.

"*We want to make sure the players have the same setup as we do. All systems need to be talking with no errors on it. When things are not connecting, we put our brains together to keep the systems up.*"

"*We're getting our handshake down*," said Sgt. Ben Wiley, of the 41st Infantry Brigade, out of Oregon, as he worked in the TOC alongside TACPs from the 116th ASOS. "*The Air Force and Army are putting our ducks in a row for real-world situations.*"

"*We have to work together, support each other with assets and make ourselves more relevant for the fight,*" added Capt. Dean Blachly, of the 41st Infantry. "*We get to come up and see what [the airmen] do and share our perspective from the ground.*"

Soldiers and Airmen experienced different aspects of the exercise. "*The goal is to flow our Guardsmen through each of the stations, allowing them to experience the field perspective, the simulation perspective, and the operations center perspective—all three within the span of the same exercise,*" said Master Sgt. Nicholas Wise, operations superintendent for the 116th ASOS.

In a wooded area several miles away at Joint Base Lewis-McChord, JTACs and radio operator/maintainer/drivers (ROMADs) relayed information from the ground back to Camp Murray. "*The end state is calling in air strikes to put bombs on target,*" said Lt. Col. Erik Eliel, director of operations for the 116th.

Army Guard joint fires observers coordinated with the JTACs and ROMADs on the ground.

"*We're doing a lot of really good integration, coordinating fires, getting used to talking to each other, just like we do downrange,*" said Staff Sgt. Alex Wood, a joint fires observer with the 81st Brigade Combat Team.

"*Two wealths of knowledge come together and it's amazing," added Sgt. Paul Martinek, another joint fires observer with the 81st. "It's great to sit down and have face-to-face meetings so when we're downrange we'll know who we're dealing with.*"

Major Jeffrey Valenzuela, an air liaison officer in the 116th Air Support Operations Squadron, operates from a tactical operations center during Exercise Cascade Warrior, a joint fires integration and simulations exercise.
Photo by Tech. Sgt. Paul Rider.v

With a successful test of the ASOC simulator by the 111th ASOS in the books, the AFRL will enter into a memorandum of agreement with the 111th to become the first user of the new system starting in March 2016, around the same time that the 116th ASOS plans to open its immersive dome simulator facility. Furthermore, Air and Army Guard units will continue their work to improve live maneuver integration at Joint Base Lewis-McChord, said Gyekis.

Air Combat Command observers were on hand at Camp Murray and Joint Base Lewis-McChord for the exercise to "*see what's possible, how to do it and how this same training can be exported to other states,*" said Gyekis. "*It's a great opportunity for Washington and our West Coast Guard partners to lead the way with joint fires.*"

Lt. Col. Craig Sandman, cell chief for the 40th Infantry Divisions Joint Air Ground Integration Cell, who brought his team from California to participate in the exercise, emphasized the opportunity for ongoing collaboration.

"*Instead of separate efforts, it's all one team effort,*" said Sandman. "*We will definitely be a part of this again next year.*"

Article by 1st Lt. Hans Zeiger, 194th Wing, USAF

Early Entry SATCOM Capabilities For US Army

In an increasingly complex world, the Army must be capable of supporting multiple contingencies simultaneously and at a moment's notice, with the ability to rapidly deploy and communicate anytime, anywhere, at every stage of operations.

A new duo of light-weight, portable satellite terminals, called Transportable Tactical Command Communications (T2C2), will provide early entry units in air-to-land missions, as well as follow-on units at the tactical edge, with a lite (v1) and heavy (v2) variant of high-bandwidth, deployable satellite dishes, to keep Soldiers and Commanders connected to the network and well informed.

"*Our mission as an Expeditionary Signal Battalion (ESB) in the Pacific is to deploy on short notice anywhere within the course of the Pacific theater, which is over 50 percent of the globe,*" said Lt. Col. Mark Miles, commander for the 307th ESB. "*We as an Army fight on the network, every element has a requirement to be a part of the digital effort that enables our military.*"

Within minutes of hitting the ground, T2C2 Lite v1 will enable early entry forces access via satellite to the Army's tactical communications network backbone, Warfighter Information Network-Tactical (WIN-T).

Enabled with connectivity, these forces can obtain the advanced situational awareness and mission command capabilities needed to conduct entry operations and set the stage for follow-on forces and the scalable buildup of additional network infrastructure.

Never let sun, rain, ice or snow disrupt your vital communications

De-Ice System

Plenum De-Ice Systems prevent snow and ice buildup that degrade your signals. Unique hot air enclosure (Plenum) design mounts behind antennas — from 5 to 32 meters. Most reliable and economical system on the market. Uniform surface heating minimizes distortion losses — unlike electric pad or heat tape anti-ice systems. Electric, natural gas, or liquid propane heater options available.

Ice Quake System

Huge —up to 100 X — electric bill savings compared to conventional systems. No need for high-power conduit, trenching, or switch gear costs. U.S. patent pending system Enhances the reliability of passive SnowShield cover by over 100%. Also acts as a Rain Shield to prevent water from sheeting on the antenna reflective surface causing rain fade on a Ku or Ka band antenna.

Snow Shield Cover

The Snow Shield Cover is designed to shed off snow and prevent snow & ice buildup on antennas from 0.6 meters to 6.3-meters in diameter. PTFE-coated material virtually "invisible" to RF, stretches over the satellite antenna. Snow Shield can be used as a passive system, upgraded to Ice Quake, or upgraded with active heating to maximize performance.

Protecting Military and Government Networks From Rain, Snow and Ice For Over 30 Years

- Industry leader with decades of field-proven experience.
- Turnkey installation, maintenance, and 24/7 support.
- Proudly designed and manufactured in the USA. Veteran-owned.

WALTON DE-ICE Snow Shield Solar Cover Ice Quake

Walton Enterprises, Inc. +1 (951) 683-0930 | sales@de-ice.com | www.de-ice.com

A new duo of light-weight, portable satellite terminals, called Transportable Tactical Command Communications (T2C2), will provide early entry units in air-to-land missions, as well as follow-on units at the tactical edge, with a lite (v1) and heavy (v2) variant of high-bandwidth, deployable satellite dishes, to keep Soldiers and Commanders connected to the network and well informed.

In later operations, T2C2 Heavy (v2) will extend the Army's network to the tactical edge by enabling company level command post/forward operating base communications. Additionally, in more mature operations T2C2 Lite (v1) could be used to support special expeditionary teams that require network access for their unique mission sets.

WIN-T is the Army's tactical transport mechanism that delivers high-speed, high-capacity voice, video and data communications throughout theater, and both the T2C2 Lite and Heavy variant can bring that powerful network capability to the most remote and austere locations.

T2C2 is an Acquisition Category III program of record that was established in May 2014 to meet immediate fielding requirements for an Army satellite communications (SATCOM) terminal that can be jumped with Airborne units, and/or deployed via commercial aircraft using overhead spaces, and also to support forward company command posts.

The T2C2 program was approved for Milestone C on November 18, 2015, by the Milestone Decision Authority, the Program Executive Officer for Command, Control and Communications-Tactical (PEO C3T). At that time, T2C2 was approved to proceed with the Low Rate Initial Production (LRIP) portion of the production and deployment phase for the purpose of conducting product verification testing and an Initial Operational Test and Evaluation (IOT&E) in preparation for a Full Rate Production (FRP) decision.

The Army awarded the first T2C2 LRIP delivery order on December 11, worth $3.26 million, under a single award Indefinite Delivery/Indefinite Quantity (IDIQ) Small Business Innovation Research (SBIR) III contract to GATR Technologies for both T2C2 Lite (v1) and T2C2 Heavy (v2). SBIRs were created to stimulate technological advancement by increasing small business participation in federally funded research and development projects.

The three-phase competitive process allows proposals to be submitted in response to Department of Defense requirements. This acquisition approach supports innovation, small business initiatives, leverages previously invested funds in the SBIR program, and reduces risk by the reuse of testing and logistics data from other services.

Because the T2C2 solution is inflatable, it can provide a larger dish size with increased capability and bandwidth efficiency in a smaller package. The Lite version fits in just two soft-side carry on cases. The highly expeditionary inflatable satellite antennas provide the commander with increased operational flexibility and speed in maneuver.

The unique GATR system design, a parabolic reflector in the center of an inflated sphere, provides approximately twice the aperture of a rigid antenna of similar volume when packed for transport. Doubling aperture size equates to at least two times increase in gain. The additional gain increases network efficiency and translates into a 50 percent reduction in the amount of satellite bandwidth required to operate both T2C2 variants.

The Army has already been utilizing the inflatable satellite antenna for operations and training exercises. The 82nd Airborne Division has successfully "jumped" with the inflatable GATR 1.2m satellite during exercises and during Joint Forcible Entry operations at Network Integration Evaluation 16.1 in October, the 82nd Airborne Division successfully air-dropped the inflatable satellite antenna (the 2.4 meter), set it up and utilized the capability to provide early entry network communications during the mission.

Additionally, during a recent air assault mission at the Joint Readiness Training Center (JRTC), in Fork Polk, Louisiana., the 2nd Brigade Combat Team, 101st Airborne Division used the 2.4 meter antenna to successfully activate Command Post of the Future (CPOF) and Advanced Field Artillery Tactical Data System (AFATDS) over the WIN-T network.

Fighting in a complex world requires equipment that is easy to transport, easy to set up and easy to operate and maintain. The Army anticipates that both versions of T2C2 will fill specific expeditionary requirements to better support multiple, unexpected contingencies.

If Army units have individual operational needs for SATCOM capability outside the T2C2 program, there are many contract mechanisms within the program office that allow the Army to procure non program-of-record SATCOM systems in response operational needs statements. The end result is to keep Soldiers connected, at all times, in all environments, at all stages of operations.

Article by Amy Walker, PEO Public Affairs

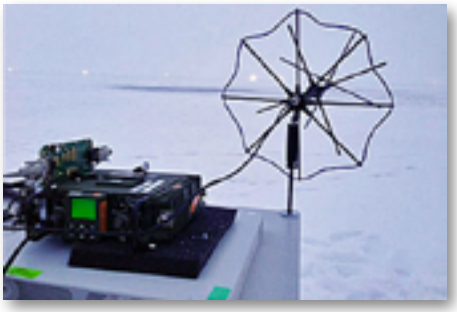
DISPATCHES

General Dynamics Missions Systems Manpack Connects With MUOS

The General Dynamics Mission Systems' two-channel AN/PRC-155 MUOS-Manpack radio has successfully provided voice and data communications with on orbit Mobile User Objective System (MUOS) satellites during a recently concluded government test of the MUOS satellite network.

The demonstration was part of an Army conducted customer test with the AN/PRC-155 MUOS-Manpack radio running terrestrial waveforms—the Soldier Radio Waveform and the Single Channel Ground and Airborne Radio System waveform—simultaneously with the MUOS waveform. The demonstration, paired with Navy MUOS operational tests, will help determine if the MUOS waveform is ready for operational use across the services.

The Lockheed Martin-built MUOS satellite communications network is the new global communications network for secure,



smartphone-like voice clarity and robust data communications for U.S. Department of Defense and government personnel. The AN/PRC-155 Manpack radio is currently fielded to the U.S. Army and is a communications hub connecting Army personnel to the Warfighter Information Network—Tactical (WIN-T) and other local and wide area military communication networks.

The General Dynamics PRC-155 MUOS-Manpack radio is equipped with a high-power amplifier that provides the radio signal strength needed to reach the MUOS satellites that are in geo-synchronous orbit above the Earth's equator. Using both channels, the PRC-155 is the bridge that connects different radios and waveforms used by soldiers across a mission area. The PRC-155 MUOS Manpack receives a call from a tactical radio on one channel, routes and retransmits the call using the second channel, sending the call to a satellite communications network, like MUOS or other tactical communications network.

There are currently 5,326 PRC-155 Manpack radios fielded to the Army providing secure line-of-sight and satellite communications connectivity for Army personnel deployed in places where other communication networks are unavailable or inaccessible.

gdmissionsystems.com/

DISPATCHES

JFCC Space Concludes Command + Control Exercise — GLOBAL THUNDER

Joint Functional Component Command for Space, in coordination with U.S. Strategic Command other combatant commands, services and appropriate U.S. government agencies, concluded Exercise GLOBAL THUNDER 16 last November.

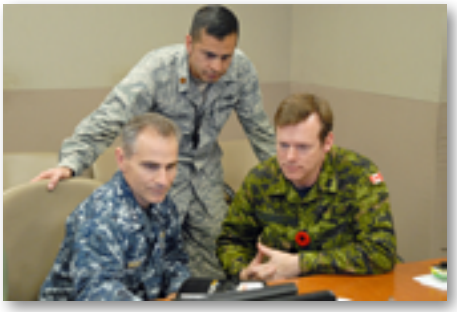
GLOBAL THUNDER is an annual command and control exercise designed to train Department of Defense forces, assess joint operational readiness and validate the command's ability to identify and mitigate attacks across all of USSTRATCOM's mission areas, with a specific focus on space, cyber, missile defense, and nuclear readiness.

Planning for GLOBAL THUNDER 16, an exercise based on a notional scenario with fictitious adversaries, has been underway for more than a year.

"*The security environment is increasingly complex and dynamic. Exercises such as GLOBAL THUNDER hone USSTRATCOM's ability to anticipate change and confront uncertainty with agility and innovation*," said Adm. Cecil D. Haney, U.S. Strategic Command commander. "*The scope and magnitude of the exercise and the training it provides will ensure that we are prepared to meet future threats whether they be nuclear, cyber or space related.*"

For its part of the exercise, JFCC Space, in conjunction with its subordinate wings, tactically-assigned space units and Allied and commercial partners, demonstrated the ability to fight through a contested, degraded and operationally-limited space environment while delivering synchronized space effects to the joint, coalition warfighter.

"*I am extremely proud of the team; the mindset they displayed and how they responded to a myriad of challenges which tested the limits of our ability to command and control in a contested, degraded and operationally-limited domain was simply outstanding*," said Lt. Gen. David Buck, commander, 14th Air Force (Air Forces Strategic) and JFCC Space.



U.S. Navy Rear Adm. Brian Brown (seated left), Joint Functional Component Command for Space (JFCC Space) deputy commander, Royal Canadian Air Force (RCAF) Brig. Gen. Michel Lalumiere (seated right), RCAF Director General Space, and U.S. Air Force Maj. Daniel Rubalcaba, Rear Adm. Brown's executive officer, prepare for a battle update and assessment briefing at the Joint Space Operations Center, Vandenberg Air Force Base, California, in support of Exercise GLOBAL THUNDER 16.

Allied participation in the exercise strengthens relationships with our international partners and provides additional levels of resiliency in our combined forces. GLOBAL THUNDER is an annual U.S. Strategic Command training event that assesses command and control functionality in all USSTRATCOM mission areas and affords component commands a venue to evaluate their joint operational readiness. Planning for GLOBAL THUNDER 16 has been under way for more than a year and is based on a notional scenario with fictitious adversaries.

One of nine DoD unified combatant commands, USSTRATCOM has global strategic missions, assigned through the Unified Command Plan, which include strategic deterrence; space operations; cyberspace operations; joint electronic warfare; global strike; missile defense; intelligence, surveillance and reconnaissance; combating weapons of mass destruction; and analysis and targeting.

U.S. Air Force photo by Capt. Nicholas Mercurio.

GLOBAL THUNDER 16 also provided opportunities for strengthening existing international partnership as both Canadian and United Kingdom officers integrated and embedded into operations and planning cells at various locations including USSTRATCOM headquarters at Omaha, Nebraska, and the JFCC Space at Vandenberg Air Force Base, California.

JFCC Space expanded its international cooperation for the exercise as Canadian Armed Forces Brig. Gen. Michel Lalumière, Director General Space, deployed to the Joint Space Operations Center to augment the senior leadership team.

"*Just as with NORAD/NORTHCOM and numerous other defense efforts, the Canadian military is integrated with our U.S. partners in the collective effort of preserving the safety, security and stability of the space domain*," Lalumière said. "*Exercises such as these provide an exquisite opportunity to explore, analyze and validate how we pull the sum of our capabilities and expertise to deliver synergized effects for the domain.*"

Rear Adm. Brian Brown, JFCC Space deputy commander, who worked side-by-side with his Canadian counterpart, highlighted the importance of cultivating partnerships within the international community and across the commercial sector. "*As space becomes more contested, it is imperative that we work with allies and partners to ensure that we are able to preserve access to space, operate through a potentially degraded space environment, and provide the support necessary to friendly military forces*," Brown said. "*Acting collectively rather than individually, with increased transparency, can build confidence and provide more effective space-based support for a participating nation's security.*"

"*I greatly appreciated the opportunity to work with General Lalumière during the exercise,*" Buck said, "*his perspective was invaluable and his presence speaks to a future of more robust cooperation between our two countries.*"

"*We have been making great strides in leveraging partnerships to bolster our ability to protect and defend the space domain*," Buck continued. "*From the Allied partners on the JSpOC operations floor, to the Commercial Integration Cell which delivers critical situational awareness and expertise from our industry partners, we are aggressively pursuing all available means to preserve the space capabilities which enable both our way of war and our modern way of life.*"

Article by Capt. Nicholas Mercurio, 14th Air Force Public Affairs

DISPATCHES

A Boost From Moog For The US Air Force

Moog Inc. Space and Defense Group recently won a technology development contract under the Booster Propulsion Technology Maturation Broad Agency Announcement from the US Air Force.

Moog will focus its efforts on additive manufacturing of parts for liquid fueled first stage rocket engines.

Moog will explore the material properties unique to additive manufacturing and discover the fault tendencies of the materials using in-house additive manufacturing technologies and failure analysis techniques.

Moog will improve the additive manufacturing processes to avoid those faults in the production phase.

The Moog facility in East Aurora opened a titanium and stainless steel additive manufacturing center in 2014.

Work on this contract will take place in the East Aurora facility which is co-located to the launch vehicle fluid controls engineers at Moog.

Moog sees the impact of additive manufacturing in many business areas. Moog recently acquired 70 percent ownership in Linear Mold and Engineering based in Livonia, Michigan. This company specializes in metal additive manufacturing.

The Air Force awarded this contract to improve the U.S. industrial base capabilities for next generation launch vehicle booster engines. The US is committed to ending its reliance on foreign first stage rocket engines to launch strategic U.S. assets into space.

Moog is proud to be a part of next generation U.S. space launch assets continuing a rich history of supporting every major U.S. space launch system over the past 60 years.

moog.com/

DISPATCHES

DoD Obtains RF Interference Monitoring + More From Kratos' SAT Corp.

Kratos Defense & Security Solutions, Inc. announces their SAT Corporation subsidiary will provide expanded end-to-end satellite RF monitoring, interference detection, geolocation and mitigation services to the Joint Functional Component Command for Space (JFCC Space).

A component of the U.S. Strategic Command (USSTRATCOM), JFCC Space is responsible for executing continuous, integrated space operations to deliver theater and global effects in support of national and combatant commander objectives.

This includes protecting the commercial satellite bandwidth leased by the U.S. Department of Defense (DoD) to support a variety of critical mission needs such as reconnaissance, surveillance and broadband communications between commanders and field units.

Air Force Space Command (AFSPC), as USSTRATCOM's service component, has renewed investment in Space Situational Awareness activities and protecting the overall space environment.

Additionally, new initiatives such as the Joint Interagency Combined Space Operations Center (JICSpOC) and the Commercial Integration Cell (CIC) have focused on a robust government and commercial partnership.

Kratos' Spectral Services team is an integral part of implementing this collaborative effort in addressing the contested and congested RF Environment.

Kratos has been tasked with end-to-end protection of the commercially-leased bandwidth for U.S. Central Command (CENTCOM) and U.S. Pacific Command (PACOM).

Kratos will continue to leverage their multi-million dollar investment of strategically positioned sensors to expand the range of services they have been providing to JFCC Space.

Kratos' Monics® sensor infrastructure covers a majority of the fixed satellite service beams and uses state-of-the-art technology to take high-speed, accurate measurements of critical satellite systems.

Kratos' globally deployed monitoring and geolocation assets will detect and locate the source of any intentional or unintentional interference.

Kratos, in partnership with JFCC Space's Joint Space Operations Center (JSpOC) and Army Strategic Command (ARSTRAT) will work to resolve interference events that impact critical DoD missions.

This award represents an expansion of an existing services contract to support more comprehensive coverage and improve collaboration.

According to Greg Caicedo, Vice President and General Manager of SAT Corporation, "*Kratos utilizes several of its products to deliver these services to JFCC Space, including Monics, the industry's leading carrier monitoring system; satID®, the most accurate geolocation solution; and Compass® Monitoring & Control (M&C) that monitors the health and performance*

of all devices supporting the services. The end-to-end services are supported by Kratos' 24/7 Network Operations Center (NOC) in Colorado Springs, Colorado, manned by expert RF analysts."

"*As military communications increasingly rely on commercial payloads, newer, lower cost methods of providing resiliency to interference are fostering the convergence of DoD and commercial protected communications applications,*" said Phil Carrai, President of Kratos' Technology and Training Solutions Division.

"*Kratos' spectrum monitoring and geolocation products and services continue to play the lead role in that convergence with new solutions for RF management and protection.*"

sat.com/

kratosdefense.com/

DISPATCHES

USAF GPS Modernization Contract Awarded To Northrop Grumman

Northrop Grumman Corporation has been awarded an order to support embedded Global Positioning System (GPS)/Inertial Navigation System (INS) Pre-Phase 1 modernization efforts.

The Military GPS User Equipment (MGUE) program is developing M-Code-capable GPS receivers, which are mandated by Congress after fiscal year 2017 and will help to ensure the secure transmission of accurate military signals.

Under the cost-plus-fixed-fee order valued at $4.8 million from the Joint Service Systems Management Office, Northrop Grumman will evaluate new GPS receivers' modes of performance, including M-Code and Selective Availability Anti-spoofing Module.

Additionally, the company will perform trade studies, assess the state of development of MGUE for upcoming applications and contribute to architecture development for next-generation GPS/inertial navigation systems.

The updated GPS/inertial navigation system will also comply with the Federal Aviation Administration's NextGen air traffic control requirements that aircraft flying at higher altitudes be equipped with Automatic Dependence Surveillance-Broadcast (ADS-B) Out by January 2020. ADS-B Out transmits information about an aircraft's altitude, speed and location to ground stations and to other equipped aircraft in the vicinity.

The modernized system is expected to be available for platform integration starting in 2018.

Bob Mehltretter, vice president, navigation and positioning systems business unit, Northrop Grumman Mission Systems, said, "*We are committed to using our navigation systems expertise to develop a solution that offers dependable and accurate positioning, navigation and timing information.*"

northropgrumman.com/

DISPATCHES

Harris Celebrates 120-Year Annivesary, Now A Top 10 Defense Contractor

Harris Corporation marks its 120-year anniversary by recognizing its heritage of transformation and innovation.

Founded in the back room of an Ohio jewelry store in December 1895, Harris grew from a tiny printing press company into a top 10 defense contractor with $8 billion in annualized sales, 22,000 employees, customers in 125 countries, and a diverse portfolio of technologies that connect, inform and protect the world.

Harris is the longest-thriving major defense contractor and one of 398 publicly held companies still in existence for 120 years or longer—including GE, CVS, Coca-Cola, Pfizer, P&G, and J.P. Morgan. (120+ Companies).

Harris has transformed itself numerous times through strategic mergers and acquisitions, including expanding its printing presence in 1926 by merging with the Seybold Machine and Premier-Potter companies, transitioning into electronic communications with the 1967 merger with Radiation Inc., and nearly doubling its defense industry presence through its largest-ever acquisition of Exelis in 2015. (120-microsite)

Harris has also introduced a long list of notable technology innovations, including the world's first automatic and four-color printing presses, the Washington-Moscow hotline, GPS navigation space antennas, multi-band military radios, and advanced air traffic management and weather forecasting solutions. Harris today is an industry leader in technologies for defense, space, weather, air traffic management and electronic warfare.

"Embracing transformation and pushing technology boundaries are foundational to Harris' success over the past 120 years," said William M. Brown, chairman, president and CEO. "We continue that heritage today with our recent defense-market expansion and our industry-leading investment in advanced research and development. We are proud of Harris' legacy, and even more excited by the opportunities that lie ahead."

harris.com

SBIRS Ground System Achieves Two Major Milestones

Air Force Space Command's Space and Missile Systems Center announced the completion of two major milestones in the development and fielding of its new Space-based Infrared System ground system.

For the first time the new system, dubbed Block 10 Increment 2, simultaneously commanded the full missile warning constellation of Defense Support Program satellites, SBIRS Geosynchronous Earth Orbiting satellites and SBIRS Highly Elliptical Orbit sensors. In addition, this Full Constellation test enabled the completion of the Capability Evaluation phase. The Block 10 upgrade enables consolidation of operational control under one primary Mission Control Station with a single backup control station.

Block 10 will also introduce a significant increase in performance capability across its four mission areas: missile warning, missile defense, battlespace awareness, and technical intelligence.

The Full Constellation test event was conducted from the MCS at Buckley Air Force Base, Aurora, Colorado by 460th Operations Group personnel. Leveraging lessons learned from previous SBIRS ground upgrades, the Block 10 plan has successfully implemented a "crawl, walk, run" approach as it has incrementally demonstrated the functionality of the new integrated command and control for the DSP, GEO and HEO constellations.

The completion of the CE phase marks the readiness of the Block 10 upgrade to proceed out of the development phase and into formal test activities. It also verified the Block 10 system's performance against requirements and demonstrated the ground system's readiness for operational use.

The SBIRS program is managed by the Remote Sensing Systems Directorate at the U.S. Air Force Space and Missile Systems Center, Los Angeles AFB, El Segundo, California. Lockheed Martin Space Systems Company, Sunnyvale, California is the SBIRS prime contractor, and Northrop Grumman Electronic Systems, Azusa, California, is the payload integrator.

The 460th Space Wing at Buckley AFB, operates the SBIRS system. The SBIRS program delivers timely, reliable and accurate missile warning and infrared surveillance information to the president of the United States, the secretary of defense, combatant commanders, the intelligence community and other key decision makers.

The system enhances global missile launch detection capability, supports the nation's ballistic missile defense system, expands the country's technical intelligence gathering capacity and bolsters situational awareness for warfighters on the battlefield.

DISPATCHES

New Military Satellite For France To Be Built By Airbus Defence & Space

Airbus Defence and Space has been awarded the contract by the French defence procurement agency (DGA) for one of two military satellites for the COMSAT NG secure telecommunications program.

Airbus Defence and Space will also be co-responsible, together with Thales Alenia Space (lead contractor), for the entire space program, which includes two satellites, their launch, the ground control segment, Ka-band anchor stations, options for additional satellites, as well as the studies and operational maintenance of the system.

Designed to replace the Syracuse III system, COMSAT NG is scheduled to go into operation from 2021 and will provide high-throughput capacity in the military Ka-band in addition to those in the Syracuse III X band. COMSAT NG has an expected service life of 17 years.

Artistic rendition of the COMSAT NG satellite, courtesy of Thales Alenia Space.

The satellite to be produced by Airbus Defence and Space will be based on the electric version of the ultra-reliable Eurostar E3000 platform. This version is the bestselling electric propulsion telecommunications satellite on account of its lighter service module, improved mission performance and lower operating costs. Aside from its role as the prime contractor for one of the two satellites, Airbus Defence and Space will also be responsible for an essential part of the two satellites' payload.

"*Following the completion of design studies, the experts at Airbus Defence and Space decided to offer the Ministry of Defence an all-electric satellite for the first time. This is a field in which we specialize and have made a name for ourselves worldwide*," said François Auque, President of Airbus Defence and Space France. "*Through our industrial team, formed jointly with Thales Alenia Space, we are eager to work to deliver these two satellites and to participate in the definition, realisation and deployment of the associated ground segment hand-in-hand with the DGA*."

airbusdefenceandspace.com/

CARRIER ID + INTERFERENCE REDUCTION FOR GOVERNMENT + DEFENSE MILSATCOM NETWORKS

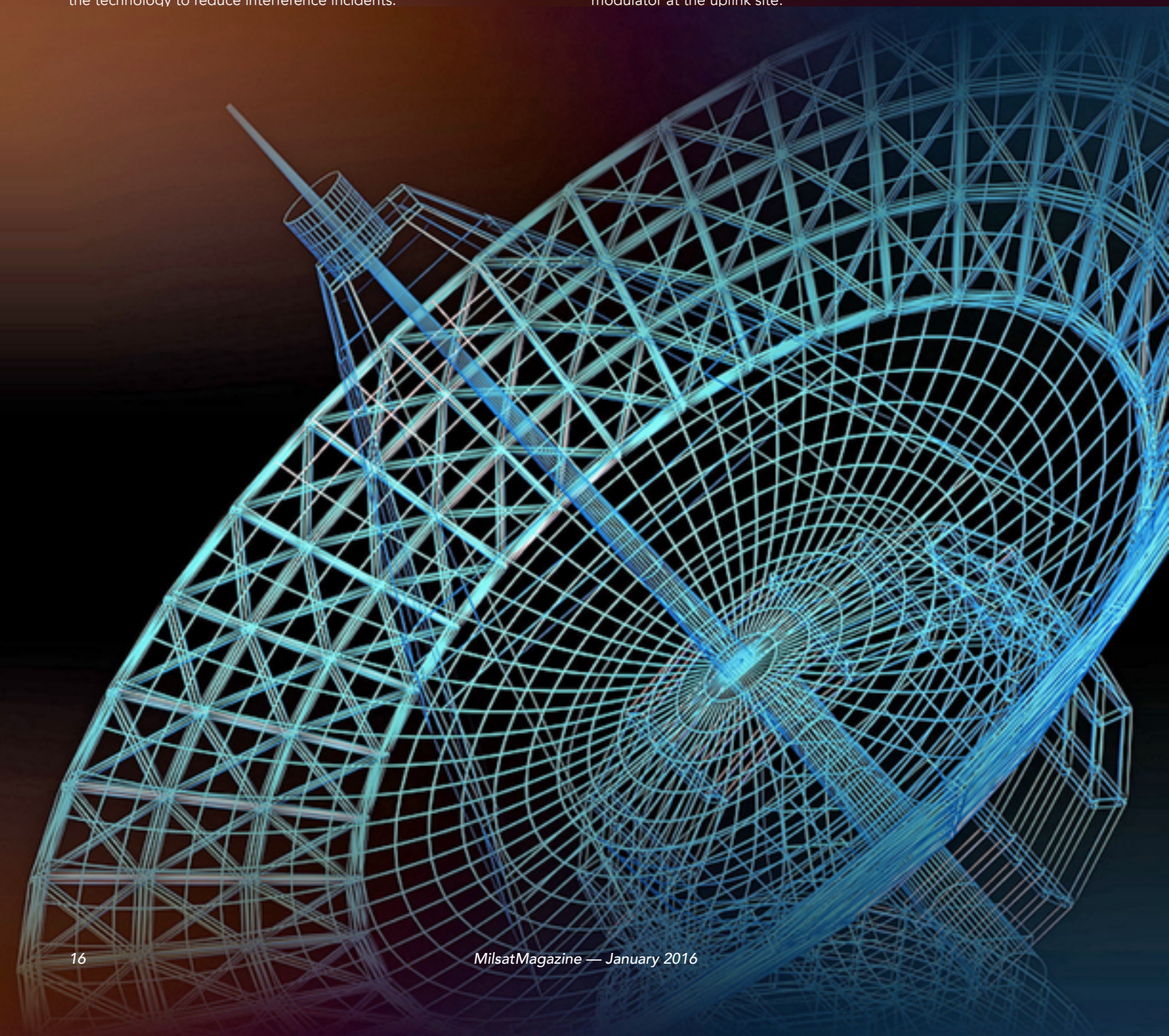
By Koen Willems, Market Director, Government and Defense, Newtec

Despite the number of articles and industry blogs that have already been dedicated to interference mitigation concerning satellite communications, there still does not seem to be enough clarity on what measures have already been taken and what solutions are in the pipeline.

Different SATCOM markets are at a different level of interference mitigation technology implementation, mainly due to the nature of their operations. The commercial SATCOM markets, more specifically the video broadcast operators, have taken the first steps into interference reduction mitigation by implementing the DVB Carrier ID (DVB-CID) standard. VSAT systems, such as the Newtec Dialog® multiservice platform, have also implemented the technology to reduce interference incidents.

In fact, the majority of COTS SCPC modulators and modems manufacturers have implemented the DVB-CID standard on their new equipment. At Newtec, Carrier ID has been on board ever since 2014 with the Newtec 6000-platform DVB-S2/S2X modems and modulators.

The Newtec modulator or modem will typically inject the DVB-CID identifier into the carrier. The identifier contains mandatory information, such as a 64-bit MAC address and a vendor serial number, in combination with optional user configurable data such as GPS coordinates, the carrier name and user contact coordinates. This information is injected into the carrier by the modulator at the uplink site.



WHAT ABOUT VSAT NETWORKS?

Having a Carrier ID process adopted for government and defense SCPC or MCPC links only resolves some interference incidents. Obviously, also needed for consideration are VSAT networks, as they represent the majority of the network infrastructure in the government and defense domain.

Three main issues arise with VSAT installations:

- *The quality of the equipment, which varies depending on the VSAT system manufacturer or the age of the VSAT installation*
- *VSAT terminals are increasingly installed on platforms that are on-the-move (land/sea/air) or on-the-pause using small or phased array antennas, which might cause adjacent satellite interference*
- *There is a lack of training of people involved in humanitarian or military operations to properly install and operate VSAT systems*

Mitigating interference incidents caused by VSAT networks will only be possible by deploying a well-designed VSAT system that can proactively highlight problems combined with additional tools in case the system fails and operated by trained personnel.

NEWTEC DIALOG MULTISERVICE VSAT PLATFORM INTERFERENCE MITIGATION

When Newtec designed the Newtec Dialog VSAT platform, some important measures were taken to reduce the interference risk. The Newtec Dialog platform is a scalable, flexible and efficient multiservice satellite communications platform that allows government and defense operators, as well as satellite service providers, to adapt their network easily to their operational requirements.

1. *The operator has the flexibility to select the technology, equipment and type of services that match the operations and the applications they wish to address. The efficiency is defined both at operational and technology level in the Newtec Dialog platform.*

2. *The operator can easily optimize modulation and bandwidth allocation, while guaranteeing the highest efficiency and availability. In order to meet the high availability and QoS requirements in government and defense networks, the following measures were taken into account when the Newtec Dialog platform was designed to reduce interference incidents.*

3. *Carrier ID: The forward DVB-S2X link inside the Newtec Dialog VSAT platform from the hub towards the remotes has an embedded Carrier ID. Combined with the Integrated Management System and Newtec Satlink Manager technology, some DVB-S2/S2X return links using MDM6000 remotes could also use DVB-CID.*

4. *Carrier Locking Mechanism: The Newtec VSAT platform has a carrier locking system on board which basically means that the remote modem/terminal will not transmit if it does not read the correct information from the forward link.*

5. *The Cross-Polarization Management: Located inside the Newtec platform, this allows an operator to measure interference from individual terminals and react in a proactive and automated way. Basically all remote modems inside a satellite network are known by the Newtec Dialog Network Management Station (NMS) through their MAC addresses. The Terminal Certification Management System inside the NMS uses the cross-pol measurement data in order to verify the alignment of the polarization angle.*

   If a terminal in the network goes beyond the determined nominal value and starts to create interference the NMS will flag the incident, an alarm will be set and the interfering VSAT will be proactively shut down. These proactive monitoring and measurements are automated and can be scheduled individually or by policies. A VSAT system can react quicker than a person to detect interference and shut down a terminal causing problems.

6. *Automated Terminal Uplink Power Control: We frequently see satellite links without automated link power control causing interference. When the link quality is degraded by weather conditions or by bad pointing an operator might wrongly crank up the power to increase the link performance. By increasing the power too much the satellite link will create interference. The Newtec Dialog VSAT platform uses Mx-DMA™ (Cross-Dimensional Multiple Access) technology for the return links.*

   The Mx-DMA return technology automatically and continuously adjusts the frequency plan, the symbol rate, the modulation, coding and power in real-time for every terminal in the satellite network. As such, the modem controls the terminal power value and the entire system adjusts every single second based on return traffic demand, the network QoS management and channel conditions for the terminal population in the network.

   In more detail, the Mx-DMA controller distinguishes uplink fades from downlink fades. As such, remote power levels will only be increased in the event of an uplink fade (and not a HUB-side fade). By automating the process for all terminals in the network the Newtec Dialog VSAT return link will not create interference.

7. *Interference Measuring: An extra benefit of the Newtec Mx-DMA technology is the fact the Newtec VSAT system is capable of measuring the interference. With these measurements the necessary actions can be undertaken.*

8. *Point & Play: One of the main reasons for interference is the bad pointing by unskilled satellite VSAT installers and operators. In government and defense crisis management operations it is up to the deployed people (with basic IT skills) to install the VSATs due to budget constraints and lack of personnel. This can only be avoided by providing them with a easy-to-use tool to facilitate the installation process as well as by training.*

The Point & Play tool provided with the Newtec Dialog VSAT terminals allows the installer (be it a professional installer or the end-user) to easily position the antenna correctly by identifying the satellite and providing feedback on both signal quality and lock. Once the VSAT terminal is in lock it will be auto-commissioned by the Newtec Dialog hub and monitoring can start.

9. *Training: In addition to a pointing tool, good training on the VSAT system is fundamental. With training, a lot problems can already be solved. The training should not only focus on installation. At Newtec we will also educate the customer on how to configure the system (understanding the basics of satellite, how to follow a set-up procedure and configure a network). Furthermore, the training will include component selection (not every BUC matches every modem or antenna) and the best locations to set-up a VSAT (for example, not next to GSM beacon). At the end of the training, different certifications can be reached depending on the level of training and the function of the trainee.*

TYPE APPROVAL FOR VSAT SYSTEMS + SATCOM EQUIPMENT

Having Carrier ID and the other above-mentioned measures are the first steps toward avoiding or resolving the majority of interference incidents with VSAT networks. A next step would be to create a quality assurance label by an internationally recognized and independent SATCOM organization.

Today, many operators will source different SATCOM components from different vendors, buy new modems but keep the older RF infrastructure or source cheap unreliable RF equipment to reduce CAPEX costs. These are typical disaster scenarios towards new interference incidents.

The international certification organization would need to test, approve and recommend different VSAT combinations. The outdoor equipment (BUC, cable and antenna) would need to be tested and approved in combination with the modem in order to achieve the best results. Which organization will run the initiative and provide the quality label is still an uncertain element within the satellite industry.

THE WAR ON INTERFERENCE

Interference incidents can cause serious problems within government and defense SATCOM networks. They endanger the operational efficiency and slow down daily activities.

Industry standards such as DVB-CID and well-designed VSAT systems with embedded interference-mitigating technology, such as the Newtec Dialog Multiservice VSAT platform, are already reducing a big number of incidents. Proactive and reactive measures are key in large-scale VSAT networks to drastically reduce interference. A VSAT system can react quicker than a person to detect interference and shut down a terminal causing problems.

Having an international independent instance that will issue quality labels to ODU-modems combinations could be an extra weapon in the war on interference.

newtec.eu

Koen Willems started his career in 1998 with Lernout&Hauspie as a project manager in the Consulting & Services division. More recently, he joined Toshiba as a Product Marketing Manager for the Benelux and, later, for the European market. In a total of 6 years, Koen contributed to all of the major Toshiba Retail IT product releases.

Mr. Willems is, currently the Market Director for Government and Defnese for Newtec, a Belgium-based specialist in satellite communications. Koen holds a degree in Germanic Languages (University Ghent, Belgium, 1997) and completed a Masters degree in Marketing Management program at the Vlekho Business School in Brussels (1998). He acquires a Six Sigma Black Belt for product development and process improvement in 2006.

Koen is also a Senior Contributor to MilsatMagazine.

NABSHOW®

Where Content Comes to Life

› register today

Free Exhibits Pass Code PA74

unleash

capacity • bandwidth • devices

APRIL 16–21 2016

LAS VEGAS, NV USA

NABShow.com

#NABShow

The media and entertainment industry has become unleashed. Communication innovations and cutting-edge technologies are shattering the boundaries of bandwidth and opening up unprecedented global access and driving content distribution.

Learn how satellite communications (SATCOM) supports mobile broadcasting services across connected devices. Collaborate with industry experts to reimagine and learn about the possibilities of new applications on the horizon.

NAB Show® offers an in-depth understanding of today's and tomorrow's satellite service companies and how the industry is gaining a fresh and exciting perspective of content creation and delivery to a global audience. THIS CHANGES EVERYTHING.

NEW ATTRACTION

SATCON® THEATER

NEW CONFERENCE

SIA Satellite Industry Association

The Voice of the Satellite Industry

Satellite Industry Forum

FREE FOR GOVERNMENT

Media Technologies for Military & Government Workshop

Free training for employees of the U.S. Military and Government Agencies with valid agency ID.

YEAR IN REVIEW—2015: HUGHES DISD

By Rick Lober, Vice President + General Manager, Hughes Defense & Intelligence Systems (DISD)

2015 was an exciting year for Hughes Defense as the company launched a new SATCOM product line directed toward specialized applications.

The new HM System uses software defined modems as well as advanced waveforms and coding to yield solutions to problems that are common to Military and Commercial users. These include airborne Beyond-Line-Of-Sight (BLOS) communications for ISR (Intelligence, Surveillance, Reconnaissance) applications on fixed and rotary wing platforms, Very Small Portable Terminals (VSAT) and systems that require features such as low probability of detection (LPI/LPD).

The new Hughes HM300 portable terminal, packaged in conjunction with Tampa Microwave, utilizes advanced waveform and antenna technology to produce the world's smallest X-band portable terminal. This terminal s now being used in a service offering by Airbus Defence and Space for operation on that company's protected Skynet satellite constellation. This is the optimum and most cost effective solution for applications such as streaming video, which require long periods of daily connectivity.

The same modem technology has been packaged by Hughes for use in airborne, shipboard and ground based COTM (Communications-On-The-Move) applications as the HM200, which features a ruggedized enclosure that meets DO-160 (Environmental Conditions and Test Procedures for Airborne Equipment) and MIL-810 specifications (eight environmental tests to determine hardware ruggedness).

A unique coding appliqué can be added to the modem to assure operation through rotary wing blades without the use of outdated techniques, such as blade timing or blade burn-through (higher BUC/PA power). As with all Hughes SATCOM products, the modem is antenna and network agnostic with configurations available for operation in the L-, Ku- or Ka-band.

The HM100 hub modem completes the network and offers advanced waveforms and network management techniques that enable bandwidth efficient operations using the terminals noted above over all new Ku- and Ka-band High Throughput Satellites (HTS), as well as WGS (Wideband Global SATCOM) and existing L-band mobile satellite systems.

Hughes also continues to invest in R&D to create very high-speed modems and the porting of protected communications waveforms to these software definable products. The company is partnering with industry leaders to add crypto devices that result in true open systems solutions for the upcoming needs of the military in this important area.

Finally, Hughes continues to support the Australian DND with the most advanced MF-TDMA systems available today and provided the SATCOM links to coalition forces in the recent Talisman Sabre exercises.

Looking ahead to 2016, Hughes will continue to enhance the HM series product line for specialized applications and will be introducing the new JUPITER™ HTS modems to the DoD for enterprise applications.

defense.hughes.com/

Rick Lober is the Vice President and General Manager of the Defense and Intelligence Systems Division (DISD) at Hughes Network Systems, LLC, and is also a Senior Contributor for MilsatMagazine. In this role, he is responsible for applying the company's broad range of SATCOM technologies and services to the worldwide defense marketplace and intelligence community. This includes both fixed Ku, Ka and X band VSAT and mobilesat products and systems. Applications cover satellite communications on the move for both ground based an airborne platforms along with numerous classified development programs. He has over 25 years experience with both COTS-based and full MIL communications and intelligence products, systems and major programs starting as a design engineer and progressing to a P&L executive.

Mr Lober previously worked at Cubic Corporation as Sr. VP/GM of the Communications Business Unit. In this role he led the company's development of the Tactical Common Data Link (TCDL) for application to both manned and unmanned military ISR platforms. In addition, Mr. Lober's business unit managed the data link system for the USAF/US Army's Joint STARS program, the Personnel Location System used in Special Operations search and rescue missions, high power HF amplifiers for military communications systems and a line of receivers and direction finders for signal intelligence applications.

Mr. Lober received his BSEE and MSEE degrees from the University of Illinois, Urbana, and is a member of the IEEE, AFCEA, AUSA, AUVSI and the Society of Satellite Professionals. He has published numerous papers and presentations on digital receiver design, high speed data links and satellite communications.

SATNEWS PUBLISHERS

DIGITAL EDITIONS

SatMagazine • MilsatMagazine • SatNews.com

» *Free subscription and access*

Timely news and editorial «

» *Complete archives*

Join at: *satnews.com/reg*

AUTOMATING TO SOLVE INTERFERENCE

By Roger Franklin, Chief Executive Officer, Crystal

Military operations rely heavily on satellite communications because personnel are often in remote and challenging environments where only satellite communications will work.

Interference is a problem for any satellite user—however, for the military, interference can cut off an extremely important communications lifeline. When MILSATCOM is used within challenging environments, keeping interference under control is quite difficult to ensure.

My personal involvement with the Satellite Interference Reduction Group (IRG), working with satellite operators and manufacturers, has resulted in a number of initiatives and developments that have been aimed at reducing satellite interference. These initiatives are starting to have an impact—however, there is still much work to be completed.

One of the most effective ways to reduce interference is with improved automation. One example of success revolves around Satellite News Gathering (SNG), which is now experiencing a decline in interference as many of these systems are now automated.

There are several reasons interference automation benefits military operations:

STAFF TURNOVER

The military experiences a higher than normal rate of staff turnover, with personnel constantly changing positions and locations. This causes a problem when operating satellite communication equipment because of the constant need to train new staff and get them up to speed with their MILSATCOM responsibilities.

The majority of interference is caused by human errors well as by staff members with limited training that tend to be in a hurry, or operating within a harsh environment. These personnel are far more likely to make mistakes and less likely to spot errors before they happen.

When a system is automated, fewer staff members require less training to operate the system, with fewer resulting errors that lead to satellite interference.

REMOTE LOCATIONS

One of the major challenges for military users is the nature of their communication links. Often operating in remote areas of the world, these personnel are isolated and are hard to reach by support personnel. If the site is unmanned, or the personnel on site are not trained, such can prove difficult in ascertaining the quality of the input and output to and from the site.

When trained personnel are on site, they can warn of issues, either before they happen or as soon as such occur. In the absence of trained personnel, human intelligence must be replaced with some semblance of automated intelligence which can serve as an early warning system for potential problems.

WEATHER ISSUES

If you have remote, unmanned sites, or are operating in highly volatile climates, one extremely challenging element is the need to be constantly aware of changing weather conditions, such as a rise in temperature, humidity, or heavy rain. Something as simple as forgetting to change an air filter in an air conditioning unit can cause equipment issues. Before your team is aware of the problem, this occurrence has already impacted communication streams.

By automating the system, a more accurate track on real-time weather conditions can be monitored, alerts set and, ultimately, arrange the system to automatically shut down if conditions are unfavorable.

INTERFERENCE MONITORING

The ideal scenario is to have automation in place across the network and constantly monitored for interference. There are highly-effective Tier 2 monitoring tools available, several of them supplied by Crystal, which enable a whole host of functionality that allow the user to monitor as well as quickly deal with any discovered issues.

For some of these tools, their complexity is such that trained staff are required to operate them, which can be a challenging if staffing changes often occur.

In some cases, consideration of Tier 1 monitoring for interference may make a great deal of sense. This takes the form of a smaller scale monitoring solution, which is inexpensive enough for users to run 24/7. The Crystal Spectrum Monitoring and Recording (SMR) solution, for example, has a few high-end features, such as a spectrum analyzer as well as the ability to set alarms and record and export spectrum traces. SMR can be used for multiple carriers, so there is no need to purchase multiple systems.

In this environment, the user will be alerted when there is an issue, but the resolution may require external assistance This external help may be in the form of one more high-end carrier monitoring system, which is them employed on a given carrier to resolve issues, as needed.

RESOLVING INTERFERENCE

There are a number of practical initiatives to combat interference, none of which are able to work by themselves, but rather as a combination of tools. Monitoring and control is extremely effective if all systems are centrally controlled with built in automation. This approach would address a entire section of interference that is mostly caused by human error.

BULLETINS

Late last year, Crystal was awarded the Vision Award for "Most Promising Company of the Year 2015." This Vision Award recognizes the company that has experienced substantial growth in the market while demonstrating long-term viability of their enterprise.

Roger Franklin, CEO of Crystal, accepted the award at the Vision Awards Ceremony held at SATCON 2015 in the Jacob Javits Convention Center, New York City.

"Crystal is pleased to be recognized for our longstanding leadership in the industry and our innovation to meet the demands of the ever-shifting landscape of broadcast, satellite and consumer demand," stated Roger Franklin. "We are proud of the work we do in support of the mission critical systems that our customers use to move video from point of origination to point of consumption – wherever content flows."

Also late last year, Crystal started a strategic partnership with Actus, an industry-leader in intelligent broadcast monitoring platform for video recording, tagging and monitoring.

"Actus enables Crystal to offer our video customers more than monitoring, control and automation of their video distribution network. We are now able to provide broadcast recording and monitoring solutions, for compliance and quality monitoring that help our customers understand what their customers actually receive," said Roger Franklin.

"Our intelligent broadcast monitoring platform enables a cross organizational solution for video compliance, clips creation for content re-purposing, ads verification, rating and competitive analysis and video quality alerts. Combined with Crystal, we offer an enhanced solution that provides operators with tools to control and manage the video distribution as well," said Sima Levy, CEO of Actus Digital.

As video content delivery streams fragment, the combined solution provided by these partner companies ensures quality and compliance wherever content flows.

GovSat Insights: An APAC Essential—Assuring Connectivity + Ops in Degraded Comms Environments

By Mark Wiggins, Director of DoD Business Development, Juniper Networks

Late last year, the AFCEA (*afcea.org/*) sponsored their annual Technet Asia Pacific Conference, which brings together private industry and leading technology companies with thought leaders and decision makers from the Federal Government and United States Military.

This is the largest event in the Asia Pacific (APAC) region that focuses on the unique defense issues impacting the region.

I had the opportunity to attend this year's event in Honolulu, Hawaii, to listen to military leaders describe their challenges and technology requirements in the region, and to discuss these things directly with senior military decision makers. There was one particular theme that resonated across the entire conference—the need to operate in a communications degraded environment.

When North Korea was first test launching missiles and the wars in Iraq and Afghanistan were winding down, the APAC theater was the focus of significant military attention. However, that area seemed to be on the back burner in recent months, thanks in large part to the threat of ISIS and other issues in the Middle East.

However, the APAC region remains a priority for the United States military, especially as tensions between NATO and Russia rise, North Korea continues missile testing and China continues to rapidly construct new islands in the South China Sea.

It's fair to say that the Asia PAC theater needs the same level of focus—or even more—today than it did previously. This creates unique challenges for the United States military, especially in the area of communications.

Today's military relies heavily on the advanced capabilities and intelligence that networks deliver. Bandwidth is essential at the tip of the spear for communications between soldiers in-theater and senior decision makers back at home. Communications are also critical for operating drones, sharing data and enabling access to today's real time intelligence, which is increasingly being delivered in the form of bandwidth-hogging video streams.

SATCOM is necessary in the Asia Pacific theater due to lack of terrestrial networks, need to get communications to ships at sea and the inability to run terrestrial networks through adversary territory.

image courtesy of U.S. Pacific Command.

Unfortunately, getting data to the APAC region is a challenge. Terrestrial networks simply can't be run as they'd have to physically travel through regions owned and controlled by adversaries. This leaves the United States military relying on satellite communications—often commercial satellite communications services—for its bandwidth needs.

This situation was eloquently summarized by Randy Bland of SES GS in a recent article that was published on the GovSat Report:

> *"...establishing the networks that have the available bandwidth for today's advanced IT capabilities could take years to implement…[and] often require running fiber through nations that aren't necessarily friendly to the United States and its military interests…It's for this reason that satellite communication… is becoming as essential to the military as the bandwidth it provides and data it delivers. Commercial SATCOM services carry the signals from unmanned aircraft back to military decision makers. They empower video collaboration between deployed personnel and leaders in the field. They deliver the capabilities, applications and bandwidth that today's military expects on base—out in the field."*

However, getting the data to the region is just one of the concerns. Protecting it from being degraded, compromised or otherwise impacted is another significant challenge, especially considering the adversaries the United States faces in this region of the world. Both China and Russia are sophisticated adversaries with incredible technologies at their disposal, making information assurance and security a distressing problem.

First, there's the issue of jamming or compromising the satellite signal. Luckily, this is something that is becoming a smaller problem, thanks to the integration of COMSATCOM into the military satellite environment.

Passing signals over COMSATCOM essentially creates deception, since it hides government traffic and data on a satellite that could be carrying other, commercial information.

Then, there's the emergence of High Throughput Satellites (HTS), which utilize "spot beams" that deliver tremendous bandwidth and throughput. These "spot beams" are smaller and more concentrated, which effectively makes the signal harder to jam as perpetrators would need to be physically in the beam's coverage area to affect transmissions.

Once the data and connection is physically in the region thanks to the satellite, such still needs to travel through established terrestrial networks to be delivered to the individuals that need access to the information and bandwidth. These networks create an additional vulnerability. They can be hacked by malicious actors that are employed by adversary states, they can be brought down by DDoS attacks and they can even be monitored and compromised, thanks to malware.

One of the most interesting technologies receiving a lot of attention wasn't specifically a security technology, per se. The technology I'm referring to is Software Defined Networking—or SDN.

SDN is a new way to architect and build the networks themselves, where the control and services plane of the network are virtualized. This essentially means that the plane that choreographs the network, understands its structure and defines what services are offered is now software.

The virtualization of services also allows more flexibility and agility by eliminating individual "boxes" or pieces of hardware that service one purpose and replacing them with more general pieces of equipment that can be assigned a task or service function.

The end result of moving to a SDN enabled network is increased agility. Changes to the network no longer require physical movement and interaction with pieces of hardware.

The network is now more flexible and can be changed from a single, centralized application. This reduces downtime by decreasing human error and allows the military to better respond to the cyberattacks that will invariably be coming from adversaries.

Imagine a situation where traffic can be routed around devices or parts of the network that have been compromised or brought down by an adversary's cyberattack. This is the level of flexibility and agility that SDN enables. SDN allows the military to "reshuffle the deck," while not compromising the network or the delivered services.

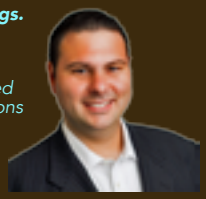
The Technet Asia PAC Conference couldn't have been presented at a better time. The APAC theater is, once again, a major concern and a major consideration for the military and the American people.

This region also creates a host of unique and challenging problems when delivering and securing the data sharing, communications and IT capabilities today's warfighter expects and relies on in the field. Thankfully, through an increasing reliance on COMSATCOM, advancements in SATCOM technologies and the emergence of SDN and other security technologies, the military now has the tools needed to better establish and protect in theater network connections than ever before experienced.

Editor's notes:

This article was originally published on ***The Modern Network*** *by Mark Wiggins, the Director of DoD Business Development at Juniper Networks (****juniper.net/****).*

You may read the full, original article at this direct URL: ***themodernnetwork.com/government/assuring-connectivity-and-operations-in-degraded-communications-environments-essential-in-asia-pacific/***



*This article is republished, courtesy of GovSat Report (****ses-gs.com/govsat/****), and Executive Editor Ryan Schradin. He is a communications expert and journalist with more than a decade of experience and has edited and contributed to multiple, popular, online trade publications that are focused on government technology, satellite, unified communications and network infrastructure. His work includes editing and writing for the GovSat Report, The Modern Network, Public Sector View, and Cloud Sprawl.*

His work for the GovSat Report includes editing content, establishing editorial direction, contributing articles about satellite news and trends, and conducting written and podcast interviews. Ryan also contributes to the publication's industry event and conference coverage, providing in-depth reporting from leading satellite shows.

*The GovSat Report is sponsored by SES Government Solutions (****ses-gs.com/govsat****).*

THE MILITARY NEEDS ID

By Martin Coleman, Executive Director, the Satellite Interference Reduction Group (IRG)

Discussions with various military colleagues continue regarding the subject of Carrier ID continue to be held.

From the start of the conversations regarding IRG, security concerns for the military indicated a "no-go." However, as we progressed, this initial reaction has been tempered and Carrier ID is now being looked at in a far more favorable light.

This, of course—given the very nature of the military—is understandable. Although we are on the correct track, I believe more has certainly yet to be done to bring the military into the Carrier ID program.

CAUSING INTERFERENCE

Military satellite operations suffer from satllite interference to the same degree as commercial operators. This stands to reason—first, because the military is one of the largest of all SATCOM user groups and, secondly, because the very nature of military operations these days is often occurring via a more commercial footing and approach.

More often than not, MILSATCOM services are provided by VSAT networks or Communications-On-The-Move (COTM) terminals that operate in remote and often challenging environments. Many times, terminals are unmanned, adding yet another complex issue to the overall the interference puzzle. Even when terminals are manned, moving through difficult terrain can easily cause misalignment of antennas.

Statistically, VSAT networks are both a significant cause of interference as presenting the most difficult problem to solve—by far. VSAT is responsible for approximately 50 percent of the interference problem for most satellite operators around the globe.

The military relies heavily on satellite communications in conditions that are often difficult to the extreme and the generation of interference a highly critical problem. Interference can often migrate to other types of communication systems, as well, which introduces complex scenarios that seem almost impossible to fix. Add to this the military personnel who are working in difficult conditions are the one's responsible for ensuring communication channels remain open—the challenge becomes highly recognizable.

SOLVING INTERFERENCE

How can interference be managed to allow an operations team to resolve common issues quickly?

With the major cause being VSAT networks, there are a number of reasons why this type of interference is so tricky to resolve and, therefore, requires a number of mitigation methods.

Quite often the equipment is simply not up to "scratch." According to Inmarsat's Mark Steel, around 50 percent of all interference is caused by poor equipment quality.

The terminals used by the military are often auto-deploy in nature. Manufacturers produce these products so as not to cause satellite interference, especially as they will often be moved during operation, and this is not a simple task.

With more and more products in the marketplace, and manufacturers facing stiff competition, this challenge is becoming all the more apparent. If all users were to ensure new equipment is of a type approved by the Global VSAT Forum (GVF), I am confident we would witness a huge decrease in the instances of interference.

The other major factor is human error due to a simple lack of proper training. This is perhaps the most simple of the problems to solve, as there are a broad range of training courses available regarding interference mitigation. The challenge in the military environment, however, is the constant movement of personnel and their positions and the need to constantly train new technical staff.

AN IDENTIFIER

The thought of identifying a carrier within the military is just not an easy pill to swallow. So far, IRG has not seen any widespread implementation of CID within MILSATCOM. As stated previously, we are at the start of project initiation and momentum is building, albeit slowly. However, a number of new regulations and rules are being structured and we should start to see an increase in Carrier ID implementation.

As Carrier ID rollout continues, highly likely is that we will reach a stage where only the military is unidentified. Such will start to change the game plan for the military's commercial operations. Suddenly, MILSATCOM operations will become the obvious difference and numerous military services will be easily identifiable due to their absence of an ID.

IRG has often considered that scenario as similar to making a comparison with car license plates. If you don't have one, you will instantly look suspicious in a world where having a number plate is the norm.

Don't forget that CID doesn't make the user identifiable to anyone, but simply tags their service. The only information in the shared database will be the unique identifier and the satellite operator to whom that customer belongs. The satellite operator's responsibility is to keep information pertaining to that customer and contact details in their own, secure database. In the case of military services, the ID would be tagged locally within their own secure systems anyway.

The clever part is that commercial operators can exchange ID information through their military operations, thereby quickly resolving normal issues. However, when an ID is truly suspicious, then the military will have the tools and good reasoning to institute more in-depth checks for the safety and security of all global satellite systems.

EXPANDING THE TOOLBOX

CID is on the military agenda and IRG is noting the growing the number of tools in the interference toolbox. We have far more technology available that has been specifically designed to help in those unique circumstances.

This includes solutions from such companies as Integrasys to ensure an antenna is correctly aligned at installation. Another, new solution in the arsenal is VeriSat's VSAT interference monitoring tool, SatGuard. (***Please see the SatGuard feature later in this issue of MilsatMagazine.***)

SatGuard is able to identify, in mere minutes, the source of adjacent satellite interference (ASI) and cross-polar interference caused by VSAT terminals. SatGuard also now includes an improved GSM demodulation tool, which uses a simple decoder unit to read information from GSM beacons. By detecting the mobile cell being received, this tool can pinpoint the VSAT terminal or terminals in an area that is likely to be the cause of the interference.

Significant improvements in geolocation technology have also been made. Siemens Convergence Creators, for example, recently announced that their single satellite geolocation tool has been deployed by Eutelsat. This technology provides reliable localization of interference signals without the need for an adjacent or second satellite. This is particularly important where an adjacent satellite is just not available, or the operator cannot gain access from another satellite operator.

MILITARY SUPPORT

The toolbox is expanding all the time and we are making some great headway which will help with the majority of VSAT terminal interference problems. However, to solve interference, we really must use a combination of these tools at all times.

If all users were to make certain they only employed certified equipment, ensured their staff was up-to-date with training and deployed all of the available tools and technology relative to their business, then I'm certain we would have little or no interference at all.

As always, we need to work together to help reduce interference for all military, government, agency and commercial users.

satirg.org/

Martin Coleman is the Executive Director, the Satellite Interference Reduction Group (IRG). Martin is responsible for spearheading a number of significant initiatives and is committed to introducing new technology and processes to mitigate all types of satellite interference: VSAT TDMA Systems, BIG Data; a reference guide to Interference; sorting out those Difficult Cases including new standards and processes within the Geolocation industry; assisting the ITU in dealing with Harmful Interference; and implementing Carrier ID (CID). Martin regularly addresses the industry on the subject of satellite interference, at global industry events, on an individual basis, and at IRG-led conferences and webinars.

The Satellite Interference Reduction Group (IRG) is the global industry organization, whose mission is to combat and mitigate radio frequency interference (RFI) for an interference-free Satellite Frequency Spectrum.

There are a number of tools, technologies, and processes already available to reduce interference and our goal is two-fold. The IRG works to help the industry understand what those tools are and how to effectively use them effectively plus the organization is constantly looking for new and better ways to fight satellite interference.

BULLETIN

The Satellite Interference Reduction Group is one of seven non-profit associations to commend the support from major inter-governmental and private-sector organizations to preserve satellite spectrum.

During the International Telecommunication Union's (ITU's) World Radiocommunication Conference (WRC) late last year, the organizations requested the national administrations of every region to preserve satellite spectrum for use in delivering mission-critical satellite services worldwide.

In a joint statement issued by an international coalition of seven non-profit associations, including IRG who represented the global satellite communications sector, the show of support was strongly commended: "The high level of support from these organizations makes clear the importance of satellite communications in the C-band spectrum and how further disruption of safety-of-life services due to wireless interference is unacceptable."

"Some administrations may be under a misimpression," the coalition statement continued. "It is not necessary to support IMT identification if they have already authorized WiMAX or other terrestrial wireless services. An identification for IMT is not required to make WiMAX or other authorizations comply retroactively with ITU rules. No ITU rule change is required at the WRC in order to enable national deployments of WiMAX or other wireless services."

THE HPA CORNER: 2015, A YEAR OF SUCCESSES

By Nicole Robinson, Chair, Hosted Payload Alliance (HPA)

As we look back at 2015 on behalf of the Alliance and the mission we're seeking to advance, we can reflect upon a number of successful events and activities—the culmination of which presents an important picture for hosted payloads and can help us chart a path forward.

Leveraging the momentum from the US Air Force' Hosted Payload Solutions (HoPS) IDIQ announced in 2014, industry and government alike anticipated increased activity in the area of hosted payloads for 2015. Yet, here we find ourselves in December without a tangible procurement activity pointing to the success of the contracting vehicle.

The first question we as an Alliance and our stakeholders in government must ask ourselves is "Why?" With so much support on both sides of the fence and an ample framework for acquisition, what is it that has held up progress?

In June of 2015, the HPA met with more than 35 House and Senate offices during our annual Hill Day in Washington, DC, to advance the cause and seek an answer to this question. As a result of this engagement, as well as a series of senior engagements with Defense officials, we discovered that much of the answer lies within the budgetary framework; not just a simple numbers game, but in the way hosted payload programs are (or are not) valued.

In today's budget-constrained environment, priority has been placed on advancing those programs with greatest operational capability and sustainability by necessity. When current programs of record supporting the warfighter today are challenged, there is little to no room to begin a new effort or explore alternatives, even when those very alternatives have the potential of saving significant amounts of time and money in the long run.

Herein lies the challenge and our task for 2016. For commercially hosted government payloads to become a regular way of delivering space capability, they must be viewed as critical operational components alongside existing programs of record. The government must place a priority on these programs for the capability they can deliver, the critical innovation they enable and the cost savings they bring.

As an alliance, we must craft a high-level contact plan for 2016 and engage senior leaders to encourage weighted fingers on the scale when evaluating the importance of these programs to ensure they make the cut in the budgeting process.

With this heavy backdrop, we would be remiss if we neglected to highlight programs outside of the HoPS IDIQ that have proven successful in recent months. In the first half of 2015, two hosted payload contracts were announced with the NASA GOLD program and the FAA WAAS hosted payload.

These programs signify an impressive ability by our Federal Civilian agencies to continue to press forward in bringing these important capabilities to bear. Though

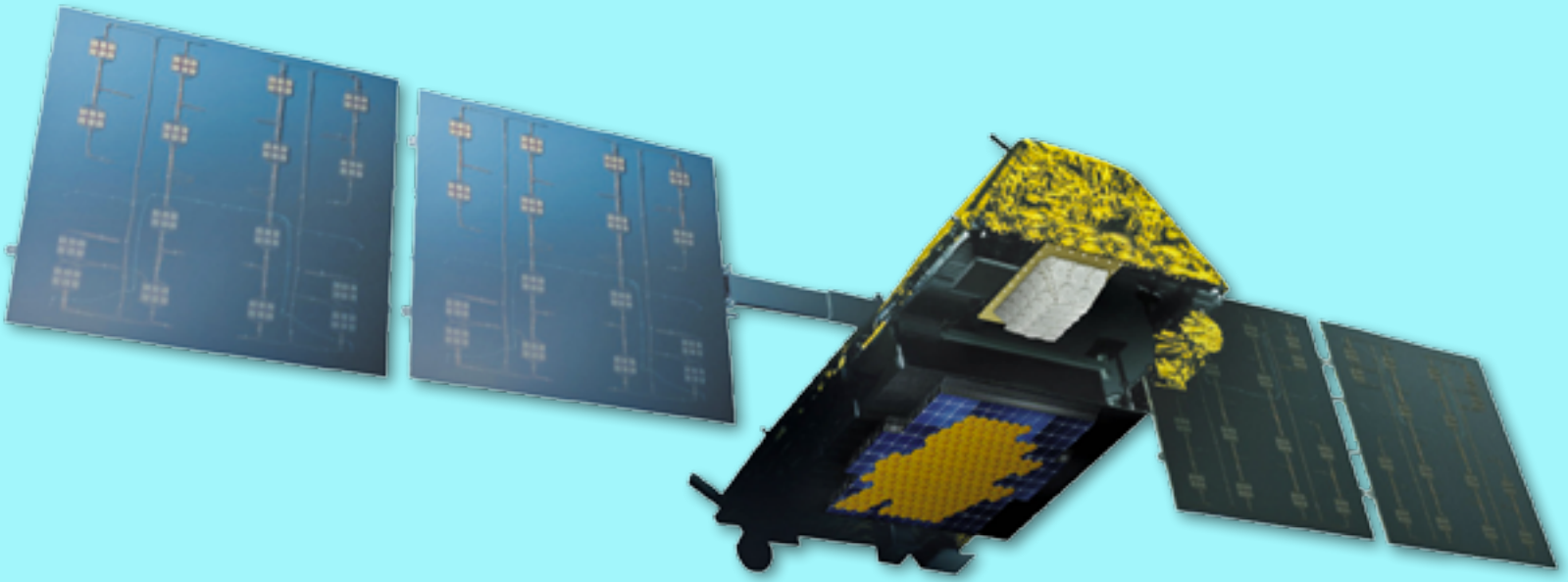


Image: Iridium NEXT satellite, the host of the Harris Corporation manufactured ADS-B receiver hosted payload for Aireon that has a highly sensitive receiver, coupled with multiple steerable beams, all capable of detecting aircraft with ADS-B compliant avionics.

Iridium NEXT's low-latency, 66 cross-linked Low Earth Orbit (LEO) satellites make them uniquely suited to meet the technical demands of global air traffic monitoring. The LEO satellites will orbit approximately 485 miles above the earth and each satellite will be cross-linked, creating a dynamic network to ensure continuous availability in every FIR on the globe with low latency and update rates suitable for air traffic control.

The Aireon receivers located in each hosted payload will detect ADS-B signals from next generation equipped commercial aircraft all over the world—including vital airways over oceans, mountains, remote areas and polar regions—relaying them seamlessly to air traffic controllers on the ground.

the development road was long and winding for both programs, government and industry both found success.

The HPA engaged in a number of important discussions with government and industry over the course of the year, and hosted several key events that brought together various stakeholders from both sides. Arguably, one of the most illuminating events hosted by the Alliance occurred just last month in London during Global MilSatCom.

During this half-day forum, the Alliance brought together representatives from nearly a dozen different nations to discuss the time, cost and technological benefits of commercially hosted government payloads in a lively exchange that resulted in heightened perspectives and established important connections between industry and government. The event made clear that expanding the HPA reach to more deliberately include international government entities is particularly key, and that the value for both would be proven in the months and years ahead.

As we move to close on a year with notable awards, progress and, perhaps, heightened awareness of areas where government and industry can further improve the relationship and program viability in the years to come, we bring in a new year filled with promise and more hard work on the horizon.

Our continued engagement with Congress, senior policy makers in the Pentagon and of course our end users worldwide is critically important. It is a task not meant for the weary; it is a task not well suited to the short-sighted. It is, however, one in which all are likely to reap the rewards by advancing a cause that makes sense, and at the end of the day, quite literally has the capability of saving time, money and lives.

Here's to an "***All Hands on Deck***" theme for 2016.

hostedpayloadalliance.org/

Nicole Robinson is the Chair of the Hosted Payload Alliance. She is also the Corporate Vice President, Communications and Government Affairs, for SES.

The Hosted Payload Alliance was established in 2011 and is a satellite industry alliance whose purpose is to increase awareness of the benefits of hosted government payloads on commercial satellites. The HPA seeks to bring together government and industry in an open dialogue to identify and promote the benefits of hosted payloads. The HPA:

- *Serves as a bridge between government and private industry to foster*
- *open communication between potential users and providers of hosted payload capabilities*
- *Builds awareness of the benefits to be realized from hosted payloads on commercial satellites*
- *Provides a forum for discussions, ranging from policy to specific missions, related to acquisition and operation of hosted payloads*
- *Acts as a source of subject-matter expertise to educate stakeholders in industry and government*

About HoPS

The US Air Force Space Command's Space and Missile Systems Center (SMC) awarded an indefinite-delivery-indefinite-quantity, or IDIQ, contract under the Hosted Payload Solutions, or HoPS, program, in July of 2015. Companies competed to be included in one of two lanes: geosynchronous orbit, or GEO, hosted opportunities and Medium Earth Orbit / Low Earth (MEO I LEO) orbit hosting opportunities. Companies were allowed to compete in both lanes.

The multiple-award HoPS IDIQ contract provides a rapid and flexible means for the government to acquire commercial hosting capabilities for government payloads. The HoPS contract provides flexibility for up to approximately six hosted payloads and a total value of up to $494.9 million. The contract created a pool of qualified vendors to fulfill the U.S. Government's need for various hosted payload missions.

The HoPS IDIQ procures fully-functioning on-orbit and ground systems services for government-furnished hosted payloads on commercial platforms. The HoPS IDIQ can also be used to procure hosted payload studies that may or may not materialize into future missions.

SMC also awarded the IDIQ contract's first competitive delivery order for the National Aeronautics and Space Administration's Tropospheric Emissions: Monitoring of Pollution, or TEMPO, mission study. From the newly formed competitive pool, as many as four GEO lane contract holders will be awarded study contracts to examine the feasibility of accommodating the TEMPO instrument as a hosted payload. Each six month study is valued at less than $800,000. NASA plans to use the HoPS IDIQ for the subsequent TEMPO Mission Delivery order.

The Air Force Space Command's Space and Missile Systems Center, located at Los Angeles Air Force Base, California, is the Air Force's center of acquisition excellence for acquiring and developing military space systems. The organization's portfolio includes GPS, military satellite communications, defense meteorological satellites, space launch and range systems, satellite control networks, space based infrared systems and space situational awareness capabilities.

The HoPS awards of $494,900,000 each were assigned to:

- *Astrium Services Government, Inc., Rockville, Maryland*
- *Boeing Co., El Segundo, California*
- *Eutelsat America Corp., Washington, District of Columbia*
- *Exoterra Resources, Littleton, Colorado*
- *Harris Corp. Government Communications Systems Business Unit, Palm Bay, Florida*
- *Intelsat General Corp., Bethesda, Maryland*
- *Lockheed Martin Corp., Littleton, Colorado*
- *Merging Excellence and Innovation Tech, Inc., Houston, Texas*
- *Millennium Engineering & Integration Company, Arlington, Virginia*
- *Orbital Sciences Corp., Dulles, Virginia*
- *Space Systems/Loral, LLC, Palo Alto, California*
- *SES Government Solutions, McLean, Virginia*
- *Surrey Satellite Technology, Englewood, Colorado*
- *ViviSat, LLC, Beltsville, Maryland*

The contract has a five-year ordering period from the date of award. Work will be performed predominantly at the contractors' locations mentioned above and is expected to be completed by Jan. 31, 2029.

AN IGC FOCUS: AISR MISSIONS VIA INTELSAT EPICNG KU-BAND

By Christopher M. Hudson, Intelsat General Corporation (IGC), and,
Eric Hall and Glenn Colby, L-3 Communications

A significant cost of AISR missions today is the leasing of bandwidth from commercial satellite (COMSAT) systems, including Ku-band. Going forward, DoD guidance recommends future AISR systems support both commercial Ku-band systems (legacy and future), as well as military Ka- band [1].

In this whitepaper, we analyze and predict AISR performance on the Intelsat Epic^{NG} satellite constellation, with comparisons to legacy Ku-band and Ka-band systems. Epic^{NG} is Intelsat's next generation satellite platform that delivers global high-throughput technology without sacrificing user control of service elements and hardware. The Epic^{NG} platform uses C-, Ku- and Ka-bands, wide beams, spot beams, and frequency re-use technology to provide a host of customer-centric benefits.

This article provides an overview of the Intelsat Epic^{NG} satellite system, including performance data, description of AISR missions, systems and waveforms to be used in the analysis as well as link budget analysis that predicts the performance of Epic^{NG} with comparisons to legacy Ku- and Military Ka-band.

INTELSAT EPIC^{NG}

Architecture

Intelsat Epic^{NG} is a series of multi-spot, high frequency re- use satellites [2]. The satellite beams are commonly referred to as User, Gateway, Wide or Spot beams.

User and Wide beams use standard Ku-band frequencies. Gateway and Spot beams use C-band and alternative frequencies. Global Ka- band beams are also provided. The frequency diversity between User/Wide and Gateway/Spot beams maximizes beam coverages and bandwidth. The diversity allows placement of Gateway/Spot beams co-incident with User/Wide beams without impacting the bandwidth available in any of the beams.

Gateway/Spot beams do not have fixed connectivities to/from User/Wide beams. Via an on-board digital switch, any uplink beam, User, Wide, Gateway or Spot can be connected to any downlink beam, User, Wide, Gateway or Spot. All beam connectivity permutations are supported, including

Artistic rendition of the Intelsat 34 satellite. Image is courtesy of Intelsat.

loopback. Gateway and Spot beams can be viewed as high capacity beams providing connectivity to any User or Wide beam as required.

User and Wide beams are primarily designed for use by remote terminals while Gateway beams are primarily designed for use by hub / teleport ground equipment. Although beams are tailored for expected usage, all terminal types—hub, controller, remote, etc.—can be operated in all beam types. Beam layouts for IS-33e are shown in ***Figures 1***, ***2*** and ***3***.

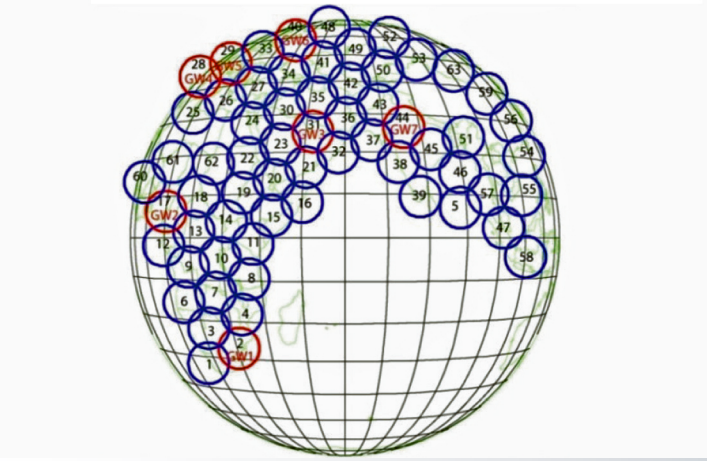


Figure 1. IS-33e Ku-band User & Gatweay Beams.

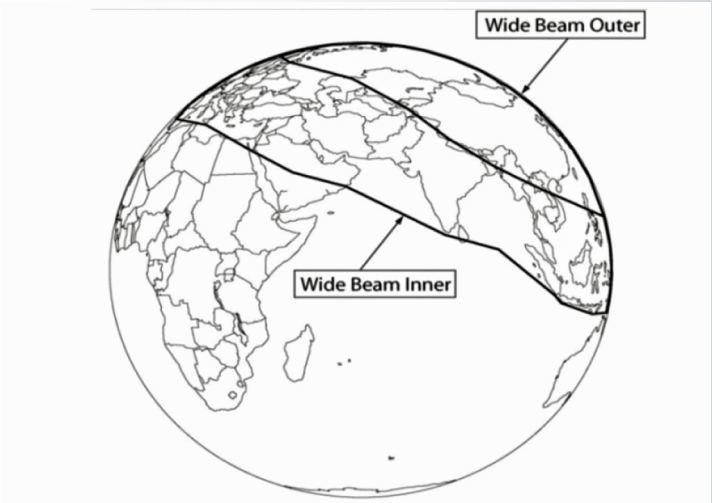


Figure 2: IS-33e Ku-band Wide Beam.

Figure 3: IS-33e C-band Spot Beams.

Beam to beam connectivities can be established in multiple sub-bands within the transponder's bandwidth. A beam may have multiple simultaneous connectivities.

As an example, User beam #7 may have 26 MHz loopback, 26 MHz to/from Gateway #1, 13 MHz to/from Gateway #2, 13 MHz to/from another User beam, and so on. Satellite operating procedures and tools are under development with the expectation that beam connectivities will change over the life of the satellite to match evolving demands.

User beam frequencies and polarizations are selected to maximize beam-to-beam isolation. Better beam isolation translates into improved received signal-to-noise ratio (SNR) and corresponding higher satellite efficiency in terms of megabits per second (Mbps) transmitted per megahertz (MHz) of satellite resource.

Based upon known and expected demands, some User beams are allocated bandwidth different from nominal. To date, all beams on Intelsat Epic^{NG} satellites are of fixed location. Steerable beams have been, and will continue to be, considered.

Epic^{NG} supports open architecture. Users can deploy ground platforms of their choosing, in their desired network topology (*e.g.*, star, mesh, distributed star), across the beam connectivities already described.

Open architecture also allows Users to select the data rates supported and whether their network capacity operates in a dedicated or shared manner.

Ku-band was chosen for the User beams for multiple reasons:

- *Large deployed base of Ku-band terminals requiring ongoing support and improved performance*
- *Compatibility with traditional, wide beam, Ku-band satellites to enable terminals to operate across multiple satellite platforms.*
- *Better performance than Ka-band during rain*
- *Better performance than Ka-band when utilizing equal- sized spot beams* [3].

Future Epic^{NG} satellites may have Ka-band User beams if market demand demonstrates the need.

The multi-spot, high frequency, re-use design provides inherent interference/jamming mitigation. An intentional or unintentional jammer must be within a beam to interfere. If outside the beam, the satellite's sharp beam roll-off design will provide isolation.

Additionally, beams operating in cross connect (*e.g.*, User to Gateway) provide a lower probability of detection. Transmissions within a beam are not seen in the uplink beam but rather at the geographically distant cross connect beam. This split beam operation also enables transmissions into a User beam while adversaries are attempting to jam transmissions from the User beam.

The onboard digital switch provides another layer of interference protection. When interference is detected, the onboard switch can be configured to not propagate the interferer further. The interferer can be terminated in the satellite or it can be switched to a beam and frequencies specifically established for monitoring. As that is being done, the desired transmitter's

carrier can be tuned to uplink in clear bandwidth and, via the switch, be downlinked at its original intended frequency.

Finally, in terms of protection, wider transponder bandwidths support a greater range of protected waveforms and provide greater protection performance. Epic^{NG} User beam transponders are nominally wider than the 36, 54 or 72 MHz typical on legacy Ku-band satellites and the 32 MHz wide transponders on Inmarsat I-5 Global Service Beams [4].

Intelsat's Epic^{NG} satellites are designed as a complementary overlay to Intelsat's existing fixed satellite network. They are not intended to replace wide beam satellites but rather augment where high capacity and high performance are needed.

Epic^{NG} will be fully integrated into Intelsat's existing satellite fleet and global IntelsatOne terrestrial network. To date, commitments have been made for seven Epic^{NG}-class satellites and more are in planning stages. Intelsat continually evaluates and updates its fleet replenishment and enhancement strategy. Epic^{NG}-class satellites are an integral tool in that process.

Legacy Ku-Band Comparison

Nominal beam edge EIRP for a User beam on an Epic^{NG}-class satellite is 55 dBW. This compares to 53 dBW beam peak performance for legacy Ku-spot beams on IS-IX series satellites. Beam peak on Epic^{NG} User beams is nominally 4 dB over beam edge, or 59 dBW. In other words, over the entire Epic^{NG} User beam coverage area, satellite EIRP will match or exceed that provided at beam peak on legacy IS-IX Ku-band spot beams.

Intelsat Epic^{NG} G/T performance, similar to EIRP, compares to, or exceeds, beam peak performance of legacy satellites; across the entire User beam coverage area. Legacy IS-IX Ku-spot beams nominally provide 9dB/K G/T at beam peak. Epic^{NG} User beams provide 8dB/K G/T at beam edge and 13dB/K at beam peak.

Application To AISR

AISR missions are often required to use smaller, so-called disadvantaged, satellite terminals. This need is driven by size, weight and power (SWaP) and other operational constraints. The high EIRP and G/T performance provided by Intelsat Epic^{NG} satellites are very advantageous for these smaller terminals.

The higher G/T provided by Epic^{NG}-class satellites translates into higher transmission rates from existing terminals and/or less terminal EIRP per transmitted Mbps. An interesting phenomenon occurs due to Epic^{NG}'s high EIRP values. If a User beam transponder is operated at saturation with the power distributed evenly across the available bandwidth, typical inter-satellite coordination limits would be exceeded; *i.e.*, Intelsat Epic^{NG}'s downlink power spectral (PSD) would be excessive. Epic^{NG}, of course, will not operate in such a manner.

AISR SYSTEMS + TECHNOLOGY

AISR satellite networks are typically characterized by high-throughput return links (remote to hub) and lower throughput forward links (hub to remote). This network architecture is opposite the more conventional Internet/surfing or video distribution models. Consequently, SATCOM engineering for AISR systems requires special considerations, especially for the return link.

Return link data rates of interest range from 1 to 20 Mbps for most systems, with 10 Mbps being of particular interest, as it allows transport of high-definition full motion video, HD 720p, along with other platform/mission traffic. AISR systems can be reasonably divided into manned and unmanned variants.

Manned AISR Systems

Manned AISR systems are typically commercial airframe systems with special equipment sets supporting the ISR collection and dissemination. The airframe often limits the antenna size. 30 to 45 cm diameter, reflector-based, antennas are common for smaller platforms such as Gulfstream and King Air.

Larger airframe platforms can support up to 1 meter antennas and low-profile, phased-array antennas are common. Manned systems often have larger forward link throughput requirements, as traffic includes both ISR data as well as other IP-based services, including voice and data.

Unmanned AISR Systems

A variety of countries maintain fleets of unmanned AISR systems. For the US DoD inventory, satellite capabilities are common on Tier III and IV UAS [5] with 30 centimeters up to 1.2 meter diameter antennas being common.

Example terminals include the L-3 Communications Ku-band SATCOM data link Predator Reconnaissance System [6]. Return link data traffic is typically sensor data, including Full Motion Video (FMV), while forward traffic is primarily platform command/control. Future sensors and missions will demand more return link throughput, at lower costs. Migration to align with future COMSAT architectures is critical [5].

AISR Waveforms

A variety of AISR SATCOM waveforms are currently in use. For purposes of this article, the focus is on the DVB-S2 waveform specified in [7] for both forward and return link operations and in an SCPC network configuration. US DoD is migrating to common waveforms [5] and DVB-S2 has been a high interest item [8], [9] and [10] due to its capacity approach, performance and affordability considerations as a COTS technology.

AISR PERFORMANCE OVER EPIC^{NG}

Intelsat Epic^{NG} Performance + Comparisons To Legacy Ku-Band Satellites

To analyze Epic^{NG} performance, link budget analyzes (LBAs) were performed using expected performance for IS-33e, a satellite presently under construction. All links have a 7.3 meter hub antenna in a Gateway beam communicating with a remote terminal located in a User beam. Both forward carrier (to the remote terminal) and remote carrier (from the remote) are DVB-S2 [11].

Antenna Size (m)	Performance	
	Tx Gain (dB)	*Rx G/T (dBi/K)*
1.20	42.5	19.8
0.76	39.1	15.7
0.45	34.5	11.0
0.30	31.0	8.0

Table I. Remote Terminal Parameter

LBAs were completed for remote terminals ranging from 30 centimeters to 1.2 meters in diameter; located at beam center and beam edge. Performance parameters of the remote terminals are shown in *Table I*.

LBAs were completed for sample carrier sizes with allocated bandwidth (BW) equal to power equivalent bandwidth (PEB)—which provides optimal satellite efficiency—unless constrained by off-axis emission limits. For the configuration analyzed, off-axis emissions limited transmissions for terminals smaller than 76 centimeters. The LBA results can be scaled to a desired carrier size and/or a desired satellite resource allocation.

Typical AISR terminal antennas range from 30 centimeters to 1.2 meters. Return link performance for those antenna sizes, at beam center, is detailed in the two *Table IIs* below, which shows results for both (a) constant 10 Mbps transmission rate and (b) constant 4.1 MHz of satellite resources.

Resources for 10 Mbps Transmit on Epic^{NG}			
Antenna Size (m)	***Tx EIRP (dBW)***	***HPA (Watts)***	***Satellite Resources (MHz)***
1.20	47.9	3.5	4.1
0.76	47.9	8.8	4.1
0.45	46.4	17.5	7.6
0.30	42.4	15.5	9.5
Transmit Rates with 4.1 MHz on Epic^{NG}			
Antenna Size (m)	***Tx EIRP (dBW)***	***HPA (dBW)***	***Terminal Transmit Rate (Mbps)***
1.20	47.9	3.5	10.0
0.76	47.9	8.8	10.0
0.45	43.7	9.4	5.4
0.30	38.7	6.7	4.3

Table II. AISR Terminal Performance On Intelsat Epic NG.

Table III details the DVB-S2 modulation and forward error correction (FEC) coding achieved in both sections of *Table II*. The corresponding satellite efficiencies are also provided.

Return Link Efficiency on Epic^{NG}		
Antenna Size (m)	***DVB-S2 Modulation, Coding Rate***	***Satellite Efficiency (bps/Hz)***
1.20	16APSK, 4/5	2.44
0.76	16APSK, 4/5	2.44
0.45	QPSK, 5/6	1.31
0.30	QPSK, 2/3	1.05

Table III. Intelsat Epic NG Efficiency With 7.3 Meter Hub

Note that the results in *Table II* are determined assuming operation at the maximum possible satellite efficiency, *i.e.*, with highest aggregate Mbps per transponder. Higher throughputs are possible—for an individual terminal EIRP—by using less satellite-efficient modulation and coding rates.

The transmit EIRP values in *Table II* are 1 dB over normal LBA results to compensate for an assumed 1 dB radome loss. HPA sizes in *Table II* assume a 0.5 dB loss between HPA output and antenna flange.

If a terminal's Tx EIRP capability is different from that shown in *Table II*, the data rate and satellite resources can be scaled accordingly. The satellite efficiency will remain the same.

The high G/T on Intelsat Epic^{NG} satellites leads to multiple efficiency gains for AISR terminals. First, the high G/T results in lower terminal EIRP and corresponding lower off-axis emissions. Due to this, carrier spreading is not required when transmitting from a 45 or 30 centimeter terminals on Epic^{NG}. This differs radically from traditional Ku-band satellites, which typically require 2 to 4 times spreading for, respectively, 45 and 30 centimeter antennas.

The lack of spreading on Epic^{NG} translates directly into bandwidth savings for the User. Additional savings are realized when more efficient modulations and coding are utilized; *e.g.*, QPSK, 5/6 listed in *Table III* instead of the QPSK, ½ that is typical today.

A second efficiency gain derives from the fact that transmissions from 76 centimeter terminals and larger can readily operate at maximum satellite efficiency on Intelsat Epic^{NG}—*i.e.*, operate with occupied MHz equaling PEB. This is due to their EIRP capabilities and off-axis isolation.

With these efficiencies, any 76 centimeter or larger terminal, capable of 53 dBW EIRP, can uplink up to 40 Mbps on Epic^{NG} at beam center and 8 Mbps at beam edge.

Table IV describes maximum return link capacities at beam center and beam edge on Intelsat Epic^{NG} for a range of terminal EIRPs. As in *Table II*, the values in *Table IV* are achieved while operating at maximum satellite bps/Hz efficiency. Also as before, for a given EIRP, higher throughputs are possible, up to transponder bandwidth limits, but at the cost of lower satellite efficiency.

Maximum Tx Rate on Epic^{NG}		
Terminal EIRP (dBW)	***Beam Center Tx Rate (Mbps)***	***Beam Edge Tx Rate (Mbps)***
50	20	4
53	40	8
56	81	16
59	161	32
62	237	65
65	237	129

Table IV. Intelsat Epic NG Efficiency With 7.3 Meter Hub

A common terminal size for airborne satellite communications is 45 centimeter (18-inch) with maximum transmit EIRP of 44 dBW. On existing Ku-band satellites, this terminal typically achieves 1.0 to 1.5 Mbps transmission rates while occupying, respectively, 5 MHz and 7.5 MHz, due to spreading.

These are nominal beam edge / beam center values. On Intelsat Epic^{NG}, performance improves to 4 Mbps in 4 MHz at beam edge and 7.6 Mbps in 5.5 MHz at beam center. This is a fourfold increase in transmit bit rate with a simultaneous 20% decrease in satellite MHz.

Intelsat Epic^{NG} Performance Comparisons To Ka-Band Systems

From [1], future AISR systems will likely support commercial Ku- as well as military Ka-band satellites (*i.e.*, WGS). In [7], analysis was performed showing link performance of WGS and legacy Eutelsat Ku-band, focused on the benefits of the DVB-S2 ACM properties. This article section updates the analysis to include AISR terminals and the Intelsat Epic^{NG} satellites. Link budgets parameters for the Ka-band system are taken from [12] .

Table V compares Intelsat Epic^{NG} and US DoD Wideband Global SATCOM (WGS) Ka-band performance for representative AISR systems. Link performance parameters, in terms of availability and bit error rate, are kept constant.

As done earlier, two comparison scenarios are explored: one showing bandwidth resources required for a fixed 10 Mbps data rate and a second showing the data rate possible with a fixed 4.1 MHz of satellite resource. With higher G/T versus legacy Ku-band, Epic^{NG} offers equal to superior performance to WGS Ka-band in all cases.

Resources for 10 Mbps Transmit on Epic^{NG} and WGS Ka-band

Antenna Size (m)	*Ku-band Tx EIRP (dBW)*	*Epic^{NG} Satellite Resources (MHz)*	*Ka-band Tx EIRP (dBW)*	*WGS Ka-band Satellite Resources (MHz)*
1.20	47.9	4.1	53.7	7.7
0.76	47.9	4.1	53.7	7.7
0.45	46.4	7.6	53.7	7.7
0.30	42.4	9.5	51.6	25.1

Transmit Rates with 4.1 MHz on Epic^{NG} and WGS Ka-band

Antenna Size (m)	*Ku band Tx EIRP (dBW)*	*Epic^{NG} Maximum Data Rate (Mbps)*	*Ka-band Tx EIRP (dBW)*	*WGS Ka-band Maximum Data Rate (Mbps)*
1.20	47.9	10	51.1	5.3
0.76	47.9	10	51.1	5.3
0.45	43.7	5.4	51.1	5.3
0.30	38.7	4.3	43.7	1.6

Table V. Epic ^{NG} Ku-Band Vs. WGS Ka-Band Return Link.

The results in *Table V* are for the following conditions:

- *Ka-band terminal EIRP is the power-controlled value optimized for aggregate transponder capacity (1.2m, 0.76m, 0.45m) or as limited by off-axis energy constraints (0.30m)*
- *Ka-band Satellite performance from [12]*
- *Modem implementation loss assumed at 1 dB @ BER = 1e-8*
- *DVB-S2 with a = 0.25*
- *Availability = 99 percent ITU-Model 7 with terminal @ 30k feet altitude*

IN CONCLUSION

UAS roadmap documents [1] identify commercial Ku-band SATCOM as an essential part of current and future AISR systems. In this paper, we extend the results from [3] to identify the opportunities with the Intelsat Epic^{NG} satellites to improve UAS performance and AISR missions. Identified is a 4x transmit data rate improvement for existing AISR terminals on Intelsat Epic^{NG} when compared to wide beam legacy Ku-band satellites.

On Epic^{NG}, existing small AISR terminals are enabled to 7.6 Mbps transmissions and large larger terminals up to 237 Mbps. A comparison was also made to WGS military Ka-band capabilities, showing that Epic^{NG} offers equal to better performance than WGS across a range of terminal sizes.

Based on the analysis in this article, future AISR mission performance will be much improved using Epic^{NG} and WGS Ka-band over legacy systems.

Direct link to the Intelsat General infosite for the white paper:
intelsatgeneral.com/document/aisr-missions-intelsat-epicng-ku-band/

Intelsat General also offers an interesting video that presents Protected Communications and describes the anti-jamming features on the Intelsat Epic^{NG} satellites that are mentioned in this article. That link is:

intelsatgeneral.com/videos/protected-and-secure-satellite-communications/

References

[1] *Department of Defense United States of America, "Unmanned systems integrated roadmap (FY2013-2038)," Open Publication Reference Number 14-S-0553.*

[2] *Intelsat Epic^{NG} websites, http://www.Intelsatgeneral.com/node/642, http://www.Intelsat.com/infrastructure/Intelsat-epicng/, 1 May 2014.*

[3] *C. McLain, S. Panthi, M. Sturza, and J. Hetrick, "High throughput Ku-band satellites for aeronautical applications," IEEE MILCOM 2012.*

[4] *G. Nicola, M. Franci, "Rocket science made simple - satellite connectivity for aviation explained," http://www.inmarsat.com/wp-content/uploads/2013/10/Inmarsat_Rocket_Science_Made_Simple.pdf.*

[5] *Headquarters, US Air Force, "United States Air Force RPA vector – vision and enabling concepts 2013-2038," February 2014.*

[6] *L-3 PPDL Dat Sheet, http://www2.l-3com.com/csw/ProductsAndServices/DataSheets/Ku-band_SATCOM_Data-Link_%28KuSDL%29_Predator_Sales-Sheet_WEB.pdf, 1 May 2014.*

[7] *B. Bennett, D. Hannan, J. Marshall, R. Gibbons, "Link analysis of commercial and wideband gapfiller satellite (WGS) satellites using DVB-S2 with variable coding and modulation (VCM)," IEEE MILCOM 2006.*

[8] *C. Timmerman, M. Wright, and T. Brick, "Extension of DVB-S2 capabilites for high-rate ASIR data transport," IEEE MILCOM 2009.*

[9] *L. Wang and D. Ferguson, "WGS air-interface for AISR missions," IEEE MILCOM 2007.*

[10] *Department of Defense United States of America, "Wireless Communications Waveform Development and Management," DoDI 4630.09, 3 November 2008.*

[11] *European Telecommunications Standards Institute, "Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications (DVB-S2)," http://www.etsi.org/deliver/etsi_en/302300_302399/302307/01.02.01_60/en_302307v010201p.pdf, 24 August 2009.*

[12] *B. Bennett, K. Quock, J. Greeves, M. Nguyen, "DoD IP SATCOM transition to WGS," IEEE MILCOM 2007.*

Military and Government Rates Available

SMi
LINKING BUSINESS *with* INFORMATION

The SMi Group Proudly Presents...

MARITIME RECONNAISSANCE AND SURVEILLANCE TECHNOLOGY

15TH-16TH FEB 2016

Crowne Plaza Hotel, Rome, Italy

Maximising Maritime Situational Awareness Capabilities for Security of Life and Territory at Sea

EVENT HIGHLIGHTS:

- **5 Flag Officers confirmed** making this the most focused Maritime ISR meeting in the Region!
- Military Briefings from **Italy, Spain, Sweden, Finland, NATO, EU and the United States**
- International military updates **on current and future Maritime ISR capabilities**
- Real Solutions presented and offered within the **Maritime Reconnaissance and Surveillance Technology Exhibition**

HOST NATION KEYNOTE SPEAKERS:

- **Rear Admiral Nicola Carlone,** Director of Plans and Operations, **Italian Coast Guard**
- **Rear Admiral Antonio Natale,** Head of Ships Department, **Italian Navy**
- **Colonel Sergio Cavuoti,** Chief of the Intelligence and Awareness Policy Branch of the Air Staff Aerospace Planning Division, **Italian Air Force**

REGIONAL EXPERT SPEAKERS:

- **Rear Admiral (ret.) Nick Lambert,** Former UK National Hydrographer, UK Hydrographic Office, **Royal Navy**
- **Rear Admiral Dan Thorell,** Head of Response and Law Enforcement, **Swedish Coast Guard**
- **Rear Admiral Giorgio Lazio,** Chief of Staff, **NATO Allied Maritime Command**
- **Brigadier General Carlos de Salas,** Head of C4ISR and Space Programs, **Spanish Ministry of Defence**
- **Commander Bow Wheaton,** Maritime Capability (Aviation), **Royal Navy**
- **Captain Durkee,** Commander of CTF-67, **US Navy Command Europe**
- **Colonel Rory Copinger-Symes,** Chief of Staff, **EU Naval Force**
- **Colonel Jeff Dooling,** Director Space Requirements, Director General Space, **Canadian Forces**
- **Commander Pasi Staff,** Chief of Surveillance, **Finnish Navy**
- **Director Chris Reynolds,** Head of the Irish Coast Guard, **Irish Coast Guard**
- **Mr Guy Thomas,** Director, **C-SIGMA**
- **Mr Jonathan Locke,** Senior Scientist, Centre for Maritime Research and Experimentation, **NATO**

Gold Sponsors:

e-geos PAE

Sponsors/Exhibitors:

ASTER CAPITA civitanavi systems HORIZON WINDWARD

MAKE SURE YOU REGISTER FOR OUR POST-CONFERENCE WORKSHOP

The benefits of C-SIGMA and how it can improve national capability to monitor the seas from space
17th February, 2016 | 9.00am - 12.10pm
Hosted by **Guy Thomas,** Director, **C-SIGMA**

www.maritime-recon.com/satnews

Register online or fax your registration to +44 (0) 870 9090 712 or call +44 (0) 870 9090 711

MILITARY, GOVERNMENT & PUBLIC SECTOR RATES AVAILABLE

CPD CERTIFIED

#maritimerecosmi
@SMiGroupDefence

COMBATING VSAT MILITARY INTERFERENCE

By Petter Amundsen, Chief Executive Officer, VeriSat

Over recent years, there has been a great deal of action to reduce satellite interference—with some good results.

Carrier ID* had been introduced for continuous carriers, but interference caused by VSAT terminals is still a major challenge, and increasingly so, as the number of VSAT terminals and VSAT networks has been growing. Until recently, there has been no efficient solution to combat this problem.

This also applies to the military environment, where VSATs are often deployed as SATCOM-On-The-Move (SOTM) and in remote locations. The operational constraints and installation procedures may differ from the commercial environment and interference is seldom monitored at installation time. The result is then often interference from military VSATs disturbing other services.

THE MAIN CAUSE OF VSAT INTERFERENCE

VSAT networks are responsible for around 40 percent of interference cases for commercial satellite operators. More significant, however, is that VSAT interference takes the longest time of all interference to resolve. Subsequently, 50 percent of interfered bandwidth is due to VSAT involvement. This is because VSAT interference is challenging to resolve:

- *VSATs are often operated in remote, unmanageable locations and spread over a large geographical area*
- *VSATs are increasingly used on-the-move*
- *Incorrect antenna pointing causes misalignment which easily leads to both cross polarization or adjacent satellite interference*
- *Many VSATs share the same frequency in TDMA mode*
- *There is no standardized way to detect the identity of the interfering VSAT terminal*
- *Incorrect installation or faulty cables and connectors can easily lead to GSM or radio retransmission if the terminal is in the vicinity of a GSM or radio base station*

WHY CARE?

Interference pollutes the satellite transponder and degrades and disturbs services operating on the same frequencies in adjacent or cross-polar transponders. In some cases the interference is marginal and the service being disturbed has sufficient SNR margin to operate without any measurable degradation.

In other cases, the interference is severe and leads to complete loss of the service. Links using ACM are vulnerable to interference as they, by definition, utilize all available link margin to increase the transmitted bandwidth of user data. As the VSAT interference comes in bursts, in a random manner, the ACM service experiences random loss of packets.

As VSAT interference, in general, only affects a minor number of services, there can, at times, be a certain amount of apathy. This is especially true as resolving VSAT interference, until now, has been a time-consuming and complicated process.

This means that a service could be affected for a long time, sometimes weeks and months, even years. The short-term solution is often to move a service to a new operational frequency, along with all the trouble that may involve. Clearly, while it does only affect a minor number of services, when interference does affect you, the impact can be significant.

FINDING THE OFFENDING TERMINAL ID

With the introduction of VeriSat SatGuard, identifying the source of interference is now possible, whether such be adjacent satellite interference or cross-polar interference. The identification is quick and efficient.

SatGuard captures and analyzes the signals from both the operational and the interfered links with patent-pending technology and determines the ID of the terminal, which is extracted from the burst payload. With this information, the satellite operator is able to take the appropriate actions to stop the interfering terminal's transmission.

The SatGuard technology also has the interesting spin-off of enabling geolocation of the terminal IDs. This is not possible with existing geolocation technology. This will have interesting applications in several market segments. VeriSat is working to commercialize this technology and expects to launch the solution early next year.

VeriSat has also developed a tool to specifically tackle the problem of GSM retransmission as mentioned above, which is caused by faulty cables and connectors of VSAT terminals in the vicinity of GSM base stations. Decoding the GSM interference signal enables operators to determine the GSM base station location by extracting the country ID and unique cell ID of the GSM base station signaling. The solution can perform this extraction down to an SNR level of 2 dB.

Resolving Military Interference

Interference will always occur to some degree. However, what we can do is to manage the interference by applying tools and processes that can resolve interference quickly and efficiently. With active monitoring of VSAT interference in the same manner that continuous carriers have been monitored for some time, VSAT interference can be managed and policed in a proactive way.

This will strongly reduce the problems caused by interference when it does occur, and also prevent VSAT interference from happening at installation time, as well as monitoring interference levels under normal operation. This is especially important for SOTM VSATs, which are frequently repointed.

verisat.no/

** The past year Carrier ID has been introduced as a solution for determining the source of continuous transmission causing interference. Carrier ID is a spread spectrum carrier transmitted at very low power underneath the main carrier. The technology is being embraced by commercial operators, but it will take sometime before broad implementation.*

SatFinder

Satellite Database & Calculation Software

DATABASE

Information on over 500 satellites (orbital location, frequencies, EIRP, G/T, SFD, bandwidth, programming etc.)

Information on 9,000 companies (address, tel, fax, web, products, services and contact names etc.)

Information on 19,000 executives in the commercial satellite industry.

800 hundred EIRP, G/T & SFD maps in color not published anywhere else.

CALCULATION

Has full up-down digital link budget calculators with input provision for uplink power control (UPC), ALC, various interferences and multiple carriers.

Finds HPA size, uplink power requirements, bandwidth and power usage per carrier.

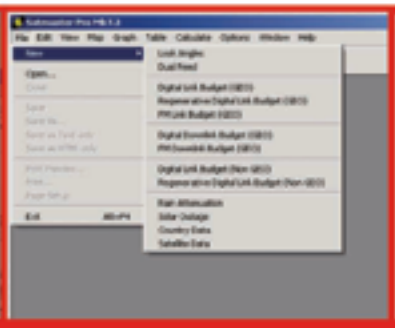
Calculates atmospheric losses and rain fade margins for any desired availability on uplink and downlink.

Handles BPSK, QPSK, M-PSK or M-QAM with any FEC code rate.

Determines power or bandwidth limited modes and calculates the power equivalent bandwidth, if appropriate.

Provision for RS codes or 'Turbo' modems. Option for rain up AND rain down scenarios where uplink and downlink are from/to the same city.

UPDATED QUARTERLY!



http://www.satnews.com/satfinder

A SATCOM FRONTIER TRILOGY

PREPARING FOR THE UNEXPECTED IN SPACE

By Nancy Rey Nolting, Marketing Programs Mgr., Intelsat General Corp.

There is a common thread through all of the speculation—informed and otherwise—about future conflicts on the global stage: Expect the unexpected.

It's an axiom built upon lessons learned over centuries of conflict, but it leaves an important question: How do you prepare for the unexpected?

The question was asked and answered by Skot Butler, Intelsat General's Vice President for Satellite Networks and Space Services, who presented at the 17th annual Global MilSatCom symposium in London last November.

IGC's Skott Butler.

The commercial satellite community has been preparing for the unexpected globally for years in partnership with the military. Examples include the Skynet fleet public-private partnership in the UK, the SES-Luxembourg joint venture to build and operate a commercial satellite with military frequencies, and Intelsat's UHF payload for the Australian Defence Force.

Cases are being forged in the U.S., where there is a long history of leasing commercial SATCOM for military and government needs. Conversations are ongoing about the commercialization of WGS flight operations, part or all of the Air Force Satellite Control Network and even the future Wideband space system itself. In the conversations, there are challenges.

ACQUISITION WOES DELAY DOD TECHNOLOGY UPGRADES

By Matthew Bearzotti, Manager, Government Affairs, Intelsat General Corp.

On October 25, 2008, the Navy commissioned the USS New Hampshire, a Virginia-class submarine, eight months ahead of schedule and $54 million under budget for the Navy by prime contractor General Dynamics.

The U.S.S. New Hampshire.

This example shows that by adapting techniques and products from the commercial sector, the Pentagon can successfully field technology quickly under its existing weapons acquisition system.

Unfortunately the New Hampshire is the exception, not the rule, witnesses told the Senate Armed Services Committee on December 1, 2015.

Sen. John McCain (R-Ariz.), who chairs the committee, pointed to several attempts at reform that have failed to change a system that is risk averse and less open to commercial solutions than it was three decades ago, according to an account of the hearing in Defense Systems.

An Air Force general echoed McCain's criticism when speaking at a December 15 National Contract Managers Association event in Washington.

"We've got some risk averse folks out there who don't really understand the commercial side," said Maj. Gen. Casey Blake, the Air Force's deputy assistant secretary for contracting, according to an article in ***insidedefense.com***.

SPACE COMMAND SHOULD BE A DYNAMIC FORCE

By Rory Welch, Director, Business Development, Intelsat General Corp.

General John Hyten bridles at the perception of his Air Force Space Command being comprised of technicians in a 9-to-5 office environment reacting to threats thousands of miles above Earth.

It's a perception he wants to correct, Hyten told the Air Force Association's Mitchell Institute for Aerospace Studies "Space Power for the Warfighter" breakfast seminar, on December 8 in Washington.

USAF General John Hyten, Commander, Air Force Space Command. Photo is courtesy of Space Foundation.

Space Command should be proactive, and space is no longer tranquil. It's a contested environment, the Commander said in a speech entitled "*My First Year in Perspective: What Did We Get Done*?"

Among other critical space missions, Space Command is challenged to provide and maintain the Global Positioning System capabilities warfighters use to target and time weapons and to navigate on the battlefield. The command also combines military and commercial satellite assets to give those branches the ISR and communications needed to win today's wars.

Gen. John Hyten, who heads Air Force Space Command, said on December 8, 2015, that he is encouraging the use of "resilient capacity" when planning future space architectures. In that, he wants an analysis of how space capabilities operate through an integrated, combined, and joint threat to continue to provide support to the warfighter. That analysis will have to include commercial capability that aligns with DoD needs.

"It's up to our community of operators, bus and payload manufacturers, cyber and Information Assurance experts … in partnership with those in government who are responsible for the next-generation architecture of military satellite communications, to ensure that this transition—whatever its final form may be—ultimately delivers the commanders and warfighters the rapid, secure, and resilient communications capabilities upon which modern warfare so heavily relies," Butler said.

To do so, commercial satellite providers have some inherent advantages:

- *Speed of fielding: With an emphasis on technology development, coupled with a future of reusable rockets, domestic engines and rapid range turns, and with a movement toward modular satellite bus design, industry is trending toward a just-in-time COMSAT model. It's a game-changer in supporting a troop surge or any military response.*

- *Rapid technology adoption: The commercial satellite industry needs to be designed into future military satellite architectures to fully realize the potential of a commercial-military partnership. Commercial is now moving to meet the capabilities the military expects of its own systems. As an example, by 2020, commercial satellites will have security features, such as nulling and beam forming, and laser and software defined payloads as standard fare.*

- *Resiliency through distribution: a combination of commercially hosted payloads, small free-flyers and traditional capacity leases may be required because a one-size-fits-all solution is neither practical nor usually possible for the complex needs of the military. Being open to the variety*

The difference between defense and commercial technology development is why, when the final Wideband Global SATCOM (WGS) satellite is launched in 2017, a decade and a half will have lapsed from system design to implementation.

That contrasts with the expected six-year commercial timeline from design to launch of Intelsat General's Epic^{NG} High Throughput Satellite (HTS) platform, with the first satellite slated for launch in January 2016.

Artistic rendition of the Intelsat 34 HTS satellite.

Among 180,000 pages of military procurement regulations is a section called "lowest price/technically acceptable" or LPTA.

While valid for some government buys, LPTA fosters longer timelines that support the way the Air Force built WGS, as opposed to a quicker, more technically up to date system like that of Intelsat Epic^{NG}.

By its very nature, LPTA does not foster innovation, and it does nothing to prevent development delays and cost overruns.

Ben FitzGerald, director of the Center for the New American Security's Technology and National Security Program, told the Senate Armed Services Committee that the Pentagon continues to cling to a Cold War acquisitions model, which makes partnering less compelling to the private sector.

A 180-degree technology switch has developed. Where once DoD drove innovation, the military increasingly adapts technology developed commercially.

"We are managing around the system," FitzGerald testified. "I get incredibly frustrated when the answer is always 'change the system,' and the thing we can't do is change the system."

Where once there was a race to the moon, the space race today is to maintain the technological superiority and freedom of access to space that the U.S. enjoys in preparation for the wars of tomorrow. That edge helps in coping with satellite interference, both intended and incidental, as well as with looming kinetic threats to our space assets from China and Russia that could turn space into a debris-infested wasteland.

Hyten contrasted the potential aftermath of war on the ground with that in space. On the ground, he said, rebuilding a bombed area can return it to its previous state of usefulness in a short time. But geosynchronous orbit is the most valuable real estate in space, and debris there can render it useless for centuries.

As part of maintaining that edge, Hyten wants control of the seven satellite systems operated by Space Command to be fused into a single enterprise. The new enterprise would knock down barriers to communication that were part of the stove-piped control system approach, and it would also facilitate missions that can take advantage of the capabilities of different mission systems.

Key to the future is also the concept of the "Space Mission Force" (SMF). Training of the first SMF will begin next spring at Schriever Air Force Base, with airmen rotating between dedicated duty in satellite and ground systems operations, and then rotating back for intensive training and certification. This links closer to how other arms of the Air Force conduct business.

He also highlighted the role for the commercial sector in the new enterprise, which has been discussed extensively over the past year. One idea advanced is for commercialization of certain satellite flight operations missions freeing the uniformed SMF personnel to plan and execute more critical missions, react to threats, monitor satellites and stay ahead of a rapidly changing potential battlefield in space.

The SMF represents a change in Air Force thinking, Hyten said. The service also should change the way it thinks about space system plans and acquisitions. Threats to assets should be factored into equations predicting their lifetimes.

of architectures that commercial can provide can increase mission security.

As an example of the innovation more commercial involvement could bring, the 10th Wideband Global SATCOM (WGS) satellite is scheduled to become fully operationally capable (FOC) in 2017, more than a decade after the first went aloft and at least 15 years after the design phase.

"A program that will take close to two decades from design to FOC naturally carries the burden of outdated technology and capacity limitations, which a capability built on a commercial model would not," Butler said.

Intelsat's EpicNG, the upcoming high-throughput satellite network, is built on the same bus as WGS and the first of at least seven will be launched next year on a standard three-year commercial timeline.

Considering the rapid development of technology and of the capabilities of our emerging global space competitors, as well as the unpredictable nature of conflict, it's clear that commercializing wideband communications is an idea whose time has come.

As important, this year has shown that the commercial sector provides value added to terrestrial satellite operations, with the military looking toward it for "smarter use of scarce dollars," Butler said. He offered an example of the seven ground infrastructure sites of the Air Force Satellite Control Network sites and their looming modernization and operations bills.

"Meanwhile," he added, "commercial ground segment operators have existing assets and facilities with available capacity and a range of customer market segments over which they can spread their costs, allowing continuous investment in infrastructure, hardware and software to maximize efficiency and minimize the highest risk element—man in the loop."

That brought up security. DoD has for several years required satellite bandwidth and services providers to meet a set of some 200 security controls.

"Long before this requirement was levied on us, Intelsat saw the criticality of protecting our networks and began a defense in depth program that focuses on our three pillars of information security: confidentiality, availability, integrity," Butler said.

The pathway toward coping with an unexpected future starts at the beginning of military satellite programs. The commercial sector must be involved.

"I don't believe we can identify every possible contingency that might arise during the life of this architecture," Butler said, "but if we have a resilient, diversified design, we should be well positioned to adapt to these unknowns."

Still, Congress tries to change the system while it also worries over technology gaps that are sending customers to France to buy night-vision equipment and to China to overcome U.S. import/export issues.

The hope is that Congressional attempts can make a difference and start to resolve this problem.

The Virginia-class submarine success shows that the DoD can do better. The United States must do better if it is to address the challenge of new adversaries in space.

The difference in development time to implementation of the WGS versus the development of more modern commercial satellites is an example of the best way forward.

Editor's note:
All of these articles are republished with permission of Intelsat General Corporation and their SatCom Frontier blog.

The SatCom Frontier blog may be accessed at ***intelsatgeneral.com/management-team/satcom-frontier/***

He highlighted that a recent Analysis of Alternatives recommended maintaining the existing architecture with few changes. This is not acceptable in the new contested and congested space.

The status quo is not resilient, Hyten said, and the use of outdated metrics is no longer a valid path toward maintaining space superiority. This is a message the Air Force needs to convey to those who provide funding to secure that future, including Pentagon planners and Congress.

Determining threats is part of Space Command's interaction with the Intelligence Community and other service branches at the Joint Space Operations Center (JSpOC). Early identification of a threat can allow Space Command minutes (for satellites in low Earth orbit) or hours (in GEO) to react with capabilities already built into space assets.

Also, Space Command is developing and refining Tactics, Techniques and Procedures for using those capabilities and doing realistic testing of these at the newly created Joint Interagency Combined Space Operations Center (JICSpOC).

Other branches are starting to include Space Command in planning operations. Such cooperation is fostering an environment in which the Intelligence Community, Space Command and industry can better develop a space architecture to meet the demands of a dynamic future.

32ND SPACE SYMPOSIUM

SPACE FOUNDATION

April 11 – 14, 2016

The Broadmoor Hotel, Colorado Springs, Colorado USA

32 Years of Excellence! Our Customers Say It Best.

"Every year I am excited to see this event and every year it surpasses my expectations!"

"It was an exciting experience where I met a lot of high profile personalities – great learning."

"It is a great venue to meet other professionals from across the space spectrum."

"All presentations and exhibits were packed with amazing information and technology."

–31st Space Symposium participants, April, 2015

- *Global Perspectives and Timely Dialogue*
- *Top 2016 Event to See the Latest in Global Space Technology*
- *Targeted Tracks and Networking Events*

REGISTER TODAY
There's still time to save!

www.SpaceSymposium.org

+1.800.691.4000

Featured Speaker
Gen. John E. Hyten, USAF
Commander
Air Force Space Command

Secure Online Registration

Stay Connected:

Featured Speaker
Maj. Gen. Charles F. Bolden, Jr., USMC (Ret.)
NASA

Mil ad2