

SATCOM for Net-Centric Warfare

MilsatMagazine

JANUARY 2019

Dispatches

Advantech Wireless

C-Com Satellite Systems

CompTIA

Hexagon Corporation

MDA

Softil

Thuraya

Ms. Rebecca Cowen-Hirsch

Mr. Ryan Schradin

*Cover image is courtesy of Spectra Group (UK):
Slingshot manpack on patrol.*



PUBLISHING OPERATIONS

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

SENIOR COLUMNISTS

Richard Dutchik, Dutchik Communications
Chris Forrester, Broadgate Publications
Karl Fuchs, iDirect Government Services
Dr. Bob Gough, Goonhilly Earth Station
Rebecca M. Cowen-Hirsch, Inmarsat
Giles Peeters, Track24 Defence
Paul Scardino, Globecomm
Koen Willems, Newtec

AUTHORS

Cristi Damian
Dr. Mark Dickinson
Rebecca Cowen-Hirsch
David Logsdon
Jassem Nasser

FEATURES

Dispatches.....	4 to 14
A Winning Blueprint: How industry innovation delivers a unified, government SATCOM architecture by Rebecca Cowen-Hirsch	16
An Integrated MILSATCOM View On..... The future tactical communications network topology and applications by Cristi Damian	18
An Out of this World Idea..... Blockchain and space by David Logsdon	22
Command Center: Chris Pogue,..... President, MDA Government	24
The Current State of Space Situational Awareness:..... A Space Data Association Focus by Dr. Mark Dickinson	28
Satellite M2M and the Government:..... Accelerating national interests with remote Internet of Things (IoT) connectivity by Jassem Nasser	30

ADVERTISER INDEX

Advantech Wireless Technologies.....	7
AvL Technologies.....	13
Comtech EF Data.....	9
CPI Satcom Products	11
NAB — Nat'l Association of Broadcasters	27
SmallSat Symposium Silicon Valley 2019.....	15
SPACEBRIDGE..... (formerly Advantech Satellite Networks)	3
Space Foundation — 35th Space Symposium.....	33
W.B. Walton Enterprises, Inc.	1 + 5

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

We reserve the right to edit all submitted materials to meet publication content guidelines, as well as for grammar and spelling errors, or to move articles to an alternative issue to accommodate publication space requirements, or remove content due to space restrictions. Submission of content does not constitute acceptance of said material by Satnews Publishers. Edited materials may, or may not, be returned to author and/or company for review prior to publication — article review PDFs must be returned with corrections within 72 hours of receipt by the author. The views expressed in Satnews Publishers' various print, online and PDF publications do not necessarily reflect the views or opinions of Satnews Publishers. All rights reserved. All included imagery is courtesy of, and copyright to, the respective companies and/or named individuals. © 2019 Satnews Publishers

DISPATCHES

Spectra Group invited to the U.S. Army Expeditionary Warrior Experiments event to demo SlingShot



Spectra Group's SlingShot has been selected to participate in the U.S. Army Expeditionary Warrior Experiments (AEWE 2019).

Spectra Group is an international specialist provider of secure voice, data and satellite communications systems, specifically optimized for use in remote and challenging environments, with offices in the UK and the USA.

Following recent contract successes in the U.S., particularly with their battle-winning SlingShot tactical communications system, Spectra Group (U.S.) Inc. has been selected by the U.S. Department of Defense (DoD) to take part in the 2019 Army Expeditionary Warrior Experiments (AEWE 2019) at Fort Benning, Georgia.

AEWE is the U.S. Army's premier venue for small unit modernization, providing capability developers, the Science and Technology (S&T) community, and industry with a repeatable, credible, rigorous, and validated operational experiment.

This event supports both concept and material development.

The AEWE is an annual campaign of experimentation to place cutting edge prototype technologies into the hands of Soldiers to solve small unit tactical problems.

The Maneuver Battle Lab, as part of the Army Futures Command (AFC), executes AEWE to accelerate near and midterm Army modernization and provide bottom up input to capability development, by providing early and iterative

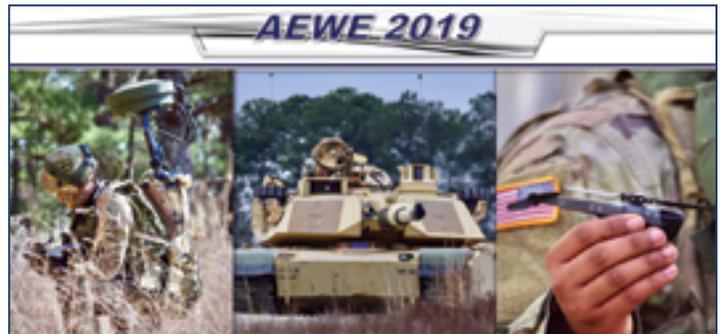
feedback on prototypes in a tactical setting.

AEWE is the "first step" of a larger Army and Joint Experimentation enterprise.

In addition to standard voice and data C2, it can enable capabilities such as remote biometric analysis, fire mission planning, tracking and inter-agency operations.

Man portable, vehicle, maritime or aviation-borne, usable on the move, delivering flexible channel leasing and with minimal increase in training-burden, SlingShot redefines tactical communication capabilities.

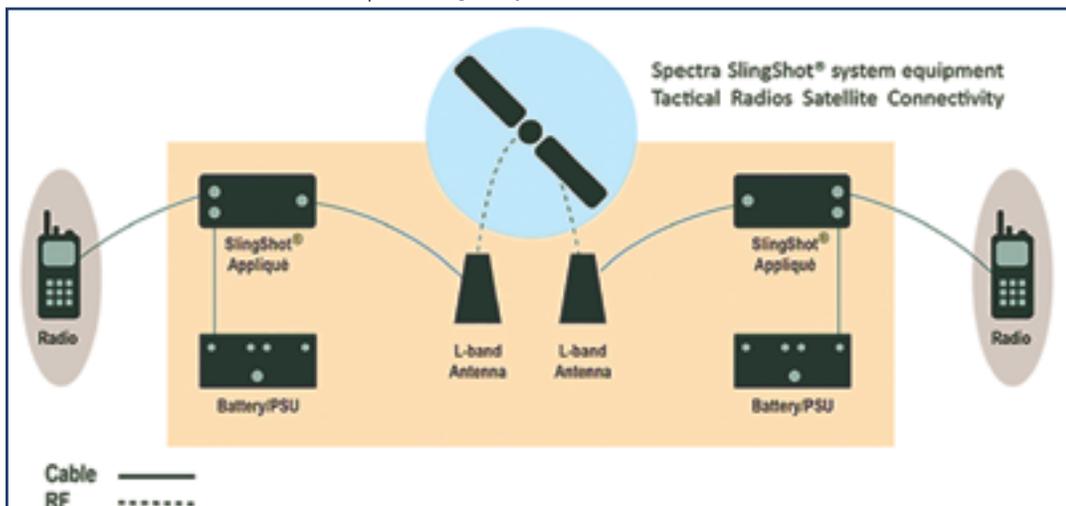
Simon Davies, President of Spectra Group, said, this is an important and prestigious step for Spectra Group to



Being demonstrated at AEWE, Spectra's SlingShot adds voice and data BLOS COTM (Beyond-Line-Of-Sight Communications-On The-Move) to in-service tactical VHF and UHF radios.

be selected to take part in the U.S.'s AEWE 2019. The company's SlingShot system is already in service with the world's premier specialist forces and it has been battle-proven on multiple occasions.

Davies added that AEWE will provide an excellent opportunity to showcase SlingShot's unique, widespread, operational capability which is attracting increasing attention from the Security Force Assistance Brigades, Brigade Combat Teams, FORSCOM, and indeed USMC and NG.



spectra-group.co.uk

www.benning.army.mil/mcoe/cdid/AEWE/

DISPATCHES

National Reconnaissance Office's NROL-71 satellite successfully launched by United Launch Alliance

Everything proceeded as planned for the United Launch Alliance (ULA) Delta IV Heavy launch carrying a critical payload for the National Reconnaissance Office (NRO).

The launch was denoted as NROL-71 and lifted off from Space Launch Complex-6 on January 19 at 11:10 a.m. PST. This mission is in support of U.S. national defense.

"Congratulations to our team and mission partners for successfully delivering this critical asset to support national security missions," said Gary Wentz, ULA Vice

President of Government and Commercial Programs, *"and thank you to the entire team for their perseverance, ongoing dedication and focus on 100 percent mission success."*

The Delta IV Heavy is the nation's proven heavy lift launch vehicle, delivering high-priority missions for the National Reconnaissance Office, U.S. Air Force and NASA.

With its advanced upper stage, the Delta IV Heavy can take more than 14,000 pounds directly to geosynchronous orbit, as well as a wide variety of complex interplanetary trajectories.



Aerojet Rocketdyne's RS-68A engine.

The mission launched aboard a Delta IV Heavy, which was comprised of three common booster cores, each one powered by an **Aerojet Rocketdyne RS-68A** liquid hydrogen/liquid oxygen engine that produced a combined total of more than 2.1 million pounds of thrust.

The second stage was powered by an **AR RL10B-2** liquid hydrogen/liquid oxygen engine.

NROL-71 was ULA's first launch in 2019 and the 132nd successful launch since the company was formed in December of 2006.



Lift off of a ULA Delta IV Heavy carrying a critical payload for the National Reconnaissance Office, NROL-71. The Delta IV Heavy lifted off from Space Launch Complex 6 on January 19, 2019 at 11:10 a.m. PST. Photo is courtesy of United Launch Alliance.

ULA's next scheduled launch is the **WGS-10** mission for the U.S. Air Force on a Delta IV rocket.

The launch is scheduled for March 13, 2019, from Space Launch Complex-37 at Cape Canaveral Air Force Station, Florida.

ULA has successfully delivered more than 130 satellites to orbit that provide Earth Observation (EO) capabilities, global communications, insights into the mysteries of the solar system, and support life-saving technology.

The National Reconnaissance Office's (NRO) systems are critical to National Security, U.S. policy makers and warfighters.

These systems provide the foundation for global situational awareness, and address the nation's toughest intelligence challenges.

Frequently, NRO systems are the only collectors able to access critical areas of interest, and data from overhead sensors provides unique information and perspectives not available from other sources.

The NRO's key customers and mission partners include: policy makers, the Armed Services, the Intelligence Community, Departments of State, Justice and Treasury, and civil agencies. All of them depend on the unique capabilities NRO systems provide:



NROL-71 launch photo is courtesy of ULA.

- *Monitoring the proliferation of weapons of mass destruction*
- *Tracking international terrorists, drug traffickers, and criminal organizations*
- *Developing highly accurate military targeting data and bomb damage assessments*
- *Supporting international peacekeeping and humanitarian relief operations*
- *Assessing the impact of natural disasters, such as earthquakes, tsunamis, floods, and fires.*

Scientists created a global environment database using NRO imagery to help predict climate change, assess crop production, map habitats of endangered species, track oil spills, and study wetlands.

NRO data also forms the basis for products that help depict and assess the devastation in areas affected by natural disasters.

The NRO's innovation also inspired technology in everyday life with contributions to medical imaging, global communications, high-definition television, cellular phones, the global positioning system (GPS), and much more.

With its vigilance from above, the NRO gives America's policymakers, intelligence analysts, warfighters and homeland security specialists the critical information they need to keep America safe, secure, and free.

www.ulalaunch.com

www.nro.gov

www.rocket.com

Together with other Department of Defense (DoD) satellites, the NRO systems play a crucial role in providing global communications, precision navigation, early warning of missile launches and potential military aggression, signals intelligence, and near real-time imagery to U.S. forces to support the war on terrorism and other operations.

NRO satellites also support civil customers in response to disaster relief and environmental research.



Copyright © 2018 United Launch Alliance, LLC. All Rights Reserved.

DISPATCHES

RigNet names a retired Admiral as the company's new Senior Vice President of Government Services

A new year and a new appointment of Senior Vice President of Government Services at RigNet — James Arden “Jamie” Barnett — who will lead the company's efforts to build a meaningful business in the government sector by leveraging RigNet's bundle of technology services: cyber security services, communications services, and artificial intelligence services based on real-time machine learning, and he will report directly to RigNet CEO and President, Steven Pickett.

Pickett said he's excited to have Jamie join the executive team, and they have a special role to play in this important market and Jamie is the ideal person to lead these efforts. His vast experience and leadership will spearhead the development of their government services business, enabling RigNet to provide unique solutions that will deliver more secure and effective communications in support of the nation's critical infrastructure.

Before joining RigNet, Admiral Barnett was a partner with Venable LLP, a regulatory law practice based in Washington D.C., where he chaired the telecommunications group.

In 2015, he was named a Top Lawyer in Washington for Cybersecurity by *Washingtonian Magazine*. Prior to that, Barnett was the Senior Vice President for National Security Policy at the Potomac Institute for Policy Studies where he was responsible for the leadership in research studies and business development that focused on policy issues related to national security, cybersecurity, and homeland security.

Barnett retired from the United States Navy as a Rear Adm. after serving 32 years

as a surface warfare officer; his last duty assignment was Deputy Commander of the Navy Expeditionary Combat Command. Upon retiring from the Navy, Barnett was named Chief of the *Federal Communications Commission's*

Public Safety and Homeland Security Bureau. He was responsible for FCC activities related to public safety, cybersecurity, homeland security, and emergency management. He also led the effort



to develop a nationwide, interoperable public safety broadband network for first responders: FirstNet.

DISPATCHES

Envistacom selected by U.S. Army to deploy the company's tactical comms solutions

Envistacom has been selected by the U.S. Army Program Executive Office Command Control Communications-Tactical (PEO C3T) and has been awarded a Prototype Project Subagreement through an Other Transaction Agreement (OTA) with Consortium Management Group (CMG) on behalf of Consortium for Command, Control and Communications in Cyberspace (C5).

The company is to develop the upgraded **Phoenix** satellite system prototypes, in an effort to modernize the U.S. Army tactical satellite communications platform. Cybersecurity threats to

MILSATCOM are a relatively new phenomenon yet have quickly come to the forefront of concern for the sustainability of satellite systems due to the vulnerabilities that such threats may exploit and negatively impact.

These mission-critical vulnerabilities include launch systems, communications, telemetry, tracking and command, and mission completion. They and other aspects of satellite communications depend heavily on secure and resilient cyber capabilities for all stages of the satellite's lifespan.

The Envistacom Phoenix satellite terminal provides *Expeditionary Signal Battalions* (ESBs) with high-capacity, tactical, satellite communication to enable inter- and intra-theater range extension for networked battle command and control information, including logistical, operational, intelligence and administrative data.

Envistacom will develop system upgrades and enhancements resulting in a more agile system that is relocatable and maneuverable, reducing size, weight, and power, enabling faster deployment, greater protection from detection, and a reduced dependency on dedicated vehicle transport.

Envistacom will expedite a typical five-year development cycle into just 18 months, including a rigorous testing and certification phase in close collaboration with *U.S. Army Project Manager Tactical Network* (PM TN) Phoenix program office.

In addition, Envistacom's cybersecurity team will integrate new and effective concepts toward solutions in awareness, resiliency, and threat-based defense for the Phoenix terminals using a balanced security posture that combines classic cyber defense approaches with a new emphasis on leveraging cyber threat intelligence to respond and adapt quickly to cyber-attacks.



A U.S. Army Phoenix terminal in use during a service test. U.S. Army photo by Amy Walker, PEO C3T Public Affairs.

Dr. Ebonese Olfus, Vice President of Cyber Strategy and Emerging Technologies for Envistacom In support of the Phoenix program said that Envistacom's cybersecurity team will collaborate with the company's government sponsors and industry partners to adopt effective new concepts and apply solutions in awareness, resiliency, and threat-based defense to all Phoenix terminals.

Alan Carson, SVP, Envistacom, added that deployed U.S. Army warfighters need modernized systems that are resilient and reliable to support global missions. Envistacom is the correct partner to deliver the next generation Phoenix system with resiliency and mobility to enhance mission flexibility and improve readiness.

www.envistacom.com

www.army.mil/peoc3t

DISPATCHES

GetSAT's terminals to support C4ISR

GetSAT has been awarded, in partnership with a division of Honeywell, a multi-million dollar contract by a U.S. Government agency for Command, Control, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) applications in support of missions during dire and emergent situations in the continental United States.

The agency selected GetSAT's MilliSAT L/M (land and maritime) Ka- and Ku-band versions to provide maritime and ground-based high-data rate, secure Communications-On-The-Move (COTM).



GetSAT's portable MilliSAT L/M terminals will be deployed to support Satellite-On-The-Move (SOTM) for land-based vehicles and maritime platforms in remote areas for emergency support.

Based on the company's patented fully-interlaced InterFLAT panel technology for transmitting and receiving signals on the same panel, MilliSAT provides fully autonomous transmission and reception of high bandwidth data rates of more than 20 Mbps.

The ruggedized, medium lightweight, Ka- and Ku-band terminals meet the demanding requirements of full-time usage in harsh environments.

GetSat's micronized L/M terminals are easy to deploy and integrate and can be outfitted in various antenna sizes in accordance with bandwidth requirements of ground, air and maritime applications. The terminal's unique all-in-one design and super-light compact installation offer significant savings in size, weight, and power usage (SWaP) and include an integrated BUC and modem.

GetSAT CEO, *Kfir Benjamin* said, "The U.S. Government has once again entrusted delicate and secure SATCOM missions, this time in remote areas, to GetSAT terminals. Together with Honeywell, we have delivered our leading-edge communications platforms that enable the government agency to meet its critical operational needs. GetSAT is committed to providing on-the-move SATCOM platforms reaching the highest specifications and standards and we are proud that our solutions are already operating in the field and maritime environments.

www.getsat.com

www.honeywell.com

DISPATCHES

Hughes receives SPAWAR contract for two hundred satellite terminals

Hughes Network Systems, LLC (HUGHES) is the recipient of a U.S. Space and Naval Warfare Systems Center (SSC) Atlantic order for more than 200 of the Hughes 9211 Broadband Global Area Network (BGAN) satellite terminals.

Placed through Hughes partner **Marshall Communications Corporation**, the order outfits SSC Atlantic with the world's smallest and lightest High Data Rate (HDR) terminal, enabling mission-critical military communications that are mobile and easy to deploy.

Filling a vital requirement for the military, the **Hughes 9211** BGAN terminal offers high-speed satellite connectivity in a light-weight and ruggedized device that can deploy quickly

and easily in the harshest environments.

The terminal delivers high-throughput speeds over 650



The 9211 BGAN satellite terminal. Image is courtesy of Hughes.

kbps., with built-in, multi-user WiFi access, the 9211 BGAN supports multiple team members simultaneously and overcomes Line-of-Sight (LoS) limitations.

With low power consumption, the terminal also includes a built-in compass and audio tone for signal acquisition.

To date, Hughes has delivered these terminals to serve military, media correspondence, public safety and mobile health care needs.

Rick Lober, Vice President and General Manager of Defense and Intelligence Systems at Hughes, said that for mobile military communications, portability is as essential as reliable connectivity.

government.hughes.com

www.public.navy.mil/SPAWAR/Atlantic/pages/Home.aspx

DISPATCHES

Network services to be supplied to major defense contractor by UltiSat

UltiSat, Inc., a Speedcast Company, has been awarded a five year, \$23 million contract in support of a significant defense contractor to provide reliable and secure meshed/managed network services for the U.S. Government (USG).

The contract value of \$23 million is for the core services and does not include pre-priced, incremental services with significant upside potential.

During the term of the contract, UltiSat will provide fully managed internet, VoIP and business application services at Forward Operating Base (FOB) locations across the Middle East and Southwest Asia.



In accordance with common USG procurement practice, the contract is subject to an annual review and approval process.

Garr Stephenson, Senior Vice President of ISR and Mobility Solutions, said that

UltiSat is part of an incredible team providing satellite, microwave and terrestrial fiber communications services to support the nation's military. UltiSat's world class network and 24/7 Secure Network Operations Center form the

critical components to ensure the success of the program.

Stephenson added that the company's expert and proactive staff alerts customers of problems with their network often times even before they are aware that such are present. Problems are escalated to engineers in real-time and are sorted out and resolved to get connectivity up and restored with the utmost urgency. Customers are highly appreciative of our rapid response to this program's dynamic, emerging and evolving needs.

ultisat.com

speedcast.com

DISPATCHES

General Atomics Electromagnetic Systems Gains U.S.A.F. SMC HoPS mission contract

General Atomics Electromagnetic Systems (GA-EMS) has announced that the United States Air Force (USAF) Space and Missile Systems Center (SMC), on behalf of the National Oceanic and Atmospheric Administration (NOAA), has awarded the company the Hosted Payload Solutions (HoPS) Mission Delivery Order for the Argos Advanced Data Collection System (A-DCS).

Under the Indefinite Delivery Indefinite Quantity (IDIQ) contract, **GA-EMS** will launch a 110 kg. *Orbital Test Bed* (OTB) satellite and integrate the *Argos A-DCS* payload, which will be provided by the **French Space Agency**. The SMC HoPS program is designed to facilitate the placement of government payloads aboard commercial satellites.

The Argos A-DCS mission is supported by the **NOAA Cooperative Data and Rescue Services Program**.

Argos is an international program that collects data from thousands of sensors and transmitters located around the world.

Currently, data is collected and distributed for use in numerous applications, including ocean buoy tracking, wildlife and fishery monitoring, and maritime security, as well as non-environmental uses.

GA-EMS hosted satellites provide a unique opportunity for customers to launch payloads into LEO without incurring the cost and schedule overhead normally associated with commissioning a full satellite mission.

The versatile OTB satellite design provides the flexibility and scalability to suit a single mission payload or the simultaneous launch of multiple payloads on a single platform, providing a cost-efficient solution to meet a wide variety of requirements.

Scott Forney, President of GA-EMS, said the company is pleased to have been selected as the hosted payload provider supporting the HoPS Argos A-DCS mission. He said that the firm's OTB platform is well suited to the needs of customers such as the U.S. Air Force, as the demand for more cost efficient solutions to deliver technologies to space continues to grow. By leveraging GA-EMS scalable architectures, volume-efficient packaging, manufacturing expertise, and on orbit experience, the company can be more responsive

and tailor platforms to meet customer's mission objectives.

Nick Bucci, Vice President of Missile Defense and Space Systems at GA-EMS, noted that this Air Force contract award further demonstrates the versatility of the OTB architecture and its utility to a number of applications. The contract award comes on the heels of the company's recent selection to host NASA's Multi-Angle Imager for Aerosols (MAIA) instrument payload. In addition, GA-EMS has successfully built and are awaiting the launch of an OTB satellite hosting multiple payloads, including NASA's Deep Space Atomic Clock and an Air Force Research Laboratory Modular Solar Array payload.

She added that the company firmly believe this approach offers significant advantages to help rapidly and efficiently launch new missions into space.

General Atomics Electromagnetic Systems (GA-EMS) Group engages in the research, design, and manufacture of first-of-a-kind electromagnetic and electric power generation systems.

GA-EMS' history of research, development, and technology innovation has led to an expanding portfolio of specialized products and integrated system solutions supporting aviation, space systems and satellites, missile defense, power and energy, and processing and monitoring applications for critical defense, industrial, and commercial customers worldwide.

www.ga.com/ems

www.noaa.gov



A WINNING BLUEPRINT

How industry innovation delivers a unified, government SATCOM architecture

By Rebecca Cowen-Hirsch, Senior Vice President for Government Strategy and Policy, Inmarsat Government



For all of the times we refer to “SATCOM” in our industry, the term really does not sufficiently describe what we do. SATCOM, of course, is shorthand for “satellite communications.” However, we are about far more than satellites.

It is about end-to-end managed systems — from redundant satellites to robust ground infrastructure, as well as terminals.

We are about the implementation of ever-advancing and diverse technological capabilities, along with optimal mobility, redundancy, scalability, global portability and security — the ultimate ‘resilience approach’.

Most of all, we are *all* about the mission, serving as a dedicated government partner to support servicemen and women wherever they are serving their nation.

As federal leaders move forward with potentially game-changing shifts in satellite procurement policies, there has never been a better time to deliver this message.

Our industry has so much to offer. It can perform more efficiently, effectively and affordably than “government only” acquisition models allow.

The architecture that government puts in place today may transform its SATCOM for years — or even decades — to come. Therefore, we in the industry must continue to collaborate with these leaders in order that the best of commercial innovation is incorporated and fully integrated into present and future unified satellite systems architectures.

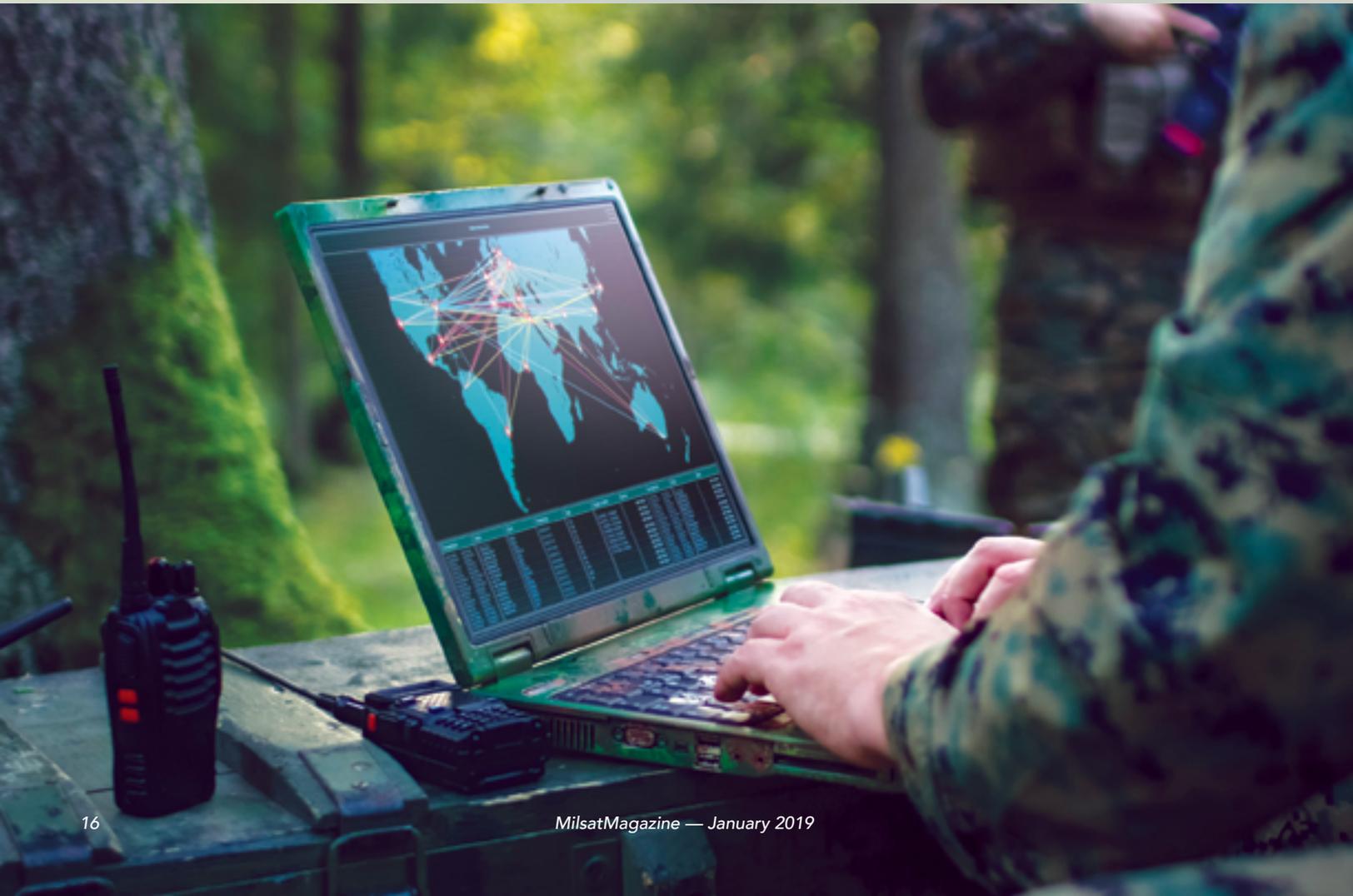
The government has made some historic, exciting advances this past year, working whole-of-government policies and strategies,

in close partnership with the private sector and its allies.

As for the latter, the budget submission for fiscal year 2019 included \$8 billion of additional funding for space over the next five years; fully embracing the new strategy, which recognizes that space is now a warfighting domain.

Then, there was the release of some conclusions from the U.S. Air Force’s *Analysis of Alternatives* (AoA) for a follow-on to the **Wideband Global SATCOM (WGS)** system. Through the AoA, unprecedented participation from industry and U.S. allies offer seemingly limitless possibilities for new space, air and ground-layer communications.

This effort underscores the urgency for a strong, forward-looking partnership between the government and the satellite



industry to ensure available solutions are fully considered as part of any recapitalization process.

Future integrated architecture depends on the reach, resilience and technology modernization of COMSATCOM as an essential element of mission assurance.

As stated before, SATCOM should reflect the entirety of what we offer, and not merely satellites.

On the terminal side, the industry is making major investments in modular terminals to replace closed, vertically integrated systems, which is driving toward an integrated architecture.

In some cases, we modify existing terminals. In others, we build new ones. In our efforts, we are not thinking in terms of decades — and we will “go fast,” as U.S. Air Force General **John Hyten**, Commander, **U.S. Strategic Command (USSTRATCOM)**, has urged.

That’s just a single example of the holistic, robust capabilities portfolio which we expand upon every day, with a **SATCOM as a Service** business model underscoring our commitment to excellence.

Engineered for global mobility, **SATCOM as a Service** provides a critical, end-to-end, communication infrastructure, owned and managed solely by a trusted commercial operator. It is designed with the government in mind.

SATCOM as a Service enables users to instantly “plug into” communications, which support high bandwidth voice, data and video connectivity and transmissions, much in the same way as they use their smartphones; a seamlessly delivered, global experience that “follows” them wherever they go.

In addition, the **SATCOM as a Service** model brings an end to the days of speculative SATCOM acquisition, when military operators had to “guess” as to where and how much bandwidth they would use. With **SATCOM as a Service’s** always-on capability, monthly pricing is fixed, eliminating a budget uncertainty for our customers.

The budget-impacting dynamics cannot be understated, especially now. In federal circles, there are frequent “free versus fee” conversations about MILSATCOM and COMSATCOM, respectively, with impressions conveyed that MILSATCOM arrives at no cost and, therefore, should be considered as the primary, if not sole option.

This is simply not true, and the debate is archaic.

We should be talking about “commercial first” strategies, in which new and enhanced capabilities are made available immediately and affordably.

Since 2009, when the Pentagon canceled the U.S. Air Force’s **Transformational Satellite Communications System (TSAT)** program, our industry has invested heavily into improving SATCOM mobility, flexibility, redundancy, throughput, resilience and protection. We are

always innovating and inserting technology upgrades; valuable R&D which arrives without upfront cost to agency customers.

Clearly, SATCOM encompasses an entire universe of robust innovation, beyond merely the satellites themselves. At what could be a turning point for systems procurement, the government needs to take advantage **now** by committing to a fully integrated commercial presence taking greater advantage of the best commercial has to offer.

Rebecca Cowen-Hirsch is Senior Vice President for Government Strategy and Policy at Inmarsat Government Inc., a wholly-owned subsidiary of Inmarsat plc, the world’s leading provider of global mobile satellite communications to the United States government. Ms. Cowen-Hirsch is responsible for establishing Inmarsat’s strategic direction, policy and advocacy with respect to U.S. government.

Ms. Cowen-Hirsch has more than 25 years of defense, aerospace and executive leadership experience. She served in the U.S. Department of Defense (DoD) as the Program Executive Officer for SATCOM, Teleport, and Services at DISA and the first Vice Component Acquisition Executive for DISA. She established the Defense Spectrum Office, serving as its first Director.

She is a rated experimental flight test engineer and became the first female civilian Mission Commander for the Advanced Range Instrumentation Aircraft (ARIA) mission. She was awarded the Exemplary Service Medal for her service to the DoD.

Ms. Cowen-Hirsch received her Bachelor of Science degree in Electrical Engineering from the University of Kentucky.

Ms. Cowen-Hirsch is a Senior Columnist with MilsatMagazine.



AN INTEGRATED MILSATCOM VIEW ON...

The future tactical communications network topology and applications

By Cristi Damian, Vice President Business Development and Marketing, Advantech Wireless

Recent geopolitical developments fueled by both regional conflicts and an increased state of political instability have highlighted serious gaps in both technical capabilities and acquisition policies within several large NATO members' procurement agencies.

In the spring of 2018, at a major North American Joint Military / Industry Conference, the Army opening statements were quite blunt:

— *The procurement cycle has lengthened from 5 to 7 years to 10 to 15 years*

— *Communication networks are ineffective and broken and help is needed from the industry to design new robust communication networks*

If the telecom hardware procurement cycle is now 10 to 15 years, groups are planning from the start to purchase obsolete equipment. Consider the fact that, even before getting to tender, the industry needs as many as five years to design, test, validate, and certify products.

Add those five years to the 10 to 15 year buying cycle and now you see that the

hardware technology being purchased can be 15 to 20 years old.

With today's rapid pace of technological change, few electronic components are available for that length of time. This reality places significant pressure on securing a massive inventory and burdens most military budgets. The challenges the U.S. Army faces today are vastly different from those 20 years ago.

With regard to the second statement about "ineffective networks" the military provided further clarification:



Current networks are...

- *Overly complex*
- *Sluggish*
- *Fragile and vulnerable*
- *Easy to detect and jam*
- *Difficult to secure*
- *Not optimized*

The repercussions are obvious. If we cannot communicate, we do not know where to move and where to shoot, i.e. the chain of command is down.

Our next generation of tactical networks need to be...

- » *Mission Adaptable*
- » *Force Scalable*
- » *Joint Interoperable*
- » *Coalition Accessible*

The new technological components of the tactical networks need to ensure:

- 1. Operation among populations within complex terrains including dense urban areas.**

This will force interoperability between Satcom terminals, with different access schemes, handheld radios, WiFi and Cellular networks.

2. Convergence for an Internet of Sensors and Shooters

IoT (Internet of Things) is now part of modern warfare. SATCOM terminals will need to move further from just a standard data access pipe to an integrated intelligent wireless platform.

3. Resiliency and reliability

We need the best technology with the highest reliability, for example Satcom GaN technology.

4. High bandwidth

It is obvious today that the Army data throughput requirements are marginally met. The need for dynamic symmetric/asymmetric type of networks, at very high data rates, are a veritable challenge for VSAT TDMA networks.

5. Anti Jamming, in a highly intense Electronic Warfare environment

Simple GPS jamming with low cost off the shelf hardware, has exposed the vulnerabilities in SATCOM Networks, artillery firing and drone flight control. The ability to change traffic profile on the spot

and find alternative secure ways of communication is needed.

6. Autonomy and Spectral Awareness

A communication node needs to be autonomous not only in terms of energy, but also in terms of traffic security, spectral monitoring, terrain monitoring, geolocation and access to wireless complementary technology. A communication node should allow convergence of multiple sensors and radios on the same data backbone.

A careful review of all these requirements, will clearly position the SATCOM technology at the heart of any modern tactical network. The SATCOM terminal is the linchpin which will bring together convergence, autonomy, interoperability and scalability within the battle telecom infrastructure.

Advantech Wireless Technologies "Engage Class" Satcom Terminal is designed and built based on this overall Convergence concept. This is a state of the art flyaway SATCOM terminal that reaches and integrates alternative technologies such as Military Grade WiFi and cellular capabilities.

The Engage Class

One of the major Army complaints was related to the high rate of hardware failure.



Active components are prone to failures more than passive ones and amplifiers are part of this chain. The vast majority of the 50,000 SATCOM terminals that NATO operates are still based on TWT technology. The Engage Class of SATCOM Terminals from Advantech Wireless has adopted an "All GaN Solid State Technology" for the power amplifier. MTBF numbers on the

RF part itself have increased from a typical 60,000 hour value to over 200,000 hours due to the use of GaN technology.

GaN SSPA

With reflector size of up to 2.4 meters, the Engage Terminal can accommodate C-, X-, Ku-, or Ka- RF feeds and can guarantee data rates in excess of 50 Mbps.

The terminal can generate two independent carriers, all with Transec security incorporated, and it is agnostic to the modem type.

Today NATO operates several incompatible VSAT networks, all of them with their own proprietary standards. Joint Interoperability between coalition units is a never reaching target and even within national defense organizations it seems impossible to reach coordination and a common channel between Navy and Air Force, for example.

Autonomy, in this case, is hardly possible, as the need for a centralized point of communication is imperative.

With the ability to uplink two independent carriers, the Engage Terminal allows a more robust communication link, as well as direct communications to the chain of command as well as simultaneously pier to pier. At IP level the traffic can be split which will drastically decrease the risk of communication eavesdropping and decryption.

The terminal can accommodate either SCPC or TDMA modem technology and can fit within any existing operating network either as an add on terminal or as a bridge to another incompatible SATCOM operating network.

In order to find the satellite, and to synchronize within a TDMA network, both the antenna and the VSAT modem need accurate GPS information. GPS information will provide accurate location, which defines the time delay to enter within a TDMA time slot, as well as look up angles for the antenna pointing.

Jamming the GPS signal, with relatively low cost off the shelf hardware, has proven to be highly efficient in disrupting the SATCOM links. Without GPS location, the antenna controller does not know where to point and the VSAT terminal has difficulty joining the network.

The Engage Class of antennas has an optional built in Anti-GPS Jamming capability and can cancel several GPS jammers that are within close proximity. Once the antenna has detected GPS jamming, it will actively generate nulling signals and cancel them. Today, this is typically more of a mandatory feature — the risk of not being able to setup the transmission link is to be avoided.

On these flyaway terminals, we are used to deploying heavy duty ruggedized laptops and tablets. These PCs contain a



2.4 meter flyaway antenna from Advantech Wireless.



C-band outdoor GaN SSPA from Advantech Wireless.

lot of critical intelligence data and should not be left in the field unattended, in case the SATCOM terminal is damaged or the position needs to be abandoned.

Being ruggedized by design, they are difficult to destroy and able to avoid data extraction by unfriendly forces. Being heavy, they are also difficult to hand carry and the soldier will always face the dilemma of carrying enough water and supplies to allow a few days survival or to carry a heavy laptop. This is one of those dilemmas that nobody wants to be faced with.

The Engage Class antennas are moving into ultralight, credit card size PC technology. These plug-in PCs weigh only a few grams and can be plugged into miniature communication consoles that are designed to be carried by soldiers or as part of the flyaway terminal, or in the vehicle mount. These antennas consume a fraction of energy, typically 5W, which is a critical element in the field.

Miniature Plug-In PC Card

A typical console can accommodate several plug-in PCs, each of them running independent tasks.

One PC can run the operating system, one can do encryption, one video encoding, one act as a data router, and so on. They can all be removed and reinserted in the field, so no critical data is left abandoned. As an add-on function, the Engage Class terminal can also generate an independent local cellular area, called the ARTEMIS LTE Platform.

The ARTEMIS' objective is to deliver secure, high performance, instant communication capabilities to voice, data, text and chat.

The platform enables rapid establishment of a scalable and mobile secure wireless network for ad-hoc operations. It is Self-forming, Self-Healing and Path-Optimizing wireless network infrastructure for dynamic network environments and supports any 4G

LTE enabled device with as many as 256 concurrent connected sessions.

The ARTEMIS LTE Platform

The network, once connected over the SATCOM backbone to a cellular provider, or to an identical point of presence, has the option to integrate different radio types (as used by local police, firefighters, medical services) and make them interoperable. This feature is critical to operations in heavy populated urban areas.

An optional Military Grade Radio network can also be deployed that is designed to be resilient in heavy cellular and WiFi use areas where typical cellular access is denied. This specialized Radio network is able to provide high data throughput, integrates easily with any existing city surveillance cameras and operates in underground networks. Drones can be integrated with these radios and they are setup to provide either simple video streams or network extensions.

Locating people in underground areas, where GPS networks are not available, is also an option on the Engage Terminal. It is a function that was designed to serve primarily in search and rescue situations.

Dedicated hardware can extend the GPS presence in tunnels, mines, or underground metro networks.

Based on this GPS extension, which is perfectly synchronized with the real external GPS network, a user can find his own location using either a simple Google Map application on his cell phone or a government user can be located with a Tetra phone.

Underground Locating Capabilities

Once again, this information is captured by the Engage SATCOM terminal and directed to a Tetra point of command center, or to a cellular provider that can correctly locate the user in distress. Geolocation maps for underground areas can be developed and ported into user PCs for accurate position finding.

To conclude, the future communication terminal, and the future tactical network, need to be able to operate in a totally different environment.

The SATCOM terminal needs to provide robust links, while benefiting a large area of coverage. It also needs to extend its capabilities into complementary technologies.

We need to be able to extend the cellular network, while at the same time avoiding cellular congestion. We need to be aware of our surroundings and have access to video feeds. We need to be able to reach people in GPS denied environments — and we need to be able to make incompatible networks talk one with each other.

These are the fundamentals on which the Engage Class Satcom Terminal was designed and on which it will evolve.

advantechwireless.com/

Mr. Cristi Damian joined Advantech Wireless in 1995 where he held various positions in Operations, Manufacturing, Sales, Engineering and Customer Support. Prior to Advantech Wireless, he acquired experience as a hardware engineer in various high-tech companies. Mr. Damian holds a Master's degree in Electrical Engineering from Concordia University.



AN OUT OF THIS WORLD IDEA

Blockchain and space...

By David Logsdon, Executive Director, Space Enterprise Council and Senior Director, Emerging Technologies, CompTIA



Blockchain technology is one of most hyped technologies to emerge in the last few decades.

Gartner has poised blockchain technology as one of the most influential technologies in the next decade on its annual hype cycle for emerging technologies. On both the federal and state level, there have been several blockchain inspired pieces of legislation introduced.

What is this technology and, more importantly, how will it impact the space industry today and in years to come?

IBM defines blockchain as a distributed digital ledger that permanently records, in a sequential chain of cryptographic hash-linked blocks, the history of transactions that take place between two entities. In short, blockchain is an immutable, highly encrypted ledger with high transparency into all the connected transactions.

According to CompTIA's **"Harnessing the Blockchain Revolution: A Practical Guide for the Public Sector,"** Blockchain is considered one of the most secure technologies

emerging today because of its inherent security features that include:

- *Immutable data records*
- *Audit trails can verify the authenticity of Data Confidential or private information can be secured through additional encryption*
- *Data protection is built into blockchain because the decentralized nature of the records means that copies can be assessed via the multi-node aspect of the technology*
- *Privacy applications could allow large groups of data to be anonymized to gain insight from that information while hiding or eliminating the personally identifiable information, or PII, within*
- *System Verification and Access IDs ensure that systems talking to each other are verified and*

authorized to access/exchange data, while access IDs combine two or more factor authentication to ensure secure and authorized access.

- *Public/Private/Court Keys could allow access to data or other records, such as communication records or bank transactions, for law enforcement investigations.*

According to **Grand View Research**, the global market size for blockchain technology is expected to reach \$7.59 billion by 2024.

The potential for blockchain use is endless. Several different business verticals have started to integrate blockchain into the lifecycle of their business transactions.

Those that are farthest along include financial services, supply chain management and logistics, and records management. There are several pilot programs ongoing on the federal level and over a dozen states have introduced blockchain legislation.



The use of blockchain technology in the space industry is in its nascent stages, though such holds great potential.

Blockchain and Education for Space Professionals

In December 2018, the **U.S. Air Force Institute of Technology** (the U.S. Air Force's Graduate School) announced the development of an educational tool for supply management.

This tool comes in the form of a live application coupled with a set of tutorial videos. Video tutorials are important because they add another dimension to learning that makes a student's educational experience more effective.

The videos allow a classroom setting that offers different perspectives and tools that students might not normally be able to take advantage of in their learning.

Blockchain, NASA, and Space Exploration

Space exploration is a difficult endeavor because there are significant supply chains involved on both the human and robotic fronts.

NASA defines the space exploration supply chain as the integration of the field centers, private industry operations, and facilities that join together products and services to support the mission from inception to launch to after delivery support and services.

On April 18, 2018, NASA awarded a \$330,000 grant to **University of Akron** Assistant Professor of Electrical and Computer Engineering **Jin Wei Kocsis** to support her research that will examine the use of **Ethereum** in developing a highly secure operational system to be used in deep space.

Ethereum is the open-source, public, blockchain-based distributed computing platform and operating system featuring smart contract functionality.

According to Kocsis, "the system will utilize the Ethereum platform to build a spacecraft that could "think" for itself, enabling it to automatically detect and dodge floating debris in a timely manner, thus being able to complete more tasks, provide more data and time for information analysis."

NASA is very bullish on the idea. The project could lead decentralized processing

being incorporated into future Earth and space science missions, meaning a more responsive, resilient, and scalable network.

Space Chain

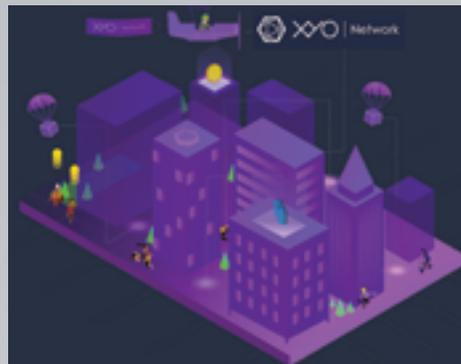
According to their website, **SpaceChain** is a community-based space platform that combines space and blockchain technologies to build the world's first open-source blockchain-based satellite network, allowing users to develop and run decentralized applications in space.

As an open-source platform, it brings many benefits, including cost, flexibility, security, transparency, and accountability. SpaceChain's vision is to remove barriers and allow a global community to access and collaborate in space. As of November 2018, Space Chain has started testing the functions of the space node in orbit.

XYO Network

The **XYO Network** (XY Oracle Network) is an open-source location network built on the blockchain. The XYO Network is a cryptographic location network that enables layered location verification across many devices.

The network uses a cryptocurrency called XYO to function. XYO uses the Ethereum blockchain to allow users to ask for specific queries that revolve around location requests. In a spaceflight agreement that was announced in December, SpaceX plans



to launch XYO's first blockchain satellite '**EtherX**' in late 2019. XYO is aiming to decentralize global location infrastructure which is currently reliant on **Global Navigation Satellite Systems (GNSS)**, heavily dominant by the GPS constellation.

Blockchain and Export Licensing

Satellite export licensing can be a barrier to entry for entrepreneurial and smaller companies. For medium to large companies, it is part of the nature of doing business.

Quite often, the delay in expediting an export license lies in the validation and verification of a company's supply chain. As stated earlier, blockchain is an immutable, highly encrypted ledger with high transparency into transactions. Because the data provided in the blockchain is highly trusted, a company's supply chain bona fides could be approved in a much more expeditious fashion. This could conceivably shrink the time it takes to process a license, and could save both private industry and the federal government a significant amount of money.

Blockchain is changing how many industries operate and the space industry is already seeing an impact from the new technology through improved supply chains and the potential to improve operational efficiencies across the board.

The initial success (both in private industry and at NASA [and other federal agencies]) of the first "blockchain in space" endeavors will certainly lead to more efforts and, in time, a more decentralized way of conducting space operations.

www.comptia.org

David Logsdon is dual hatted at CompTIA. He is the Executive Director of CompTIA's Space Enterprise Council as well as Senior Director, Emerging Technologies at CompTIA. As Space Enterprise Council Executive Director, he runs a 22-member council focused on the U.S. space enterprise (commercial, civil, and national security). Under Logsdon, the Council is particularly focused on the satellite platform/data/data analytics/innovative technology/cyber ecosystem.

Under the Emerging Technologies role, he runs the association's New and Emerging Technologies Committee (focused on the policy surrounding big data/open data/ data analytics, cloud, mobility, Internet of Things, smart cities, automation, AI, blockchain technology, and digital infrastructure.

Logsdon served on the inaugural Space Based Positioning, Navigation, and Timing Advisory Board. He currently serves on the Department of Commerce International Trade Advisory Committee (ITAC) on Aerospace, where he chairs the ITAC's Space Subcommittee. He is also the U.S. industry space industry lead for the U.S.-Brazil Defense Industry Dialogue.

COMMAND CENTER: CHRIS POGUE

President, MDA Government

On June 12, 2018, Maxar Technologies' MDA appointed Chris Pogue as the President of MDA Government.



Prior to that appointment, Mr. Pogue had served as Vice President, Mission Systems International and Vice President, Public Safety and Security Solutions, at General Dynamics Mission Systems, where he worked for eight years.

Before General Dynamics, Chris was President of CAE Defence and Professional Services and he also had a successful 18 year career in the Canadian Air Force.

Chris has a B.Sc in Physics and an M.Sc in Physics and Oceanography from the Royal Roads Military College in British Columbia, which was followed by executive education at the universities of York, Liverpool, and Harvard Business School.

Mr. Pogue, would you please tell our readers about your career?

Chris Pogue (CP)

This is an exciting time and I am really honored to be MDA's President of MDA Government.

This is MDA's division that is responsible for the global growth and operations of MDA's government lines of business for defense, Earth Observation systems, enterprise geospatial systems and space robotics.

Since joining the company, one of the elements that drew me to MDA was the firm's track record of pioneering some of the most impactful technology innovations in Canada's history. We've completed and shipped the three RADARSAT Constellation Mission spacecraft built for the Canadian Space Agency; been selected as part of the preferred team for the Canadian Surface Combatant program; and launched the MDA LaunchPad, a Canada-wide program, to support small business collaboration.





Please tell us about MDA.

CP

MDA is an internationally recognized leader in developing and building innovative, complex, operational systems including radar satellite systems and infrastructure, ground systems, space robotics and sensors, satellite antennas, electronics and payloads, surveillance and intelligence solutions and defense systems.

For more than five decades, MDA has been a trusted partner to customers in Canadian, United States and international government and commercial sectors, providing mission-critical solutions for exploring space, understanding changes on Earth and monitoring maritime and land activity.

MDA will complete its integration within the Maxar Technologies family of companies in the coming year and realize the benefits of the new corporate structure through efficiencies and the scale and breadth to address bigger opportunities than it could as an independent entity.

With almost 2,000 employees across Canada, MDA is the nation's largest space prime contractor and a leading defence contractor, which continues to grow its ecosystem of innovative Canadian partners and suppliers.

Is MDA involved in the various UAV market segments?

CP

The readers probably already know MDA is best known for its work in satellite remote sensing, defence and space technology. Lesser known, but equally impressive, is the company's Unmanned Aircraft System (UAS) surveillance services that have provided a broad range of frontline surveillance capabilities to defence users around the world since 2007.

Based on the company's track record in complex, operational system management and development, these turnkey service offerings comprise end-to-end frontline deployments that include aircraft, ground control and data exploitation tools, flight and operations personnel, training, logistics and support services.

The benefits of delivering near real-time battlefield or maritime awareness to war fighters and commanders are manifold, but even today's high-resolution optical and SAR satellites have their limitations.

UAS surveillance services deliver real-time, on-demand surveillance and intelligence to frontline users for tactical operations, while collected EO/IR/SAR/SIGINT and full-motion video supports strategic decision-making at the HQ level.

Together, satellites and UAS surveillance solutions work in tandem to deliver the broadest possible suite of information for situational awareness in land and maritime operations.

Under the Intelligence Surveillance Target Acquisition and Reconnaissance (ISTAR) project, the Canadian Armed Forces (CAF) has selected MDA as Prime Contractor for two UAS programs.

In 2013, CAF selected MDA as Prime Contractor for the Miniature Unmanned Aircraft System (MUAS), using AeroVironment Inc.'s Raven B. Each Raven B system includes two aircraft complete with full-motion video color and infrared payloads, enough batteries to conduct 12 hours of flight, one spare payload and the typical spare parts required to maintain the system for 100 operational flights.

To develop a cadre of trainers and maintainers, MDA delivered the first Raven B systems to the Combat Training Centre for the Canadian Army Centre of Excellence for Unmanned Aircraft Systems at the Royal Regiment of Canadian Artillery School (RRCAS), which ultimately assumed all responsibility for MUAS training in the Canadian Army.

In 2018, the Department of National Defence again selected MDA as Prime Contractor to deliver Maritime Miniature Unmanned Aircraft Systems (MMUAS), including services to support training, resource

and equipment development activities, development and validation of naval tactics and new capability development.

The MMUAS is the first UAS project that will see the RCN operate and maintain its own capability and provide a sustainable ship-borne, near real-time, Beyond Visual Line Of Sight (BVLOS) ISR capability, initially deployed onboard Kingston-class ships.

MDA employed another AeroVironment Inc. UAS for this contract, the PUMA™ AE all-environment aircraft that is capable of both ground and water landings. It shares the same ground control station as the Raven UAS used by the Canadian Army, and has an innovative fuselage that offers operational flexibility and the ability to carry additional payloads.

In early 2018, MDA won a contract to provide turnkey UAS surveillance for an un-named international customer. This contract uses a fleet of Schiebel CamCopter™ S-100 rotary wing unmanned aircraft to provide surveillance information, and MDA is responsible for all aspects of the service including the acquisition of all systems and required infrastructure, training, airworthiness, logistics, supply chain management, maintenance and all flight operations.

MDA has become a global leader and trusted partner in UAS surveillance services for challenging, complex and hostile environments. These UAS projects successfully illustrate the effectiveness of MDA's growth strategy to date, creating flexible UAS services to serve in different environments, and for a diverse set of mission objectives.

Based on its 10-year, multi-force UAS services experience, MDA is well suited to capture more business in the coming year. Domestically, Canada's Defence Policy Strong, Secure, Engaged outlines the Government's intent to invest in an extensive range of new capabilities for the Canadian Armed Forces by acquiring a fleet of remotely piloted systems for the Royal Canadian Navy, the Canadian Army and the Royal Canadian Air Force, which includes remotely piloted aerial systems.

Internationally, MDA brings a broad understanding of the operations and systems across space, air, land and maritime domains that enable operational, highly reliable solutions that interoperate across domains and between allied forces.

The company's approach is to understand customer missions, determine the appropriate UAS and sensor suite and deliver turnkey support services for training, in-service support and even full in-theater operations.

What are you plans for the future in the UAV area?

CP

Looking forward, MDA will continue to expand its UAS market share with systems for rapid land deployment and embarked naval vessels to provide unmatched situational awareness by addressing the need for critical intelligence, analytics and enhanced decision-making.

MDA's flexibility in delivering turnkey or mixed services includes systems, analytics, operations, maintenance, risk management, logistics, training, regulatory matters and facilities.

Performance-based contracting, partial amortization for customers requiring intermittent or focused mission services and comprehensive training programs enable the company to address the widest range of customer needs in a cost-effective manner.

mdacorporation.com/



THE CURRENT STATE OF SPACE SITUATIONAL AWARENESS

A Space Data Association Focus

By Dr. Mark Dickinson, Chairman, Space Data Association



Space Situational Awareness (SSA) is absolutely critical for safety of flight — SSA always been important, helping satellite operators determine the precise location of other objects in space, thus reducing the risk of collision. As space gets more and more crowded, this is becoming increasingly challenging. Ensuring the correct SSA tools and processes are in place is more important now than ever before.

The State of SSA

According to the United Nations Office for Outer Space Affairs (UNOOSA), there are 4,857 satellites currently in orbit, representing an increase of 4.79 percent when compared to the number in orbit in 2017.

When you consider the number of mega constellations due to launch in Low Earth Orbit (LEO) in the near future, that number is set to become even more challenging. Indeed, a recent study by the *University of Southampton* has estimated that mega constellations will increase the risk of collision by as much as 50 percent.

Any collision in any orbit could be extremely detrimental for not only the objects involved, but for the entire space environment. The debris from such a collision would add to an already growing problem in space and further increase the risk of collision. It is in

all of the industry's interests — commercial and military/agency government — to do everything possible must be done by commercial and military/agency/government actors to prevent such from occurring.

There are a number of SSA tools on the market, including the **Space Data Center (SDC)** that is run and operated on behalf of the **Space Data Association (SDA)**.

However, over the past few years, the SSA landscape as far as the capabilities of these tools has not substantially progressed, even though the environment has become more and more challenging. The result is that the existing flight tools are not nearly accurate enough for today's spatial environment.

However, many satellite operators are content to remain with the status quo. To some degree, it is easy to see why — there are a number of free tools available that seem to be accurate enough and, in certain circumstances, they seem to be quite adequate — why pay the amounts necessary for more accuracy?

Current Systems

Existing systems are certainly good enough... to a certain degree. In LEO, they are generally good enough for most circumstances. That said, in lower altitudes, space weather continues to be challenging to predict and

in higher altitudes, debris is problematic. The most significant problems with current systems is their inability to track small objects and the lack of precise and actionable data.

Even debris as small as 20 cm. can cause catastrophic debris-generating collisions. Current services can only track objects in size down to around 1 meter for collision warnings in the geostationary (GEO) arc.

Currently, operators receive collision warnings even when there isn't a risk of such occurring because the data is not accurate enough to result in accurate forecasts. Even if the operator believes the satellite does need to be precisely moved, knowing where to move without actually impeding the situation is difficult to accomplish. This means that quite often, no action is taken.

If warnings were more accurate, such should lead to less frequent, but actionable, collision warnings. This would save time and money for the operator in terms of not having to review inaccurate warnings. The space environment would be far safer by ensuring genuine collision risks are flagged in time to avoid unnecessary maneuvers being performed.

The Space Data Center

The Space Data Center uses a combination of owner operator and other freely attainable data to deliver accurate collision warnings.

While for the future environment, even this data needs to become much better as described above — and as of this writing, this information is probably the most accurate data source currently available.

The inclusion of owner operator data brings precise and timely location information and SDA members can also enter future maneuver information. This means it is possible to spot any issues that could arise from those actions, especially when two operators are looking to perform maneuvers at the same time.

Military Operators

For the most part, military and government satellite operators rely solely on freely attainable data. There are exceptions and the SDA has a few of these organizations sharing data with the SDC.

Military operators are generally far much more cautious about sharing data than operators within the commercial environment. While that is understandable, given the sensitive nature of their operations, it is absolutely critical that all operators share their data for the improvement of SSA capabilities.

The SDA and SDC are setup with a framework that enables data sharing, even given all of those considerations. Data is shared within the SDC but other operators do not have access to each other's data and are only alerted when there is a risk of collision.

Commercial Operators

Many commercial satellites are owned by operators that are members of the SDA. This means they are sharing owner operator data with the SDC, helping improve the accuracy and timeliness of the data the organization holds. It also means these operators obtain warnings from the SDC whenever there is a potential issue.

However, there are still a large number of commercial operators who are not members of the SDA, which has two major consequences. First, those operators are not getting the benefit of the shared owner operator data that will help determine any potential risks of collision. Second, it means that we aren't getting data from those operators to further increase the accuracy of this important catalog.

If all satellite operators were to join, the SDC could be far more accurate regarding the available data concerning satellites. Of course, this doesn't solve tracking debris; however, it would definitely be a step in the correct direction.

The Future of SSA

As the space environment continues to evolve, the need for accurate SSA will become more and more crucial for all involved in the space industry. While it is clear that we need to get better at ensuring accurate and actionable data, even for small items of debris, there are some immediate actions all operators should undertake:

- Development of, and adherence to, space standards, best practices and established norms of responsible behavior
- Reliance on STM systems that always seek the best, most actionable and timely collision avoidance data, techniques and important mitigation strategies
- Collaborative, mutual and transparent sharing of key satellite operations information elements, including planned maneuvers, spacecraft characteristics and RF information

- Adherence to station-keeping boxes, authorized RF levels and national, international and organizational space debris and RFI mitigation policies and practices.

The best way to ensure SSA's success is by joining the SDA and sharing data with the SDC.

www.space-data.org/sda/

After completing a Ph.D. in High Energy Astrophysics (University of Durham) in 1997, Mark joined the Vega Group as a software engineer working on various defence and space systems. In 2000, Mark joined the Satellite Operations department at Inmarsat as part of a team developing that company's new satellite control system. In 2005, he became manager of the Satellite Operators Support Group and, in 2009, became the Director of Satellite Operations.

In 2013, Mark was appointed Vice President of Satellite Operations. In this role he is responsible for the operation of Inmarsat's fleet of geostationary telecommunication satellites, as well part of the team defining the specifications and following the development of Inmarsat's future satellites.

Mark represents Inmarsat at the Space Data Association (SDA) and is currently the organization's Chairman. The SDA is a non-profit association that brings together satellite operators who value controlled, reliable and efficient data-sharing critical to the safety and integrity of the space environment and RF spectrum. The SDA was founded by commercial satellite operators for the benefit of the satellite community.



SATELLITE M2M AND THE GOVERNMENT

Accelerating national interests with remote Internet of Things (IoT) connectivity

By Jassem Nasser, Chief Strategy Officer, Thuraya



Little did Kevin Ashton know in 1999 that a catchy term he once used in a presentation about tracking technology would captivate the tech world 15 years later.

Internet of Things — (IoT) — refers to a concept that's been around for decades but one that only became a buzzword in 2014 with Google's acquisition of home device automation company, Nest.

While organizations have been using connected devices and *Machine-to-Machine* (M2M) networks for a long time, the real potential of the IoT phenomenon has only been explored and universally attested in the recent past.

Today, IoT is all the rage and for good reason — there's no doubt that its implementation is the way forward for developing more efficient, responsive and reliable systems that gather data, generate

insight and intuitively take actions in light of those decisions.

With a growing understanding of the technology's wide-scale application and cost-cutting capabilities across vertical markets, the public sector has taken a keen interest in IoT and M2M technologies. After China took the initial step to add IoT to the nation's strategic plans in 2010, governments worldwide have allocated annual budgets for M2M integration in countrywide projects. This year alone, the MENA region is reported to have dedicated \$8 billion to IoT infrastructure.¹

As these technologies grow congruent with daily life, satellite-based IoT is increasingly relevant to the mix. Given that IoT devices are primarily used to eliminate the need for human interface and provide real-time automated monitoring and control across distances, it's often essential to enable its functioning in remote regions that lie outside

the range of terrestrial networks' coverage.

That's why SATCOM companies, such as **Thuraya**, are set on continuously improving their M2M capabilities, empowering all kinds of IoT applications to seamlessly run over an always-on, robust satellite network with global reach.

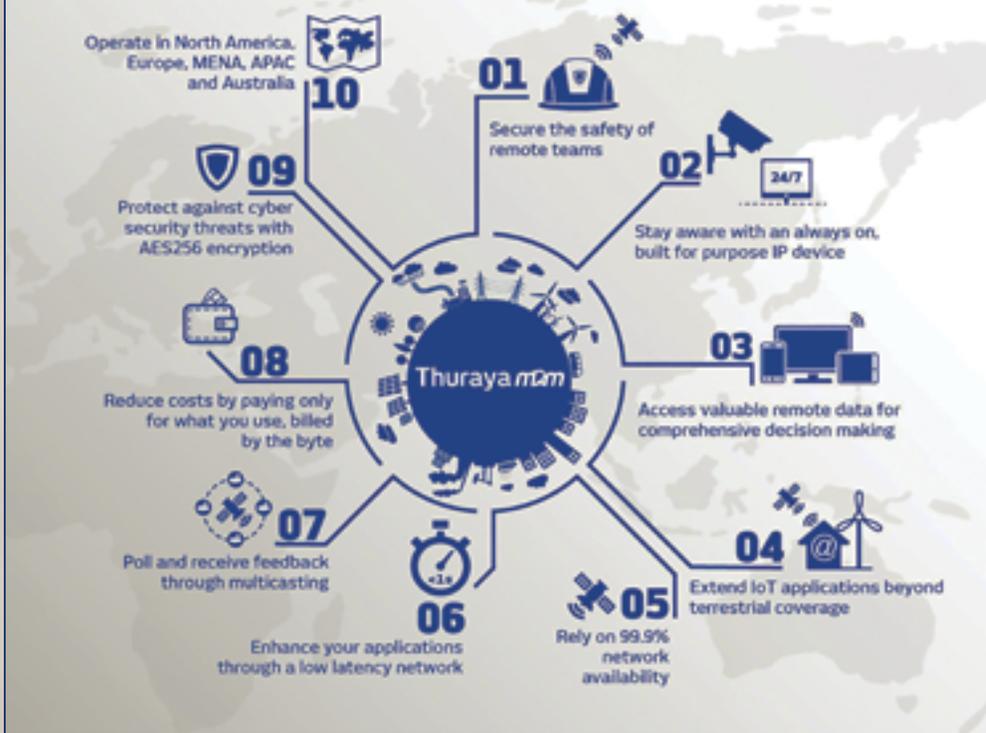
Furthering Government Prospects and Public Welfare

Satellite connectivity is an absolute necessity in the optimized adoption of M2M technology, especially in the case of government-run projects involving diverse industries and dispersed assets across the country.

M2M enables the collation and exchange of data in real-time from many inaccessible points and industrial zones to one central monitoring hub, enabling smart and efficient processes and reducing time,



10 things you can do with Thuraya m2m



money and personnel requirements on extensive operations.

Thuraya typically works with different service providers — for example, security companies - to sync their services and existing infrastructure with satellite technologies that support M2M; this ‘backhand systems integration’ process then gives us access to meet the government’s specific M2M demands. The focus on exactly how satellite M2M is integral, across the board, to public sector interests, follows:

Safety and Security

One of the top priorities of any government is to ensure the safety and security of the nation and safeguard its borders, territories, population and resources. IoT solutions like seismic sensors are ideal for use in remote border security and perimeter monitoring by civil defense and military teams. Real-time video surveillance is an enhanced capability in border protection, made available with services like Thuraya IP M2M which supports higher bandwidth applications.

Many governmental authorities have already expressed interest in deploying these telemetry solutions for civil defense missions. Additionally, all critical infrastructure requires monitoring, especially in far-off, unmanned areas. Even private organizations working in remote regions, such as oilfields, have to adhere to government protocols for safety, often achieved via satellite-enabled remote asset control terminals.

Harvesting Green Energy

This is big on the to-do list of many environmentally-focused public sector agencies. As natural resources are fast depleting, there is an urgent global call to harness clean energy and develop sustainable practices. Remote connectivity is essential to efficiently monitor solar and wind farms and other renewable energy sources. With a smarter understanding of how inaccessible appliances are working, personnel are better equipped to boost the production of clean energy.

Resource Protection

In the recent past, government agencies have collaborated with us and our service partners to use satellite M2M solutions for the smart monitoring of groundwater levels, and to manage and conserve water supplies in order to prevent droughts.

As in this case, IoT solutions are ideal for helping to safeguard resources. Satellite M2M services can be used to study weather systems and forecast impending climate changes; monitor regions prone to calamities like earthquakes and forest fires; and protect endangered habitats, and inland and aquatic resources.

Utilities

While utilities are often offered by private companies, they usually still fall under the jurisdiction of government authorities. With the introduction of smart metering and the monitoring of power grids and treatment plants outside areas of mobile coverage, satellite M2M delivers a scalable, efficient solution in high-volume data collection for electricity, gas and water authorities.

Moreover, an IoT solution helps ease the stress to meet the increasing demand for utilities as consumption and supply are better managed with timely detections in delivery networks — for example, with smart sensors that can swiftly detect water pipe leakages.

Banking

Banking as an industry has been using an early IoT prototype for decades with the ATM, lending customers access to financial services without having to meet a bank teller. Over the years, these virtual transaction trends have moved towards mobile banking services and governments are now taking measure to add more efficiency to banking procedures.

These steps include setting up real-time video for customer support and surveillance at ‘smart ATMs’; customized offers to smartphones using beacon technology when customers enter a bank branch; and POS terminals at establishments that allow customers the convenience of secure credit or debit card transactions right from their phones.

IoT services, by way of satellite, offer many more applications — from smart agriculture, and transportation and fuel management to cargo and personnel tracking.

As knowledge and legislations for convergence technologies become pervasive, governments around the world are set to embrace IoT solutions in every relevant industry.

Creating Resilient Systems

While most agree on the benefits of IoT, there are no doubt dilemmas associated with its implementation, from different perspectives including technology, regulatory, and so on.

Public authorities are generally open to new tech solutions, as long as they don't compromise on information data security. As we rush towards an ever more connected future, the danger of hacking looms larger.

Moreover, the increasing use of **artificial intelligence (AI)**, while spectacular in its capabilities, comes with its own problems — a reduction in human factor with such technologies implies that system errors are harder to find, stop and fix.

These examples pose an ongoing challenge for IoT service providers — to develop highly resilient IoT platforms with advanced encryption, and early warning and predictive systems.

The service provider's responsibility is to develop intuitive capabilities for data exchange and monitoring and to incorporate elaborate protection and data leak detection.

Another important factor to keep in mind when dealing with users from the government sector is timeliness — authorities are constantly bombarded with services and solutions and have rigid roadmaps and procurement plans.

As service providers, product portfolios need to be distinguished as well as possessing a superior understanding of the public sector's operational needs and purchase cycles. It's vital to know when to approach public agencies with a sale and be ready for how long the integration process may take in order to be recognized as a preferred partner for smart government needs, emphasizing solutions and not just products.

Connecting Distances

Despite the aforementioned hurdles, governments usually include IoT in their annual plans in some form or shape.

Currently, the percentage spent is rather negligible in terms of overall budgets; private sector undertakings in the same vein are certainly moving at a rigorous pace in comparison, and the public domain has a lot of catching up to do.

With the rising trend in smart urban spaces and smart cities though, there is a surge in joint IoT initiatives as public and private entities work together on shared goals for their locale.

The Asia-Pacific (APAC) nations take a lead here — as **Amy Kean of Mindshare Asia Pacific** recently mentioned, this region is most eager to adapt to a connected future.²

Satellite service providers, likewise, have a lot more to tap into when it comes to IoT offerings — the future is rife with possibilities to further develop resilient IoT platforms with AI, data mining and big data capabilities, which will especially be beneficial for governments.

www.thuraya.com

References

¹arabnews.com

²campaignasia.com

As Chief Strategy Officer, Jassem Nasser leads the strategy and business development division which includes Corporate Strategy, M&A and investigating new ventures outside the company's core MSS business. Jassem also manages Thuraya's Corporate Affairs including Regulatory, Spectrum Management & Development.

Jassem has more than 19 years of experience in the satellite industry including roles of providing strategic direction, as well as overseeing spectrum and frequency management. His engineering background has been applied to a business environment specializing in satellite communications and other radio communication systems. Jassem has been involved in setting up and managing a start-up satellite organization and seeing the company through its various stages of development by devising strategic direction and priorities, identifying and selection of strategic options.

Jassem graduated with first class honors from Khalifa University of the UAE with a bachelor's degree in Communications Engineering.



