SATCOM For Net-Centric Warfare – April 2017

MilsatMagazine

The USAF's WGS-9 lift off aboard a United Launch Alliance Delta IV launch vehicle from Space Launch Complex 37 at Cape Canaveral Air Force Station, Florida, on March 18, 2017.
Photo is courtesy of United Launch Alliance.

MilsatMagazine

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DISPATCHES

CHEERS! WGS-9 LAUNCHES AND USAF CELEBRATES A 70TH ANNIVERSARY

What a terrific day March 19 was for the USAF as their WGS-9 satellite was successfully launched and the Air Force celebrated their 70th Anniversary.

This was the ninth Boeing-built Wideband Global SATCOM (WGS) satellite and was embarked to orbit aboard a United Launch Alliance Delta IV Evolved Expendable Launch Vehicle from Space Launch Complex 37B, Cape Canaveral Air Force Station, Florida, at 8:18 p.m. EDT.

"*WGS-9 launch marks an important occasion for the Wideband constellation as it is a major milestone in a 20-year partnership with Canada, Denmark, Luxembourg, the Netherlands, and New Zealand,*" said Mr. Bob Tarleton, director of the Space and Missile Systems Center's Military Satellite Communications Systems Directorate.

"*This accomplishment is the result of the remarkable relationship with our international partners and our exemplary operations at the 45th Space Wing, 50th Space Wing, and industry,*" said Tarleton. "*Thanks to the astounding commitment, focus on the mission, and team work, we successfully launched the next satellite in the WGS satellite constellation." This mission demonstrates the Air Force's continued commitment to deliver secure and reliable satellite communications around the globe to US forces and her allies.*"

WGS satellites play an integral part in the strategic and tactical coordination of military operations.

With this launch, WGS-9 will significantly enhance the current WGS constellation by providing increased communication capacity and coverage.

Improving on previous WGS satellites, WGS-9 uses a state-of-the-art channelizer, which increases the communication capacity by approximately 45 percent, as compared to the first seven WGS satellites.

Over the next few months, Boeing will begin on orbit testing of WGS-9 to verify performance and prepare the satellite for operational use.

Ultimately, WGS-9 will be controlled by the US Air Force's 3rd Space Operations Squadron at Schriever Air Force Base.

The WGS-9 satellite will enter operations in October of 2017. With one additional satellite in production, the WGS constellation is planned to ultimately consist of 10 satellites on orbit by 2019.

Photo of the WGS-9 launch is courtesy of United Launch Alliance.

DISPATCHES

OPTICAL COMMS FROM SSC AND BRIDGESAT

The Swedish Space Corporation (SSC) and BridgeSat, Inc., have agreed to a long-term partnership.

This new agreement will find BridgeSat installing satellite optical communications equipment at certain of SSC's established radio-frequency (RF) ground sites.

Additionally, the two companies will cooperate commercially for the benefit of their respective customer bases.

SSC owns and operates a global network of ground stations to provide secure and reliable access to a large number of satellites seeking radio frequency (RF) services.

BridgeSat is developing a global optical communications network that will offer secure delivery of data from LEO satellites at fast speeds and low cost.

The partnership provides BridgeSat with access to certain of SSC's high quality existing ground stations and creates incentives for BridgeSat and SSC to cooperate commercially for the benefit of their customers in leveraging their respective capabilities in optical and RF SATCOM solutions.

Leif Österbo, SSC's President of Satellite Management Services, reported that his company is pleased to enter this partnership with BridgeSat, with scope for mutual beneficial commercial cooperation going forward given the firms' complementary capabilities.

Optical communications is well suited when satellite operators need to downlink large quantities of data, but have limited access to RF spectrum.

BridgeSat is a perfect partner as they are developing a commercial optical communications systems that fits well with SSC's mission.

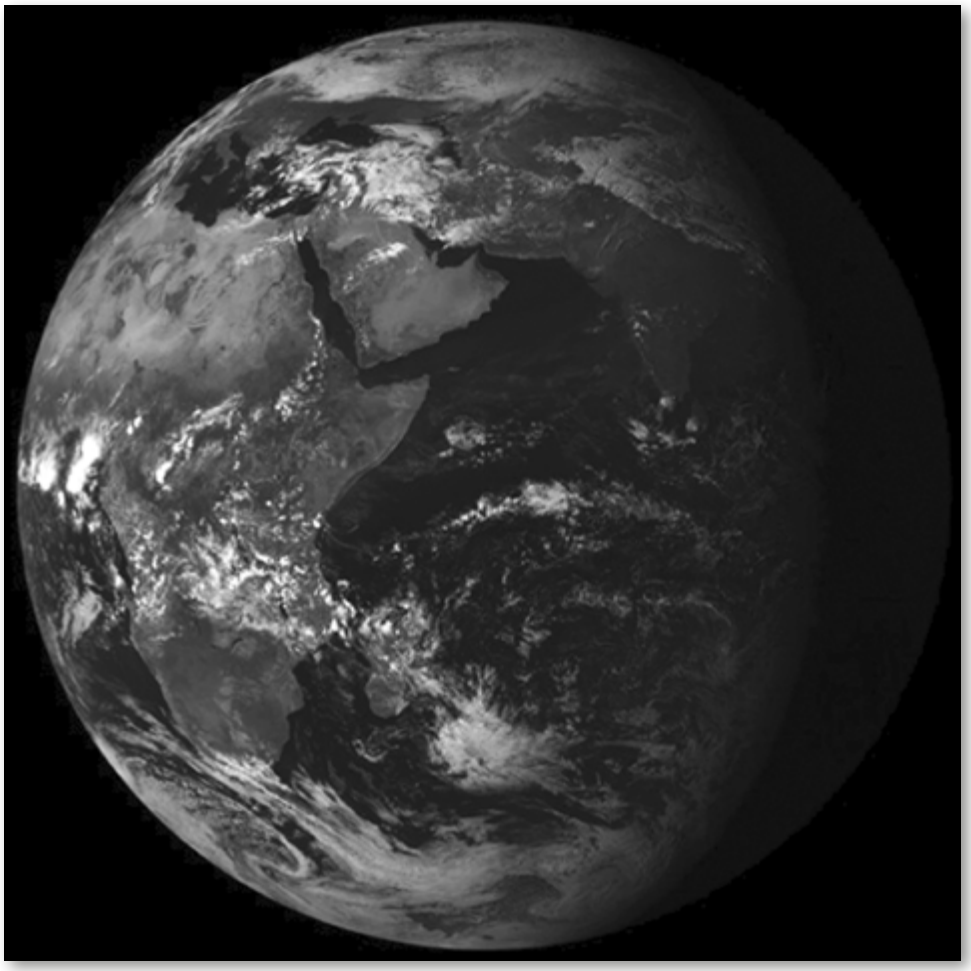
sscspace.com/

bridgesatinc.com/

DISPATCHES

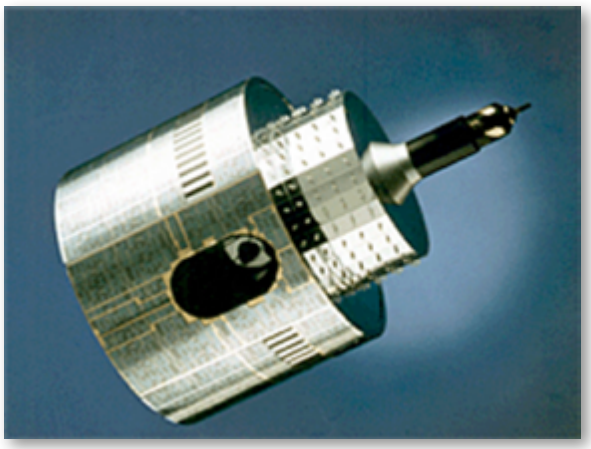
AFTER 20 YEARS OF EXCEPTIONAL SERVICE, METEOSAT-7 DEPARTS

The final command was sent at 09:00 UTC on April 11, 2017, ending the exceptional service record of the entire Meteosat first generation mission, started in 1977 by ESA.



Meteosat-7's final image.

During the past four decades, the series of seven successive Meteosat first generation satellites established the foundations for the products and services EUMETSAT delivers today from the geostationary orbit in support of nowcasting of high impact weather and built up an archive of over 36 years of observations, an invaluable asset for climate change monitoring.



The mission also supported large scale international research programs, in particular the Mesoscale Alpine Program and the Indian Ocean Experiment (INDOEX) investigating the impacts of natural and anthropogenic aerosols on regional and global climate.

Over the last ten years, Meteosat-7 has been delivering observations of the Indian Ocean from geostationary orbit.

This heritage mission has been provided by Meteosat first generation satellites ever since 1998. After the December 2004 Indian Ocean Tsunami, Meteosat-7 became an essential part of the Tsunami warning system, acting as a relay spacecraft for the Tsunami warning buoys that were put in place.

EUMETSAT's Director-General, Alain Ratier, said, "*This last maneuver puts a safe end to a foundational program. Not only did the successful Meteosat first generation mission give birth to EUMETSAT in 1986 and made it a true satellite operator in 1995, but it shaped satellite meteorology in Europe, testing concepts such as rapid scanning of thunderstorms and extraction of wind vector products from the tracking of water vapor patterns across successive images.*"

Meteosat-7 launched on 2 September 1997 and was developed under the Meteosat Transition Program (MTP).

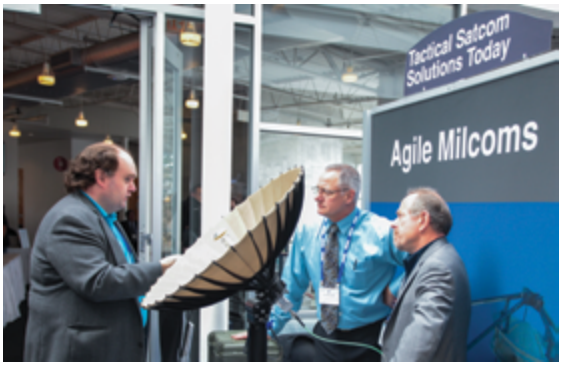
The satellite was designed to fill the gap between the Meteosat Operational Program (encompassing Meteosat-4 to -6) and the first satellite of the second generation, Meteosat-8 (launched on August 28, 2002).

The satellite provided the prime 0 degrees longitude Full Earth Scan Service as of June 3, 1998, until it was replaced by Meteosat-8 on May 16, 2006. On July 11, 2006, EUMETSAT moved Meteosat-7 to the Indian Ocean, where it provided the so-called Indian Ocean Data Coverage (IODC) Service from 57.5° East from December 5, 2006, until March 31, 2017, to bridge an important observational gap over the region.

Meteosat-7 has been replaced by Meteosat-8, the first Meteosat second generation satellite, at 41.5° East, as EUMETSAT's best effort contribution to a multi-partner Indian Ocean observation system also involving geostationary satellites of India, Russia and China.

eumetsat.com/



SATELLITE INNOVATION SYMPOSIUM

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Rapidly evolving technology coupled with mergers and acquisitions are changing satellite market dynamics at an accelerating pace. The 2017 Satellite Innovation Symposium aims to pinpoint key imminent market changes that will become obvious in years to come. While infrastructure and capital status have dominated for decades, key innovations will continue to cause major disruptions to the established marketplace. *What innovations will define the satellite communications industry going forward?*

Sessions To Date

- New Horizons in Space: The Innovation Landscape of the Future
- Manufacture and Servicing in Space: New Solutions for What is Needed
- Staying Ahead of Technology: Robotics, AI, 3D, Big Data Analytics and More
- Ground-Based Ecosystems of the Future
- Satellite Constellations – The New Roles of LEO & MEO
- Contemporary Financial Modeling
- Government as Innovators: Incubators, Investors & Customers
- Digesting Software's New Role
- Alternatives to RF and the State of Spectrum
- Mobile Satellite Connectivity
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- Innovative Partnerships & New M&A Strategy
- New Space Clients & The Internet of Things
- Cyber Security - Secure Satellite Systems of the Future

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DISPATCHES

AFRL ENGINEER DEVELOPS SATELLITE TECHNOLOGY

Space systems engineer Millay Petersen has worked at the Air Force Research Laboratory on Kirtland Air Force Base for the past 12 years, supporting both the Space Vehicles and Directed Energy Directorates.

"Right now, my job is in the Space Vehicles Directorate and is a mix of technical and program management," Petersen said. *"I am responsible for overseeing requirements, design, testing, operations, schedule and financial activities for satellites that we develop to meet Air Force technology needs. This involves management of technology development across a broad range of fields — structures, thermal analysis, software, electronics, launch and range safety, and orbital mechanics."*

"I love working at AFRL. We have great people who look out for each other and there's always something amazing to work on."

Her branch chief, Mark Scherbarth, said Petersen has been a pleasure to work with over the years.

"She embodies what it means to serve, having done so in several different capacities (active duty, civilian, Reservist) and in a highly technical field," Scherbarth. *"Her support and hard work on our highest-priority program is greatly appreciated."*

Petersen holds a Bachelor of Science degree in mechanical and aerospace engineering and a master's degree in engineering and technology management, both from Oklahoma State University.

Millay Petersen, Air Force Research Laboratory's Space Vehicles Directorate engineer, assists with a solar array deployment test to prove that the solar array hinges and explosive bolt release mechanisms will function correctly when the satellite unfolds the solar array in space.

A native of Oklahoma, her early years were spent in a rural setting where she had chickens and a huge vegetable garden. In later childhood she lived in Oklahoma City.

Her curiosity began at an early age.

"I always enjoyed learning new things and I wanted to know how everything worked, whether it had to do with mechanical systems, biology of plants and animals, or ecological systems," she said. *"I really liked math and science, and I knew that I wanted to do something where I could focus my interests on creating or doing new things."*

Petersen said her mother was her biggest influence in her career choice as well as her primary role model.

"I admired my mom for her intelligence and hard work," Petersen said. *"As a single mom raising two daughters, she was working through a difficult pre-law degree at the University of Oklahoma, and I watched her work hard to get the highest grades in her class. We didn't have many material things growing up, but I think we had every copy of National Geographic in the house and a wall full of books."*

When she was a junior in college, Petersen decided to join the Air Force Reserve Officer Training Corps and was commissioned in 2001.

"I had always admired the service and sacrifice of my grandfather and father through their military service," she said. *"I felt that by joining the Air Force, I would honor the memory of their service, that I would be able to use my degree to contribute to the country, and that I would have a career that I was proud of."*

As a wife and mother of five children, Petersen said it became harder to balance the need to move more frequently and attend long training and military education courses. She decided to become a government civilian and to continue her service to the Air Force as a Reservist.

Petersen feels fortunate to have been selected for a civilian position with AFRL at Kirtland, where she was assigned while on active duty.

"I am a woman working in a male-dominated field — engineering — and in a male-dominated employment sector — the military. I have always been treated fairly and respectfully, and I have always been recognized for the work that I do," Petersen said. *"In my experience, the Air Force is an excellent place for women and minorities to work."*

wpafb.af.mil/afrl/

Story by By Jeanne Dailey,
Air Force Research Laboratory

DISPATCHES

QUINTECH'S XTREME 256 MATRIX SWITCH PROCURED BY US GOVERNMENT

Quintech Electronics & Communications, Inc. has reported that their XTREME 256 matrix switch and distribution equipment was procured by a US Government media agency for expansion of their satellite network capacity.

Quintech's XTREME 256 matrix switch provides best-in-class reliability and uptime for critical 24x7 transmissions.

The XTREME 256 is the only L-band matrix that provides a dedicated redundancy path that does not require re-routing of any existing connections.

Redundant power supplies, controllers and fans are standard. All active cards are hot swappable and accessible through the front panel, which reduces maintenance time and disturbance of cables as compared with rear panel accessible cards.

The XTREME 256 matrix uses less than 600 Watts, thereby reducing the total cost of ownership, whereas comparably configured matrices use more than 1500 Watts.

Frank Elling, the President of Quintech Electronics, noted that the XTREME 256 (patent pending) matrix switch is the only switch that can be configured as a symmetric 128x128 or asymmetric 96x160, 64x192, 32x224 configuration.

The company designs products with the highest reliability for mission critical applications. The matrix switch, paired with Quintech's splitters and LNB power sources, meets or exceeds 99.99 percent availability, as required by the government media agency.

quintechelectronics.com/

DISPATCHES

NEW ORDERS FROM MILITARY CUSTOMERS FOR ADVANTECH WIRELESS

Advantech Wireless has received follow up orders from Military Customers for the firm's X-band line of Gallium Nitride (GaN) technology based Solid State Power Amplifiers (SSPAs) and Block Up Converters (BUCs) designed for Tactical Mobile Military Applications.

This latest generation of X-band GaN based SSPAs/BUCs from Advantech Wireless feature exceptional linearity and operating efficiency. These advanced systems are extremely versatile and perfectly suited for harsh environments, Satcom on the Move (SOTM) and man-pack terminal deployments.

The X-band GaN based BUCs from Advantech Wireless are weatherproof and constructed in a compact cooling enclosure for outdoor operation. Based on ruggedized designs these BUCs are the smallest fully integrated units on the market today and are enabling new terminal designs for both mobile and on the halt tactical communication systems.

Cristi Damian, the Vice President of Business Development at Advantech Wireless stated that to-date the company has received orders for more than 300 units, with the high linearity combined with small size, and low energy consumption appreciated by customers. The GaN X-band line of SSPAs is versatile, with small form factor units for mobile applications, to medium power for maritime, and very high power for large teleports. According to the company, several models are either already WGS certified, or in the process of certification.

advantechwireless.com/

DISASTER RESPONSE AND CONNECTING AFFECTED COMMUNITIES ENABLED BY SES

SES offers a broad range of solutions to support humanitarian and disaster relief efforts across the globe.

Some of these efforts were showcased during the Humanitarian ICT (Information and Communications Technology) Forum that was organized by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and Emergency Telecommunications Cluster (ETC).

SES's satellite solutions can help to restore essential communication links, ensuring immediate coverage via capacity reserved for relief efforts and support for multiple end-to-end humanitarian services.

Emergency.lu, a multi-layer platform, which includes a portable Rapid Deployment Kit delivering connectivity via SES satellites, has been devised to support first responders' efforts.

In past years, the platform, which is supported by a public private partnership between the Luxembourg government and three Luxembourg-based companies (SES, HITEC Luxembourg and Luxembourg Air Ambulance), and in collaboration with the World Food Program (WFP), Emergency Telecommunications Cluster and Ericsson Response, has been deployed in many emergency situations around the world, including Haiti, Nepal and Vanuatu, and earlier in Mali, the Philippines, South Sudan,

Venezuela and Ebola-affected countries in West Africa.

SES's capabilities go beyond enabling quick humanitarian relief efforts and supporting the immediate needs of first responders. At this year's Humanitarian ICT Forum, SES unveiled its new SATCOM-enabled solution, Government+ Rapid Response Vehicle (RRV).

Using a combination of GEO (Geostationary Earth Orbit) and MEO (Medium Earth Orbit) satellite connectivity, RRV can enable wireless Internet access for refugee camps and communities, reinforce downed public infrastructure, and provide IP backhaul for mobile networks and long-term connectivity for agencies on the ground. High-definition video conferencing, streaming, GSM backhaul, cloud-based services and high-speed broadband in locations where infrastructure is non-existent or destroyed—are only a few of the applications the RRV can provide.

The plug-and-play modular RRV solution can easily integrate and deploy an array of communications technologies and devices aboard its mobile vehicle, including the emergency.lu disaster recovery platform, SES Government+ persistent surveillance aerostat or SATMED telemedicine service. The RRV is equipped with wireless capabilities, including MIMO (Multiple Input Multiple Output) SDR radio technology that provides humanitarian aid teams with an expansive mesh type, frequency programmable, mobile communications platform that supports private 3G and 4G LTE networks.

Nicole Robinson, the Head of Government Market Solutions Centre at SES, commented that SES's launch of the Government+ Rapid Response Vehicle is a natural and exciting extension of the company's vast experience and the technological advancements SES has honed for decades in support of humanitarian efforts around the globe. Whether these are aid missions in response to natural or technological disasters or humanitarian operations, the SES RRV platform can provide tailored multi-band, multi-orbit connectivity to support virtually any situation imaginable, anywhere in the world.

emergency.lu/

DISPATCHES

ROCCOR'S HIGH STRAIN COMPONENT TECHNOLOGY PATENTS LICENSED TO AFRL

The Air Force Technology Transfer (T2) Program was created to ensure Air Force science and engineering activities are transferred or intentionally shared with state and local governments, academia and industry.

The exchange of knowledge, expertise, equipment, and testing facilities leverages the Department of Defense (DoD) research and development investment.

roccor.com/

Roccor, a disruptive aerospace supplier, has finalized an agreement with Air Force Research Laboratory, Space Vehicles Directorate (AFRL) to license patents of High Strain Component (HSC) technology.

These patents will enable Roccor to build a large number of Solar Array Development Systems (SADS) to support mega-constellations.

Roccor recently moved into a dedicated expansion of their world-class facility in Longmont, Colorado, which allows for high volume production of the company's HSC boom product.

The HSC boom uses AFRL's HSC technology controlling the release mechanism and kinematic mounts while in space.

These mechanisms support Roccor's SADS, enable seamless deployment of solar arrays and allow electrical energy generation to power the constellation via the solar panels.

This mass production of SADS serves as the foundation for large constellation support.

The HSC technology is also being leveraged for a number of other customer applications including deployable hinges and antenna systems for other commercial and military customers.

Roccor's work with AFRL represents a technology transfer agreement used by the Air Force to share government developed engineering related to design or manufacturing activities with external, non-DoD partners.

Image courtesy of DoD

DISPATCHES

SIGNALEERS AID BRIGADE IN GOING WIRELESS FOR COMMS

Sgt. Shereena Martinek (left) and Sgt. Marcel Nicholas assemble the mast for the BlueSky Mast AL1 wireless antenna at Schofield Barracks, Hawaii, on April 3, 2017. Both Soldiers are assigned to the signal section (S6) for Headquarters and Headquarters Battery, 25th Division Artillery, 25th Infantry Division. The new AL1 wireless antenna will allow Soldiers to communicate on a secure wireless network on the battlefield. (US Army photo by Staff Sgt. Armando R. Limon, 3rd Brigade Combat Team, 25th Infantry Division)

Staff Sgt. Stuart Jackson, the network operations NCOIC assigned to Headquarters and Headquarters Company, 3rd Brigade Combat Team, 25th Infantry Division, helps to assemble a BlueSky Mast AL1 wireless antenna at Schofield Barracks, Hawaii, on April 3, 2017. The new AL1 wireless antenna will allow Soldiers to communicate on a secure wireless network on the battlefield. (US Army photo by Staff Sgt. Armando R. Limon, 3rd Brigade Combat Team, 25th Infantry Division)

Signal Soldiers in the Army have to contend with laying hundreds or even thousands of meters of networking cables throughout a tactical operations center (TOC) while in the field either in garrison or deployed.

What if there was a way to eliminate the need for all the excess cables and allow Soldiers to communicate seamlessly while using their Warfighter Information Network-Tactical (WIN-T) systems?

"*The purpose of the training is for us to use wireless communication connection and setup, instead of having to run hundreds of feet of T4 line,*" said Staff Sgt. Stuart Jackson, network operations noncommissioned officer in charge, Headquarters and Headquarters Company, 3rd BCT, 25th ID. "*It allows us to use less personnel for the setup. As for setting up, they made a lot more things clearer, instead of going through the actual PowerPoint.*"

Instructors from Training Support Division, Communications-Electronics Command (CECOM), based out of Fort Gordon, Georgia, provided training to the Bronco Soldiers.

"*It's an operating level course that we're taking them from VALEX (validation exercise) to be fully operational,*" said Dwane Aristide, a primary instructor from TSD, CECOM, "*so they'll be able to do an extension of their network from their WIN-T systems.*"

This new system will allow signal units to hook up clients, even their network managers wirelessly to the system, said Aristide. Increased data speeds were also an important feature for the wireless system.

"*Some of the newer technologies now require higher data rates, especially for streaming video, target data, stuff like that,*" he said. "*They'll have that ability to be on the go and access their secure clients.*"

According to David Givens, an instructor from TSD, CECOM, the new technology is the first time the Army is getting wireless services within its tactical and non-tactical environment.

"*This system will give brigade commanders the ability to be mobile when they're working in their TOCs, instead of being stationary with landlines,*" Givens said.

Previously, if commanders wanted to get their feeds from their various battlefield services, the commanders would be confined to their TOC for their updates.

"*The commander would have to be sitting behind his own desk,*" he said. "*Now with wireless services, his information goes along with him, with his tablet or laptop. As he moves, as long he's within the wireless service provider, he has the same information as he would be sitting behind his desk.*"

Bronco Soldiers found the instruction and setup of the wireless system rather easy as they received hands-on instructions by Aristide and Givens.

"*The training is really good because eventually we are going to move to wireless capabilities,*" said Staff Sgt. Steven Garruto, transmission NCO, HHC, 3rd BCT, "*so getting it now, in front of having the actual package will really help. We have all the documentation to build QRGs, which are quick reference guides for our battalion elements beneath us.*"

Story by Staff Sgt. Armando Limon
3rd Brigade Combat Team,
25th Infantry Division

DISPATCHES

NEW FACILITY OPENS FOR NRO

National Reconnaissance Office Operations Squadron held a ribbon cutting ceremony at Schriever Air Force Base in Colorado to mark the grand opening of their new building late last month, operational as of April 6.

More than 75 Airmen, civilians, military and community leaders witnessed the unveiling of the 19,985 square foot facility.

"*Our biggest challenge was not having enough work space*," said Capt. Emanuel Chatters, NRO Operations Squadron flight commander. "*We had multiple reports from our headquarters stating we were under-spaced by approximately 10,000 square feet. Now, we will have meeting environments, system test labs and training labs we didn't have before.*"

NOPS links NRO satellites that are critical to US national security to the Air Force Satellite Control Network; the squadron facilitates the design, build and operation of the nation's reconnaissance satellites, providing products to customers including the CIA and Department of Defense (DoD), that can warn of potential trouble spots around the world, help plan military operations and monitor the environment.

L-R Col. Deanna Burt, 50th Space Wing commander, Col. Matthew Skeen, National Reconnaissance Office Director of Space Launch, Ms. Betty Sapp, NRO Director, Mr. Gary Lund, Office of Space Launch Design and Construction Manager, and Lt. Col. Bryan Dutcher, NRO Operations Squadron commander take part in a ribbon-cutting ceremony for the NOPS Annex here, Mar. 21. (U.S. Air Force photo/Christopher DeWitt)

The new facility features development and work areas, command section, front office staff, a visitor area, conference rooms, a break room, emergency storage and security.

"*We could not have done all of this without base support*," said Capt. Derrick Burnett, NOPS chief of Mission Operations.

Col. Matthew Skeen, Office of Space Launch director, attended the ribbon cutting ceremony and spoke of those who contributed to the success of the new annex.

"*The mission of protecting our nation requires an incredible amount of teamwork, and that teamwork is certainly on display here today*," said Skeen. "*The combined efforts to deliver this facility will enable the NRO to continue to operate our satellites and be America's eyes and ears in space.*"

Story by Senior Airman Arielle Vasquez
50th Space Wing

CRITICAL EVENTS REQUIRE EFFICIENT AND ADVANCED SOLUTIONS
AN ADVANTECH WIRELESS APPROACH TO DISASTER RECOVERY

By Chris Chapman, Special Communications Advisor, Government and Defence, Advantech Wireless

An earthquake hits without warning, killing many and leaving thousands displaced, without electricity or clean water—collapsed buildings leave tenants caught below the rubble and roads are all but unusable.

First Responders struggle to work with the damaged infrastructure while the police attempt to maintain order in this once prosperous and safe area. Non-Government Organizations (NGOs) flood into the country in the hope to gain a foothold but with the total collapse of terrestrial and cellular networks communication is already causing a barrier to all of the immediate response efforts.

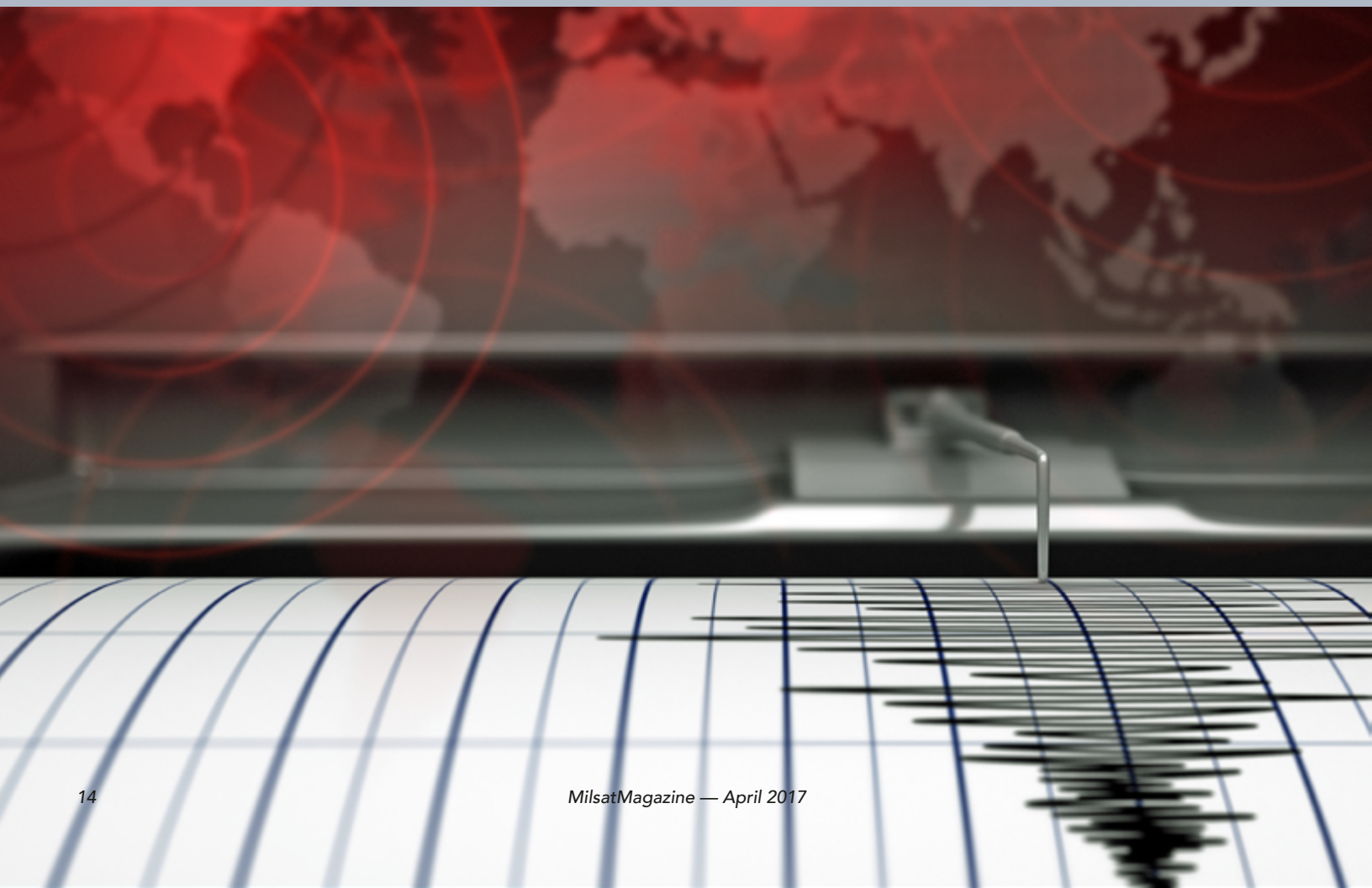
This is just an example of the initial effects of any given natural disaster. First Responders and NGOs are highly trained and experienced in both short term and long term efforts and how best to achieve them.

Danger to life means that the short term efforts begin immediately; finding casualties and saving life, providing power and clean water, providing clean areas of shelter and getting the displaced persons to these areas, getting hospitals and First Aid stations working, the list is endless and near impossible without collaboration and communication.

When responding to an emergency situation or disaster, it is of paramount importance to have a fast, reliable and secure form of communication. Communication requirements in a disaster recovery and emergency management situation can benefit from the flexibility, versatility and quick deployment of satellite networks enabling responders to coordinate first response activities and command, control and communicate urgent information quickly and efficiently.

Advantech Wireless empowers emergency response units with quickly deployed voice, video and data connectivity to exchange vital information, make critical decisions and manage the rescue and recovery efforts. The quick and easy deployment allows for first responders to begin coordinating and assessing the situation before they even arrive at the emergency area.

Advantech Wireless' emergency relief solutions are critical for public safety agencies, providing reliable, always-on communications technologies in the event of a crisis or disaster. Whether in a densely populated urban area or a remote location where no infrastructure exists, first responders are equipped with full communications capabilities and the confidence to exchange voice, data and video.



With built-in security features, Advantech Wireless' technologies help first responders run their operations more efficiently and securely.

Advantech Wireless deployable hubs, with state of the art ASAT II™ and WaveSwitch™ technology allow First Responders and NGOs to hit the ground running with the most cost and bandwidth efficient capability to keep the team in full communication no matter the weather or terrain.

The Advantech Wireless Raptor Hub.

Offering up to 200 Mbps Forward Link and 48 Mbps on the Return Link, and supporting as many as 500 remote users, the Advantech Wireless Raptor Hub is ideal for any Disaster Recovery effort.

Always uncertain of when or where a disaster will occur, Advantech Wireless provides a Hub that can be used in any location.

The Hub is not frequency dependent; whether the location is within sight of satellites in C-, X-, Ku- or Ka-band, the Hubs and Terminals will communicate and are also not satellite dependent; the Raptor Hub can work on different transponders or even different satellites, all quite seamlessly.

All network architectures are supported; DVB-RCS/RCS2, DVB-SCPC, Multi-mode (DVB-RCS/DVB-SCPC), Mesh or Star, the Advantech Wireless family of Hubs are turn-key solutions which can be fully installed and working within a matter of hours to enable a wide range of Public and/or Private Network topologies with Satellite Interactive Terminals.

Advantech Wireless' entire system, as well as the DVB-RCS standard, have been designed to minimize the cost of scaling a broadband access network from terminal populations as small as a few tens of terminals to hundreds.

Performance of access layer protocols is highly dependent on the traffic profile. Advantech Wireless' implementation of DVB-RCS, using dynamic assignment techniques mandated in the DVB-RCS specification, has been specifically designed and tuned for multi-media traffic. In comparison, other VSAT systems are less dynamic and less flexible.

Efficient bandwidth utilization is key for the success of any satellite system. Well ahead of any solution available in the market, Advantech Wireless has developed a revolutionary technology for use on the Discovery VSAT Hubs product line-up based on the New Generation ASAT II System. Advantech Wireless ASAT II™ System and the unique WaveSwitch™ and 3D BoD™ 3D bandwidth-on-demand capacity assignment technologies deliver best possible service, highest quality and most efficient bandwidth utilization.

ASAT II™ monitors channel utilization and dynamically switches the satellite access method and MODCOD seamlessly for the return channel. This new technology maximizes the space segment utilization efficiency by supporting three waveforms seamlessly managed on a shared bandwidth pool: DVB-RCS2 / RCS MF-TDMA, ASCPC™ near-SCPC long burst and true SCPC.

ASAT II™ 3D BoD™ and WaveSwitch™ manages terminals' traffic across these three waveforms in real-time. WaveSwitch™ manages the entire Return Link as a single shared resource—eliminating any bandwidth fragmentation and utilization losses required to meet peak capacity demands. It allows providers true bandwidth optimization matching best spectral efficiency, without sacrificing network utilization, delivering high service quality.

Advantech Wireless also offers GaN-based SSPAs and BUCs which deliver unmatched performance and reliability. The crystal lattice structure, and the high temperature handling capabilities of the GaN devices (over 300°C channel temperature), makes them extremely robust and reliable and the breakdown voltage for GaN devices is above 100VDC, which makes them extremely difficult to damage.

These innovative systems offer the best linearity and intermod performance in the market. It delivers significant savings in electric power usage (low OPEX), physical space and heat generation.

Within the same footprint, Advantech Wireless GaN-based units...

- *Deliver double the RF power*
- *Are 50 percent smaller (volume reduction)*
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CONSTANT CONTACT: THESE FOUR ATTRIBUTES ARE CRUCIAL FOR AN EMERGENCY SERVICES ORGANIZATION

By Marty Lamb, Head of Software Engineering, and Don Gilbreath, Head of Media Services, Rajant

During the tragic events of September 11, 2001, many communications networks went down in the chaos, or became clogged up due to interference from the thousands of people attempting to reach loved ones—this meant many first responders were unable to communicate with one another or with their command centers, impeding rescue efforts.

This was a catalyst for many first response organizations —"What if that was us?"—upon learning of these issues. Since that day, many agencies have actively worked to upgrade their wireless networks to ensure communication breakdowns will never happen to them—but many still lag behind the curve because they are unsure as to exactly what they should be seeking in a wireless network, or what their networks should be able to do for them.

A wireless network built for first responders should have four key attributes in order to properly serve their needs.

It must have high availability.

First responders require a network that allows communication from anywhere in the service area, but the conditions in which first responders usually operate cripple many networks—every incident is located in a different area, and all personnel and vehicles are constantly moving.

In addition to these changing environmental conditions, other outside factors can affect a network: Environmental or accidental radio frequency (RF) noise, broken RF equipment, dynamic changes in the characterization of the RF site, and the range on non-compatible RF devices all can interfere with network performance.

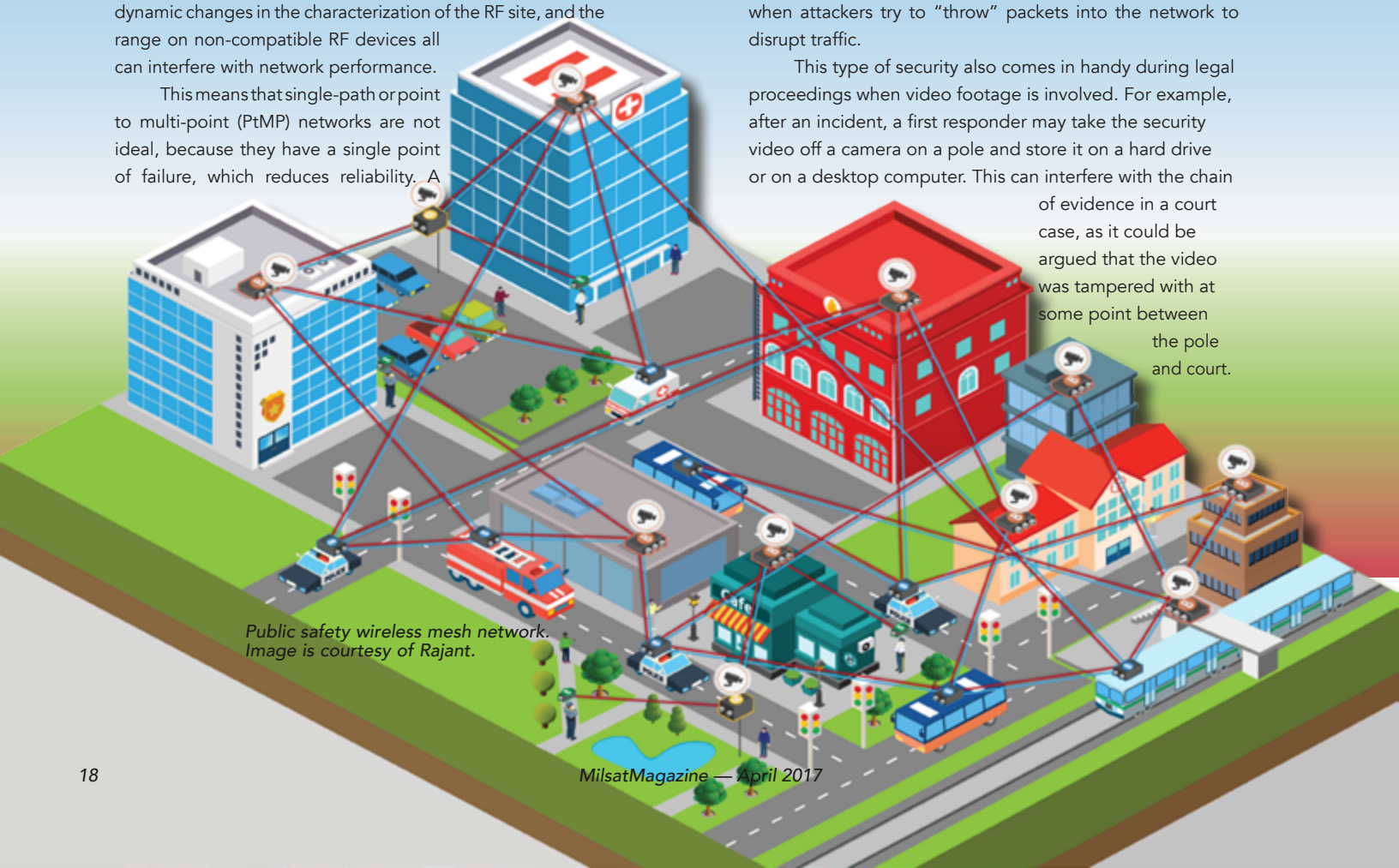
This means that single-path or point to multi-point (PtMP) networks are not ideal, because they have a single point of failure, which reduces reliability. A network should allow for and survive any changes to network infrastructure, whether planned or unplanned, by having multiple radios creating multiple paths, and thus no single point of failure.

Even if a radio on one piece of equipment or vehicle fails, the network should be able to reroute, limiting connectivity problems to an individual vehicle versus multiple vehicles, and ensuring that response operations are minimally affected.

It must be highly secure.

Networks with military-grade security with configurable per-hop, per-packet authentication are ideal for first responders. A network should offer end-to-end encryption—meaning when encrypted information flows through the network and comes out another radio, it stays encrypted all the way through, and is not decrypted until it is delivered to its final destination, ensuring privacy of mission-critical data. This protects from a type of cyber-attack called packet injection, when attackers try to "throw" packets into the network to disrupt traffic.

This type of security also comes in handy during legal proceedings when video footage is involved. For example, after an incident, a first responder may take the security video off a camera on a pole and store it on a hard drive or on a desktop computer. This can interfere with the chain of evidence in a court case, as it could be argued that the video was tampered with at some point between the pole and court.



Public safety wireless mesh network. Image is courtesy of Rajant.

First Responders mesh network. Image is courtesy of Rajant.

A secure network will offer cryptographic assurance of tamper-free data, which proves to the court the video is accurate.

It must allow real-time data transfer to enhance safety. Real-time data has become an integral part of response operations, to protect both those on the force as well as citizens, through the use of such tools as dashboard cameras, body cameras and license plate recognition software. A high-bandwidth, low-latency network allows this critical information to be vetted and processed in real time.

With high-bandwidth operations, such as surveillance video or identification software, a large amount of data is constantly coming and going on the same network. A network must be able to support the constant real-time transfer of data to ensure that data streams are not lost or delayed. Video is the most affected data on many networks; if wireless networks are not engineered correctly, an organization risks missed or lost frames due to these interruptions.

It must be scalable, mobile and reconfigurable. Emergency response people and vehicles are always coming and going, and are never in the same place for long. Standard design and equipment cannot support a first responder's nomadic state.

A network should have assets that allow first responders to reconfigure and move radios and network infrastructure as the environment changes. For example, radios can be placed in vehicles as well as in static locations, and the network travels with the vehicles. Then three vehicles driving down a road with radios in them are all connected to each other as well as to any radios on poles, drones flying overhead, etc., and all work in concert. If another vehicle with a radio joins, the network adjusts immediately and that vehicle is then connected.

With a scalable, easily changed network, during emergency operations, any vehicle with a network radio in it that is first on the scene can act as the first broadcast point for all other emergency personnel and vehicles arriving; a wireless network that runs point to point (PtP) would require getting the single vehicle with the access point to the scene first.

This mobility also allows a faster response time as well as proactive intervention during disasters. For example, in the case of a flood or widespread fire, even if multiple utility poles with radios attached go down, the network reroutes and stays connected.

EXAMPLE IN ACTION: SURVEILLANCE VIDEO IN MEDIA, PENNSYLVANIA

Surveillance cameras on utility poles and in vehicles with dashboard cameras have become popular in recent years as a way to protect public safety and monitor an area in real time.

With a scalable network, an organization does not necessarily need a lot of money to get camera surveillance up and running; it can start with just a few assets, being strategic about where it places them, and add more over time—and any number of cameras can be added at any time, improving the network without any reconfiguration.

The town of Media, Pennsylvania, installed a six-camera network running on a kinetic mesh wireless network in October of 2014. Media has budget challenges like many small towns and the scalability of the network and wireless nodes meant the town could strategically implement video assets in a few key areas.

The six-camera installation enabled video surveillance and also acted as a police force multiplier for the borough; police officers cannot be everywhere at once—placing high-definition cameras in important areas is like having extra boots on the ground.

The town's businesses also allowed their own security cameras to tie into the common network, creating an open architecture that can help in the event of a crime.

The small town saw the investment pay off after a crime committed in February 2015, in which a man assaulted a woman and fled the scene. The incident was captured on a high-definition edge video processor radio located on a nearby utility pole camera. The video could not have been altered or tampered with in any way due to the innate security of the network and the video was able to be used as evidence in the court case.

POWERING EMERGENCY OPERATIONS

First responders have some of the most difficult jobs in the world, with no shortage of challenges to overcome each day—but communicating with each other during emergency situations should not be one of them.

Using a reliable, mobile wireless network, first responders have constant access to real-time data, letting them make more informed decisions and ensuring a swift response to any emergency, no matter where they are.

rajant.com/

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LONG ENDURANCE UAS MISSIONS—A SATCOM CHALLENGE

A GILAT PERSPECTIVE

By Chaim Weinberger, Director for Defense and UAV SATCOM Products and Solutions, Gilat Satellite Networks

Unmanned Aerial Systems (UAS) have become an essential component of tactical military operations—also known as Unmanned Aerial Vehicles (UAVs) and RPAs (Remotely Piloted Aircraft), these platforms offer defense organizations numerous advantages over manned platforms.

First and foremost, UAS units reduce the risk of casualties and lives being lost. They are also capable of performing long endurance missions, beyond the limits of any human pilot. In terms of cost-effectiveness, the flight hour cost of a UAS is substantially less than that of a plane or a helicopter.

UAS are used as force multipliers. They provide real-time Intelligence, Surveillance and Reconnaissance (ISR) information on remote targets and areas, as well as damage assessment and electronic warfare. They are also commonly used in border control as well as anti-terror operations.

TACTICAL UAS TRENDS FOR THE MILITARY SECTOR

To meet the needs of today's military and information-gathering missions, UAS continue to evolve at a rapid pace. This evolution is especially evident in two key areas:

- *Operating range and endurance are getting longer—Depending on the type of platform, UAS can fly for periods of up to 30 hours without refueling, while operating ranges can reach thousands of miles. A fleet of alternating UASs can indefinitely cover an area of interest.*

- *The physical size of UAS is getting smaller—Defense organizations are focusing on miniaturization. The challenge is to reduce the size, weight and power consumption (SWaP) of UAS-installed devices, such as sensors, all without compromising on performance. This size reduction affects all subsystems, including communications, radars and electronic warfare.*

There are many different types of UAS, designed for different purposes. In the military segment, UAS are categorized into groups based on their size, weight, speed and operating altitudes. The smaller tactical unmanned platforms are commonly used for medium to lengthy endurance missions.

Group 3 UAS includes the Lockheed Martin Fury 1500, Insitu (Boeing) Integrator, Northrop Grumman BAT 12 and others—these UAS craft operate at medium altitudes (typically 15,000 feet) with medium to long range and BLOS (Beyond Line Of Sight) communication capabilities and have much-needed endurance. With a payload capacity of less than 100 pounds, they typically carry multiple sensor packages (***e.g.***, FMV, SIGINT, jamming) and can be fitted to carry a SATCOM terminal.

THE NEED FOR BLOS COMMS

The combination of longer endurance missions and a smaller, lighter form factor has had a major impact on UAS communication requirements. Tactical UAS units, in particular, require low-SWaP communication systems for delivering high definition ISR imagery, while maintaining a dependable Command and Control (C&C) uplink with the supporting ground station.

Due to the increased distances in long endurance missions, Line-Of-Sight (LOS) communication solutions are no longer feasible. In the past, in order to support BLOS communications, UAS aircraft relied on ground-based or airborne repeater stations. This type of solution is not appropriate for tactical operational scenarios, which are dynamic and time-sensitive.

SATCOM TO THE RESCUE

SATCOM is the natural and preferred solution to provide reliable, real-time BLOS connectivity. SATCOM uses geostationary satellite capacity to provide full-duplex communications, linking the UAS to its ground control station.

Satellite coverage can span an entire continent, which is ideal for long-range UAS missions. SATCOM enables seamless BLOS communications between the UAS and the ground station without having to deploy relay equipment on the ground or on another aircraft.

Moreover, improvements in satellite technology, particularly the emergence of HTS, make SATCOM even more attractive for the UAS market. HTS satellites, which transmit over Ka-band, provide an estimated 300 to 400 percent improvement in throughput over traditional wide beam satellites.

UAS craft can take advantage of HTS to increase data rates from a single terminal. This is important for supporting transmissions of Full Motion Video (FMV) and high-resolution photos in real time to commanders on the ground and units in the field.

In contrast to traditional geostationary satellites which use a single wide beam, HTS uses multiple spot beams. The massive throughput of HTS spot beams are designed to provide greater capacity and high data rates over smaller surface geographical areas.

As these spot beams cover a smaller area, a key challenge for SATCOM connectivity using HTS is to switch seamlessly between beams as the UAV travels over various swatchs of land or sea. Leading UAS SATCOM solutions, such as Gilat's, are equipped to take advantage of HTS technology.

SIZE VS. THROUGHPUT TRADE-OFF

Given the operational and physical constraints of today's unmanned platforms, designing and implementing effective tactical UAS SATCOM solutions is a complex endeavor. There are trade-offs between size and performance that need to be reconciled in order to meet the needs of tactical missions.

With a payload capacity of only a few dozen pounds, equipment weight is crucial—every additional pound of payload means one less pound of fuel. However, at the same time, minimizing SWaP to meet payload limitations doesn't always go hand in hand with maximizing data throughput.

The leading vendors in the military UAS SATCOM market are those that are able to offer a compact, lightweight terminal without compromising high throughput. In this context, the ability to operate in Ka-band with high throughput satellites is a major advantage.

However, supporting high bit rates for fast download of sensor information does not come without a cost. Military organizations purchase satellite capacity from various satellite operators. Efficient bandwidth utilization on the satellite link, measured in terms of bit/Hz, is important for reducing operational costs.

UAS SATCOM TECHNICAL REQUIREMENTS

In addition to size and throughput, UAS SATCOM terminals must address other technical requirements that are related to the antenna, modem and management capabilities.

Given the limited space in tactical UAS aircraft, it's important for SATCOM antennas to maximize aperture size within the available radome volume. In addition, the antenna must use highly accurate and stable tracking systems to maintain a continuous link between the unmanned platform and the ground station.

Due to the small antenna size and the numerous number of satellites on orbit, there is an increased need to control Adjacent Satellite Interference (ASI). This can be done through the use of low modulation and coding, as well as spread spectrum transmission.

Modem sensitivity allows the SATCOM terminal's modem to work at a lower signal to noise ratio, thereby requiring less power on the other side of the transmission link. For this reason, modem sensitivity is a most important consideration in overcoming smaller antenna size.

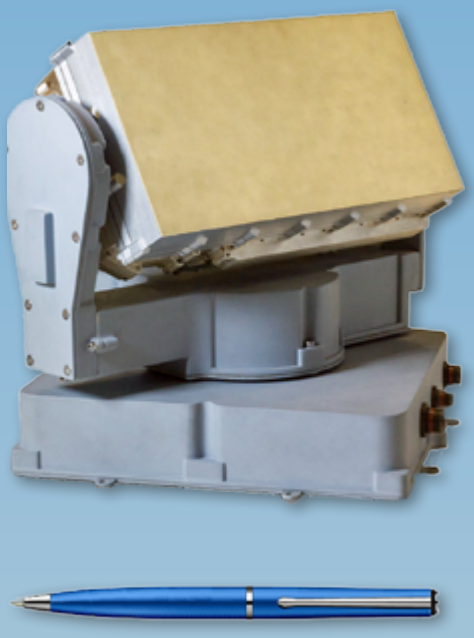
In terms of management, note that ISR and other tactical operations are most commonly carried out by a fleet of UAS units that communicate through a network. While one or more UAS may be operating above a target, another UAS may be on its way to, or returning from, the target. Ideally, all UAS in the fleet should be managed simultaneously from one ground station.

Lastly, UAS SATCOM terminals must be ruggedized to meet military standards for operating in harsh outdoor environments. Flying at high altitudes, UAS craft are exposed to extreme temperature ranges, humidity, vibrations and shocks (particularly during catapult launches and net landings).

GILAT'S SOLUTION FOR LONG ENDURANCE UAS MISSIONS

As a pioneer and a leading innovator in SATCOM solutions for the UAS market, Gilat offers unmanned SATCOM terminals that eliminate the trade-off between size and throughput. This enables military organizations to fully exploit the extended operational range of today's UAS for a wide variety of missions.

The ***BlackRay*** family of unmanned aerial terminals, operating in Ka- and Ku-bands, is specifically designed to provide the uninterrupted broadband connectivity needed on long-endurance BLOS missions. The system's tiny dimensions address the tactical need for reduced size and weight, while supporting full duplex satellite communication with the ground control station.



The Gilat BlackRay 72Ka.
The smallest SATCOM system for UAS .
Size: 11.8 (d) x 9.5 (h) inches (30 x 24 cm).

The small 10 lbs. BlackRay 72Ka delivers data download speeds of up to 2 Mbps, giving mission commanders the FMV and high resolution images required to make those split-second operational decisions.

Gilat's SATCOM solutions for UAS are highly appropriate for manned ISR missions that use small, special-mission aircrafts.

For more information, visit:
http://www.gilat.com/Unmanned-Aircraft-Systems

Chaim Weinberger (chaimw@gilat.com) is Director for Defense and UAV SATCOM Products and Solutions at Gilat Satellite Networks. Chaim has been in this role since 2011 and is responsible for product definition and go-to-market strategy. Chaim has over 30 years of experience in engineering and management in hightech and communication companies. Chaim holds B.Sc. and M.Sc. degrees in engineering from Tel Aviv University, Israel.

RESTORING COMMS: IT'S ABOUT MORE THAN BANDWIDTH

SECURING COMMUNICATIONS CAN NO LONGER BE AN AFTERTHOUGHT…

By Nelson Santini, Vice President, Sales and Business Operations, Envistacom

Hurricane Sandy earned its place in history as the second-costliest hurricane in United States history, causing more than $60 billion in damages across the Northeast—second only to Hurricane Katrina.

"Superstorm Sandy" affected a total of 24 US states, killing 160 people, destroying homes, leaving millions without power and disrupting telecommunications services.

A full week into the storm, there were areas still suffering through a total blackout, with communities reverting to printed paper and bullhorns to share what little information they possessed.

A major lesson learned was the need to better factor communications into emergency preparedness, both in terms of network restoration protocol as well as the use of multiple contact paths to decrease reliance on any one device when outages occur.

While restoring communications in haste is a core component of any disaster or catastrophe recovery plan, network security must also be woven into network restoration. In fact, security should be embedded into the very architecture of the new network.

Cyber security is largely missing from the post-Sandy commentary—this is an unfortunate commonality with many recent US and global disaster response efforts over the past decade. We might never know what threats these hastily deployed networks are vulnerable to until they are exploited.

As an industry, satellite communications companies can no longer afford to leave network security as an afterthought.

"JUST GIVE ME THE INTERNET. I DON'T CARE WHAT IT TAKES!"

The above sentence can be attributed to many of the victims, first responders and their on-scene commanders. Restoring communications for, and among, first responders is an essential requirement for successful recovery. On-site responders are often asked to become their best version of MacGyver in order to secure bandwidth… and lots of it, immediately.

More often than not, those who have deployed, operated and maintained fly-away terminals, and those who have enabled temporary networks, did so as fast as is humanly possible—providing unbridled and unmonitored bandwidth to anyone who needed it.

Examples of the destructive power of Hurricane Sandy.

If you have ever deployed a network in-haste, you know how difficult it is. If you have ever deployed a network in haste and connected it to another network that was also deployed in-haste—and you then managed to get them to work together—then you know this feat is just shy of a bona fide miracle.

However, in today's global threat climate, it's about more than speed and bandwidth.

FAST… AND SECURE.

Under the effect of the "fog of war," even the most seasoned network architect would celebrate connecting major backbones to remote networks, restoring communication to impacted areas, and enabling first responders and recovery crews to do their job; saving lives and property in the process.

Unfortunately, there are those who will take advantage of the vulnerability of disaster recovery as an opportunity to break into a network, waiting for systems administrators (SYSADS) and network operations centers (NOCs) to lower their guard in order to sneak malware or back-doors into networks and applications.

While a primary focus when restoring communications in an emergency is speed, network security should be a close second. Today, governments, NGOs, and relevant organizations need to be cognizant of the ever-evolving cyber threat landscape, taking such into close consideration when developing and implementing emergency communications networks.

No one knows when the next disaster will strike—another disaster is always on the horizon. Rather than reaching out to the first solutions provider or integrator who can land a fly-away kit in the middle of a disaster recovery area, those in charge should consider:

- *What real-world experience does the provider have in complex network architectures?*
- *Do they have experience in IA or cyber security?*
- *Are their personnel and operators trustworthy?*

SATCOM capabilities have advanced in terms of what's possible in haste under the most dangerous of circumstances; however, there are still few technology providers that bridge across complex network restoration and cyber security expertise.

Companies such as Envistacom, who specialize in implementing communications networks with disaster recovery capabilities and with dedicated cyber security expertise, live in the intersection of the network restoration and security matrix. These firms have experience deploying satellite, wireless, and OLAN networks under the most challenging of timelines and situations; their personnel are also subject matter experts who know how to protect networks that are about to be deployed—in Envistacom's case, that's because their experts were once first responders of sorts.

The industry can no longer afford to think of cyber security as an add-on when building or restoring networks, regardless of the haste required. In the same way that flyaway kits have asserted themselves as a standard protocol, today security is an essential component that must be engineered into the technology and systems that are used and brought to the forefront of emergency preparedness planning.

The mix and interplay of fast, reliable and secure network development and their implementation is the future standard of the SATCOM industry… and that future is now.

envistacom.com/

SUPPORTING THE COMMS-ON-THE-MOVE USER

REVIEWING TRUSTED TECHNOLOGIES; UNDERSTANDING NEWER CLAIMS

By Jim Chambers, Vice President of Engineering, XTAR

In today's military and political environment, Comms-On-The-Move (COTM) is more important than ever before—the ability to maintain solid communications while moving across wide geographical areas is a large determinant of mission success—or failure.

New technologies emerge in the commercial arena and are often deemed as being suitable for military use. However, designing satellite service that works equally well for commercial and military use is challenging. The military has specific requirements which often differ greatly from commercial applications in regard to terminals, data rate transmissions and geography.

Satellite communications have to move reliably and efficiently to support these missions. Not only is X-band reserved for military use, but its natural characteristics make it ideal for COTM situations. High Throughput Satellites (HTS) are gaining notice in the commercial market, but are also targeting military applications as well. HTS, by design, provide increased data rates and lower cost when delivered as a managed service. These services are most often designed around commercial applications that provide the largest user base.

Government/military users often have unique support requirements that are best handled by custom networks.

As always, caution should be exercised when considering a commercially-designed product for military use. Here's what decision makers need to keep in mind:

MISSION SUPPORT

X-band spot beams are wide and typically cover more than 1,000 miles, encapsulating entire countries and areas of operations. This means that the COTM user typically won't travel outside of an X-band spot beam. Service is uninterrupted as the mission moves.

X-band spot beams are also placed over areas of interest to military users as X-band is reserved for military use. Although X-band spot beams are wide, it does not mean that high data rate cannot be supported. As an example, XTAR has supported missions on both XTAR-LANT and XTAR-EUR that transmitted data rates in excess of 10 Mbps from a COTM remote terminal of 0.4 meters. Another advantage of wider spot beams is that the military user has a wider choice of locations to use as a hub/gateway. Often, an existing gateway facility or teleport may be used, thereby saving the government money in hub Earth station and platform as well as terrestrial backhaul costs.

Today, the latest HTS have small beams that are, at most, a few hundred miles wide. This presents two immediate issues. First, COTM users are forced to have bandwidth in many different areas to support movement between beams. Second, HTS require users to have specialized equipment with beam switching technology which will transition communications from one spot beam to the next as the user is moving. Both of these issues translate into additional costs.

Finally, one of the basic principles of HTS is frequency reuse. Frequency reuse leads to multiple gateway earth stations for accessing large areas of operations. Users will be required to install and maintain hub equipment in multiple gateway Earth stations for their network, rather than at only one location. In addition, the gateway Earth stations and the end-user location must be connected via a terrestrial network, again, leading to further expense. X-band does not require the user to have a big terrestrial infrastructure and one can use the teleport of one's choosing.

RELIABILITY

Satellite COTM must be reliable in every condition and as conditions change. Due to its frequency range, X-band fares better in challenging weather situations. As a general rule of thumb, frequencies above 10 GHz are susceptible to atmospheric attenuation, and frequencies below 10 GHz are relatively immune to atmospheric attenuation. X-band, with a transmit frequency range of 7.9 - 8.4 GHz and a receive frequency range of 7.25 - 7.75 GHz, has a frequency range less than 10 GHz. Whether it is humid conditions by the sea, or sand storms in the desert, X-band's position on the spectrum make it virtually weatherproof.

In addition to weather advantages, users on X-band have a smaller chance of adjacent satellite interference. This is due to X-band satellite spacing of 4 degrees. Other bands have half the amount of spacing between their orbital slots and are at greater risk for this costly and dangerous occurrence. Commercial satellites including HTS most often use Ku- and Ka-band frequencies, which are higher than 10 GHz and therefore susceptible to atmospheric attenuation. These frequency bands are not well suited for operations in tropical areas. In addition, these bands are subject to interference levels not found in military frequency satellite systems. Combining naturally weatherproof characteristics with greater satellite spacing gives COTM users the reliability they need. In fact, many X-band users experience exceptionally high link availability (99.9 percent), ideal for COTM situations.

EFFICIENCIES

Today's COTM user must be able to easily and efficiently transmit and receive voice, data, imagery and HD video. X-band is an ideal frequency band for transmitting high data rates efficiently with small (sub-meter) antennas.

As mentioned previously, X-band satellites are typically spaced 4 degrees or greater apart. This greater spacing allows X-band satellites to operate at higher uplink and downlink EIRP/Power densities than commercial satellites with typical 2 spacing. Higher allowable EIRP/Power densities at X-band allow small antennas to transmit without the need to use spread spectrum techniques that greatly increase bandwidth requirements. Efficiencies will vary depending on data rates transmitted, terminals utilized, and coverage areas, but as an example, XTAR has provide service to a 0.4 m transmitting a 10 Mbps carrier at an efficiency of 1.05 bits/Hz over an entire area of interest.

These are efficiencies that HTS satellites would struggle to achieve. This difference in efficiencies is vital, especially when considering the HD video and imagery requirements required by today's COTM user. Increased efficiency translates into lower bandwidth costs.

EXCLUSIVE

X-band is designated solely for government and military use. Its features and applications are all designed to accommodate one type of user. This is important for a variety of reasons. First, suppliers of X-band understand the unique needs of their customer and have designed their services to accommodate government and military users by shifting beams to areas of interest, adjusting transponder settings to best serve user applications, etc. Second, as the band only serves one customer, a military user will not get kicked off by a commercial user, or lose communications to a higher priority user (with the exception of use on WGS). Leased access is guaranteed in order to support the mission. Finally, X-band has fewer users to cause accidental interference and these users are better trained.

HTS is gaining a lot of notice and has solid commercial applications, but works best when customers purchase HTS as a service, with equipment and service level agreements included. Its limitations in military use are accompanied by the purchasing challenges—procurement offices prefer not to buy in this manner. In addition, managed services designed for multiple commercial users provide service level agreements for data rates and availability that may not be suitable for a military mission. Custom networks allow the military to design a network around their unique requirements.

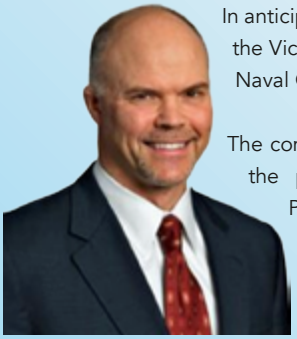
In conclusion, designing satellite service that works equally well for commercial and military use is challenging. X-band has been around for years and there is a reason for that—the company's advantages closely match the needs of today's military and government user —in COTM situations, X-band especially shines.

THE ROLE OF SATCOM IN INFORMATION WARFARE

By Ryan Schradin, Executive Editor, GSR, and Senior Contributor

Late in February, senior leaders from the US Navy, Marine Corps and Coast Guard descended on San Diego, California, for the premier naval conference and exposition on the West Coast—AFCEA West.

Now in its 27th year, AFCEA West brings private industry together with the military to discuss challenges, best practices and the new technologies that are revolutionizing warfare.



In anticipation of the event, GSR sat down with Bill Flynn, the Vice President of Programs at SES GS and a former Naval Officer.

The communications challenges facing the Navy today, the particular challenges presented by the Asia Pacific (APAC) region and the role that SATCOM plays in the Navy's network infrastructure were discussed, as well as "information warfare" and how SATCOM—specifically COMSATCOM—can be an "information warfare" weapon for the military.

Here is what Bill had to say:

Government Satellite Report (GSR)

Much of the AFCEA West agenda seems focused on delivering a prepared, combat-ready and connected warfighter. What does a connected warfighter look like for the Navy? What role can SATCOM play in enabling that?

Bill Flynn

A connected warfighter should have access to the network capabilities that provide them the information they need to know—when they need to know it—to meet their mission requirements. This can be a challenge for maritime forces which are typically spread across a wide Area of Responsibility (AOR) and almost always over the horizon, especially in the Pacific.

You've probably heard the term "***network-centric warfare***." That term refers to connecting all the nodes—sensors, platforms and weapons distributed throughout the battlespace. SATCOM plays an integral part in achieving network-centric capabilities for the Navy. And COMSATCOM is a significant part of the transport layer, delivering essential comms to meet mission requirements.

In addition to meeting warfighting requirements, the Navy must also consider providing warfighters the ability to communicate home, for [Morale, Welfare, and Recreation] reasons. Today's warfighters are young

men and women who have grown up with communication devices in their hands. They expect to be able to connect back no matter where they are in the world, and that can be a challenge for people in the military.

Unfortunately, when you assess the [Navy platforms'] throughput, it's not nearly enough to meet all their mission requirements. There are threshold —or minimum—requirements and there are objective requirements. The Navy is currently meeting their threshold requirements; however, they're not meeting their objective requirements.

Consider how many people are on a carrier. How much bandwidth do they need? And how much bandwidth are they getting? Is that enough to really address all their requirements?

That's one area where SATCOM—especially COMSATCOM—can help. COMSATCOM can provide that high throughput capability to ships at sea.

GSR

AFCEA West, being where it is geographically in San Diego, California, naturally lends itself to discussions about the Navy and military operations in the Pacific. Are there particular challenges that the APAC theater creates for the military in the areas of communications and connectivity? How does SATCOM—and specifically COMSATCOM—help address these challenges?

Bill Flynn

In terms of communicating and providing network-centric capabilities, there's no more challenging area than the Pacific. You could probably argue that—now that the ice caps are melting—you're going to have challenges at the North Pole and above the Arctic Circle. But, at this point, the Pacific has the most challenging communication requirements because it's vast and we have challenging missions there. There are high priority missions and platforms that deploy in the Pacific. We have important national level requirements that have to be addressed.

This geographic challenge is compounded by the fact that terrestrial networks in the region are not reliable. If you go to a place like the National Weather Service Station in American Samoa, they've replaced their terrestrial network with O3b high-throughput, low-latency satellite connectivity because the terrestrial network was not reliable.

We anticipate that other US Government agencies and military organizations will look to utilize similar services in the same way. This would give them access to the high-throughput, low-latency capabilities similar to what they would get with terrestrial fiber, but with the benefits and reach of SATCOM.

GSR

There are a significant number of panels and discussions at this year's show regarding "information warfare." What is "information warfare?" What role does SATCOM play in "information warfare?"

Bill Flynn

Information warfare is the effective use and management of information and communication technology in the pursuit of a competitive advantage over an opponent—this can include the collection of tactical information, denial of information collection opportunities, electronic warfare, cyber warfare, information assurance, and other weapons. In fact, the Navy has an entire career path dedicated to information warfare, which illustrates the importance the Navy places on it.

SATCOM plays an important role in information warfare by connecting the disparate sensors, platforms and systems that are taking part in information warfare missions. SATCOM delivers the connectivity that's required to meet mission requirements. For example, SATCOM allows us to capture high definition video from RPAs and convert it into an intelligence product quickly and efficiently.

In the old days, you would go out to do a mission, collect things on a tape, come back and play that tape at an analysis center where they would turn it into intelligence products. The whole process could take weeks or months. Today, we greatly shorten that process by delivering high definition video back to analysis centers in real time via COMSATCOM. This has enabled us to conduct warfare in a more efficiently and effectively—it's simply amazing.

GSR

What challenges are facing our military when it comes to "information warfare" in the space domain, and what role can COMSATCOM play in better preparing our Navy—and broader military—for "information warfare?"

Bill Flynn

One of the key challenges facing our nation in the area of information warfare is how contested and congested space has become. You can't go a week without somebody writing an article about space and the wars that are going to be waged—and may currently be being waged—in space today.

How does SATCOM play a role in that? When you've got a combined MILSATCOM and COMSATCOM capability, you've got resiliency. You've got the capability—when one gets taken out —to go to the other. I think that affords the US Government tremendous ability to get past this contested environment.

We're also paying close attention to this in the COMSATCOM world. We're looking for ways to provide jam-resistant capabilities that benefit both our commercial SATCOM users, as well as our military users.

GSR

What do you hope and expect to learn from Navy leadership at AFCEA West this year?

Bill Flynn

Well, like all of the services, the Navy continues to express concerns that the fleet is too small and the operational tempo for getting ships at sea is relentless and very challenging for them. So, right now, the Navy is looking at their funding levels and wondering how it will impact ship and aircraft maintenance abilities, and how it will impact their mission readiness. We're hoping to learn how Navy leadership is going to tackle that, especially with the new administration and the budget uncertainty that comes with it.

Despite some of the uncertainty, we do expect to see communications programs high on almost everyone's priority lists. We'll be listening specifically for ways the COMSATCOM industry can address their requirements — how can we help solve their problems with our COMSATCOM solutions?

GSR

You mention using COMSATCOM to fill those communications needs, but the military already has access to its own satellite constellation in WGS. For what reasons would the Navy want to utilize COMSATCOM vs. WGS?

Bill Flynn

COMSATCOM provides flexibility, controllability, rapid reconfigurations, and tailored, immediate responses. When the US government leases bandwidth from the COMSATCOM industry, they own that bandwidth for all practical purposes. They'll be assigned an engineer and a program manager dedicated to support their requirements. So, we can also be a lot more resourceful when it comes to overcoming outages and handling surge capacity.

It's common practice for a government agency to come to us and say, "I need capacity now, over this area." Since the COMSATCOM providers have worldwide networks consisting of large constellations of satellites, we're well-equipped to support that.

With WGS, bandwidth is available to the military based on priority. If a military organization requires satellite capacity, it goes on a priority list. Depending on the mission and its level of priority, it could either wait a long time for bandwidth, or even get kicked off the WGS satellites should higher priority missions need that capacity.

GSR

How do you envision next-generation Navy communications changing ten years from now? What are some in-theater examples?

Bill Flynn

When you assess almost any US Government customer, they are typically using some combination of MILSATCOM and COMSATCOM. I anticipate the next-generation to continue to use that hybrid solution approach.

However, I also think they will take larger advantage of the high-throughput, low-latency solutions that are available via High Throughput Satellites (HTS) and Medium Earth Orbit (MEO) satellites. They'll make the move towards HTS because it's less expensive. With advanced HTS solutions, the cost per megabyte decreases significantly, meaning that the government can get more capability at a lower cost.

To embrace HTS, there will need to be some upgrades to military SATCOM terminals and hardware. We're looking for ways that will enable the government to support that kind of transition on a limited budget. One way is to lease the terminals. Another way is to somehow incorporate the cost for the terminals into the COMSATCOM pricing. However, even with the cost to upgrade or replace some ground infrastructure, the cost savings of HTS should be enough to justify the transition.

For additional information about HTS and its benefits to the military, download the info sheet, "***High Throughput Satellites for U.S. Government Applications***," by selecting this direct link:
ses-gs.com/govsat/resources/high-throughput-satellites-u-s-government-applications/

This article is republished, courtesy of The Government Satellite Report (GSR) 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 Government Satellite 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 events and conference coverage, providing in-depth reporting from leading satellite shows.

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THE FUTURE OF AIRBORNE INTERCOMMUNICATION

AN ORBIT COMMUNICATION CASE STUDY

By Max Gadot, Director of Product Marketing, Airborne Communication Solutions, Orbit Communication

Airborne audio inter-communication systems are an integral and mission critical avionic component for aircraft flight safety and crew survivability—this is true for all manned aircraft categories including trainer and combat jets, helicopters, business jets, commercial airliners, transporters, tankers and special mission aircraft.

The majority of airborne inter-communication systems employ a star topology architecture, in which a central communication unit is connected by dedicated wiring to each operator's audio control panel. This star topology was suitable in its time but has several drawbacks when advanced audio capabilities such as spatial 3D audio are required.

One main drawback of the star topology is limited computational capacity of the central communication unit required for spatial 3D audio implementation in a dedicated manner for each operator. The algorithms for dynamic 3D positioning of audio resources require extensive computations per airman. This is challenging without dedicated computing power for each airman.

Dual IP Ring offers significant benefits for spatial 3D audio

Additional shortcomings of the star topology are the central communication unit being a single point of failure, the lack of inherent system redundancy, a lack of incremental scalability, and lack of system flexibility.

A patented Dual IP Ring topology that overcomes all these drawbacks has been invented by ORBIT. In this novel approach the Communication Control Panels (CCPs) are cascaded in an Ethernet Dual IP Ring and communicate using an IP based deterministic avionic protocol. The CCP is a hybrid of an "End-System" and a "Switch" eliminating the need for a central communication unit and thus reducing system SWaP-C (Size, Weight, Power and Cost).

Dual IP Ring architecture provides significant benefits for implementation of spatial 3D audio. The algorithms for dynamic 3D positioning of audio resources, according to the airman's helmet line-of-sight or his location relative to other crew members require dedicated and extensive

computations per airman. With ORBIT's novel approach each additional CCP adds resource capabilities and computing power dedicated to each airman and crew member, ideal for supporting spatial 3D audio and advanced noise reduction algorithms.

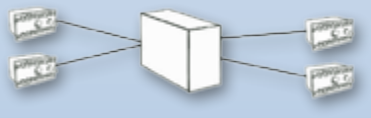
Dual IP Ring topology is ideal for all aircraft categories and offers exceptional 3D audio, noise reduction, system redundancy, incremental scalability and flexibility; all with reduced Swap-C

Inherent redundancy is achieved by each CCP transmitting IP packets in both directions on the ring simultaneously, providing continued normal operation without degradation even upon failure of a network segment.

The innovative Dual IP Ring architecture is ideal for implementation in all aircraft categories and offers exceptional 3D audio, noise reduction, system redundancy, incremental scalability and flexibility; all with a reduced SWaP-C.

LIMITATIONS OF CURRENT SOLUTIONS

The majority of airborne inter-communication systems employ a star topology, in which a central communication unit is connected to the audio control panel of each operator. The aircraft's audio communication, navigation and warning systems are all connected to the central communication unit which acts as a gateway and distribution hub. This topology has several drawbacks as described below.



Star topology has practical limitations for implementation of spatial 3D audio

A main drawback of star topology is the finite and limited computational capacity of the central unit for spatial 3D audio implementation. 3D algorithms require extensive processing in order to position each audio resource in 3D space in a different and dynamic manner for each airman, according to each airman's unique position relevant to other crew members and the dynamic line of sight of the airman's helmet. This is challenging without dedicated computing power at each operator terminal.

Additional drawbacks of the star topology are the central communication unit being a single point of failure, the lack of inherent system redundancy, a lack of incremental scalability, and lack of system flexibility.

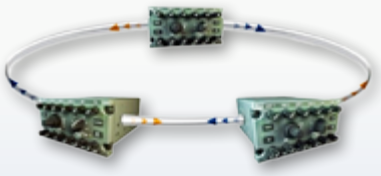
The following case sheds light on the lack of incremental scalability. Say a certain central communication unit supports 8 radios. If 9 radios need to be supported then a whole additional central communication unit has to be added, increasing SWaP-C.

BENEFITS OF DUAL IP RING

Dual IP Ring Topology Overview

Dual IP Ring is a patented intercommunication topology that overcomes the drawbacks of star topology (US Patent # 9,077,641). In this novel approach the Communication Control Panels (CCPs) are cascaded in a ring topology and communicate using an Ethernet IP based deterministic avionic protocol.

Dual IP Ring eliminates the need for a central communication unit and thus reduces LRU count, and system SWaP-C



The CCP is a hybrid of an End-System and a Switch; it inserts and extracts information from the network (as an End-System would do) and also routes the information to other CCP's (as a Switch would do). This distributed approach eliminates the need for a central communication unit and thus reduces LRU count and system SWaP-C.

The Dual IP Ring topology provides inherent redundancy, as each CCP transmits its IP packets in both directions on the ring, as illustrated by the blue and orange arrows in the figure above, effectively creating two IP networks. The result is continued normal operation without degradation even upon failure of a network segment.

Dual IP Ring topology provides inherent redundancy and is ideal for 3D audio implementation

Dual IP Ring architecture also provides significant benefits for implementation of spatial 3D audio. The algorithms for dynamic 3D positioning of audio resources, according to the airman's helmet line-of-sight or his location relative to other crew members require dedicated and extensive computations per airman.

With ORBIT's novel approach each additional CCP adds resource capabilities and computing power in an incremental and dedicated manner to each airman and crew member, ideal for supporting spatial 3D audio and advanced noise reduction algorithms.

3D Audio

Spatial 3D Audio has significant benefits for pilots and other crew members, increasing situational awareness and reducing workload and fatigue, thus improving operational effectiveness and increasing flight safety.

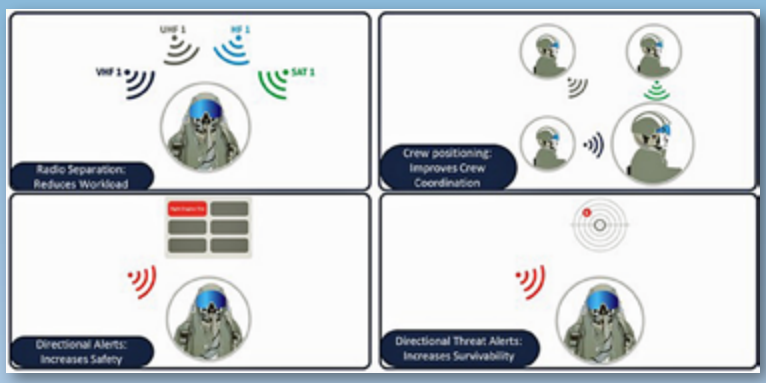
3D positioning of audio resources, according to the airman's helmet line-of-sight or his location relative to other crew members require dedicated and extensive computations per airman. In systems with a central communication unit this usually creates a computing capacity bottleneck.

ORBIT's 3D technology uses advanced binaural and psycho-acoustic principles, giving a unique and natural perception of sound as coming from a particular direction.

With ORBIT's Dual IP Ring topology, each additional CCP adds powerful computing power in an incremental and dedicated manner for each airman and crew member, ideal for supporting spatial 3D audio algorithms.

ORBIT's 3D technology uses advanced binaural and psycho-acoustic principles, giving a unique and natural perception of sound as coming from a particular direction. The result is consistent and accurate directional audio delivered into the ears of the mission-critical user, so that the spatial position of the sound source can be accurately located.

Applications include radio separation, crew positioning, directional safety alerts and dynamic directional threat alerts.



Incremental Scalability

The Dual IP Ring distributed architecture allows increasing system capabilities in an incremental manner. In a star topology the maximum number of system resources supported (radios, NAV receivers, discrete inputs and outputs, etc.) is defined by the central unit's capability. The computing power limitation is also defined by the central unit's capability.

> ***The Dual IP Ring distributed approach offers incremental scalability resulting in cost effective matching of system capabilities to the platform requirements***

Consider, for example, a star topology system with a central communication unit that supports up to 8 radios. If a certain program requires 9 radios then an additional central control unit has to be added, significantly increasing size, weight, power and cost.

In the Dual IP Ring approach, each CCP adds its own resource capabilities (3 radios, 7 NAV receivers, etc.) and its own computing power. This incremental scalability allows ideal and cost effective matching of system capabilities to the requirements of the platform and results in improved SWaP-C.

System Flexibility

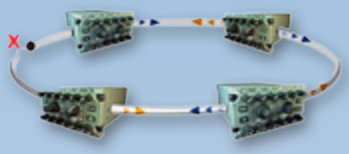
> ***Systems powered by Dual IP Ring possess outstanding flexibility—the basis for this is the ability to incrementally scale and match the system's capability to the platform requirements.***

This flexibility is what allows a system based on Dual IP Ring to be ideal for implementation on small or large platforms in almost any aircraft category, whether it be trainers and combat jets, helicopters, business jets, commercial airliners, transporters, tankers or special mission aircraft.

> ***Systems powered by Dual IP Ring possess outstanding flexibility and are suitable for multiple aircraft categories***

Dual IP Ring examples: 2 Seater Jet and Airliner implementations

Inherent Redundancy



The Dual IP Ring topology provides inherent redundancy. Each CCP transmits its IP packets in both directions on the ring simultaneously, clockwise and counter-clockwise, effectively creating two IP networks. In case of a malfunction in a segment of the ring the system continues to operate normally without any degradation, as illustrated above, right.

The Dual IP Ring topology also allows preservation of key functionalities while experiencing a hardware, software or network malfunction. Emergency mode provides redundancy in case of network failure in the Dual IP Ring. Backup/Slave mode provides redundancy in case of a CCP hardware or power failure.

> ***Dual IP Ring topology allows preservation of key functionalities while experiencing a hardware, software or network malfunction***

DEDICATED COMPUTING POWER FOR EACH AIRMAN

Dual IP Ring topology is a new and exciting approach to airborne audio intercommunication. The architecture overcomes several drawbacks of star topology. A significant benefit of Dual IP Ring is the dedicated computing power per airman required for spatial 3D Audio implementation.

Additional benefits of Dual IP Ring include inherent redundancy, incremental scalability and outstanding flexibility, all with a reduced SWaP-C. Dual IP Ring is ideal for implementation on small or large platforms in almost any aircraft category, whether it be trainers and combat jets, helicopters, business jets, commercial airliners, transporters, tankers or special mission aircraft.

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