SATCOM For Net-Centric Warfare – June 2017

MilsatMagazine

Going Where Angels Fear to Tread
Ka-Band Critical for UAS Missions
Free-Space Optical Comms
SATCOM Versatility
Military C4ISR Needs
GEO + MEO Impact on the Feds
Space Enterprise Consortium
The SATCOM Benefits for APAC Governments
Dispatches

MilsatMagazine

June 2017

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DISPATCHES

APAC MILSATCOM CHANNEL PARTNER PROGRAM FURTHERED BY AIRBUS

Airbus has added Planet Communications Asia Public Co., Ltd. (PlanetComm) to the firm's channel partner program for Skynet 5 MILSATCOM services and has also expanded the firm's partnership with Speedcast.

Under this channel partner agreement, both PlanetComm and Speedcast will be offering Skynet X-band and UHF services as part of their extensive satellite communications portfolios.

Speedcast has been delivering tactical secure communications services to the Australian and New Zealand governments since September 2016 and the partnership has now been extended to cover customers in the Philippines.

In addition, on behalf of Airbus, Speedcast manages the Asia anchor station facility for the Skynet 5A military satellite, based at Speedcast's teleport in Adelaide, Australia.

The newly signed partnership with PlanetComm covers Thailand, and expands their product offering into the military market.

PlanetComm is one of the leaders of telecommunications and digital TV technologies in ASEAN (Association of Southeast Asian Nations) region and have over twenty years of experience in delivering resilient communications.

Airbus continues to work with service providers to develop new partnerships to deliver highly resilient Skynet military satellite communication services to the Asia Pacific region, following the move of its Skynet 5A satellite from 6° East to 95° East to provide global X-band and UHF coverage in this region.

Since the move of Skynet 5A in September 2015, Airbus Defence and Space has signed ten channel partner agreements with companies in the Asia Pacific region and in the USA.

The relocation of Skynet 5A was initiated to extend the X-band coverage and services from 178 West to 163 East, including the Indian Ocean and Western Pacific region.

The Skynet network now offers global military coverage, expanding core service reach for the UK military and augmenting coalition capabilities in the region.

Airbus owns and operates the hardened Skynet X-band satellite constellation of seven satellites and the ground network to provide all Beyond Line of Sight (BLOS) communications to the UK Ministry of Defence.

The contract also allows other NATO and allied governments such as members of the five-eyes community (besides UK, the USA, Australia, New Zealand and Canada) to use the Skynet system to augment their existing services.

Military and governmental users worldwide benefit from the unique expertise developed by Airbus in the field of satellite communications.

In addition to covering the complete range of frequency bands (L-, C-, Ku-, Ka-, X- and UHF), the company provides military satellite communications to some of the most high-tech armed forces in the world.

Richard Franklin, Head of Secure Communications at Airbus Defence and Space, noted that this is a really positive step to further increase the company's relationship with SpeedCast and also PlanetComm within countries that can really benefit from the unique capabilities of the Skynet fleet.

According to Trevor Thompson, President and CTO, PlanetComm, since the relocation of Skynet 5 to 95 ° East, which is ideally suited for Thailand and Southeast Asia in achieving high Earth station look angles, the company has been actively promoting Skynet-5's X-Band and UHF MILSATCOM services to the Thai Defence Forces and Government agencies.

Andrew Burdall, EVP, Enterprise and Emerging Markets, Speedcast, added that this extension is a testament to the hard work and dedication the Speedcast and Airbus teams have dedicated into creating this trusted partnership.

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DISPATCHES

US MILITARY PROVIDES OUTREACH EFFORTS TO RURAL ALASKAN COMMUNITIES

More than 30 service members from the Alaska National Guard and United States Military Entrance Processing Command teamed up to provide community outreach efforts and to interact with the community of Galena, Alaska, late last month.

The Guardsmen arrived via a C-17 Globemaster III aircraft crewed by the Alaska Air National Guard's 249th Airlift Squadron loaded with supplies ranging from the AKNG's Counterdrug Support Program's drug and alcohol education and prevention materials to the 103rd Civil Support Team's operations truck and trailer.

"*Conducting the airlift mission with the CST team served as an annual training requirement,*" said 1st Lt. Jamie Bowden, a medical operations officer with the 103rd CST, referring to the truck and trailer that was securely strapped inside the aircraft while being transported. "*Our mission in Galena was in support of the Alaska National Guard's joint staff in order to demonstrate Weapons of Mass Destruction-Civil Support Team airlift operations, provide a capabilities brief to the emergency responders and community members, and demonstrate our communication capabilities in the state.*"

In addition to demonstrating efficient transportation capabilities to a remote location in the state, the CST members tested communication capabilities from high latitude satellite angles with a dismounted strike communications system, and answered local residents' questions as they weaved their way through the CST displays.

(*Photo above*) Alaska Guard Sgt. 1st Class Nicholas Dutton, communications chief for the 103rd Civil Support Team (Weapons of Mass Destruction), briefed local residents on CST capabilities including the satellite in the dismounted strike kit at the Edward G. Pitka Sr. Airport in Galena, Alaska.

Next to the CST display, CDSP Guardsmen disseminated Narcan and drug disposal kits, and other education and prevention materials to local residents. Across the runway, the C-17 crew opened their doors and gave tours of the massive, four-engine transport aircraft.

Two-miles down the road, Guardsmen from the Alaska Army National Guard's Recruiting and Retention Battalion walked service members from USMEPCOM through Galena's store, school and health clinic to help them get a better understanding of some of the difficulties rural recruits have when enlisting into the military.

"*The visit allowed them to see first-hand the process that we have to go through to bring someone in from a rural area,*" said Sgt. 1st Class Jason Ekeland, a recruiter in charge of the Yukon-Koyukuk Region. "*I don't think they sometimes understand the massiveness of Alaska. We can point to a map and say 'there is Nome,' but they have no idea how far or the lengths it takes to get to Anchorage.*"

Ekeland said that it is important to have leadership from military entrance processing in rural Alaska to listen to the difficulties that recruits face and ensure that they are legally and successfully contracted.

Service members from the USMEPCOM also received a brief history of the Alaska Scouts and the new pilot-program that authorizes waivers to Alaska Natives who might be trying to join the Guard but face barriers to qualifications.

"*We are hoping to bring more service members from MEPS to other rural locations in the future,*" explained Ekeland. "*We have ideas and are hoping to find resources and funding to make it happen.*"

Story by Staff Sgt. Balinda O'Neal Dresel, Alaska National Guard Public Affairs

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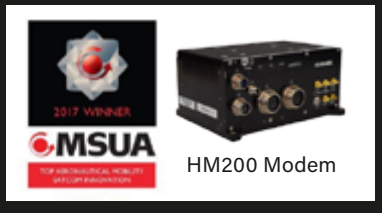


HM200 Modem

DISPATCHES

MILSATCOM EQUIPMENT MAINTAINED IN COMPLEX ENVIRONMENT

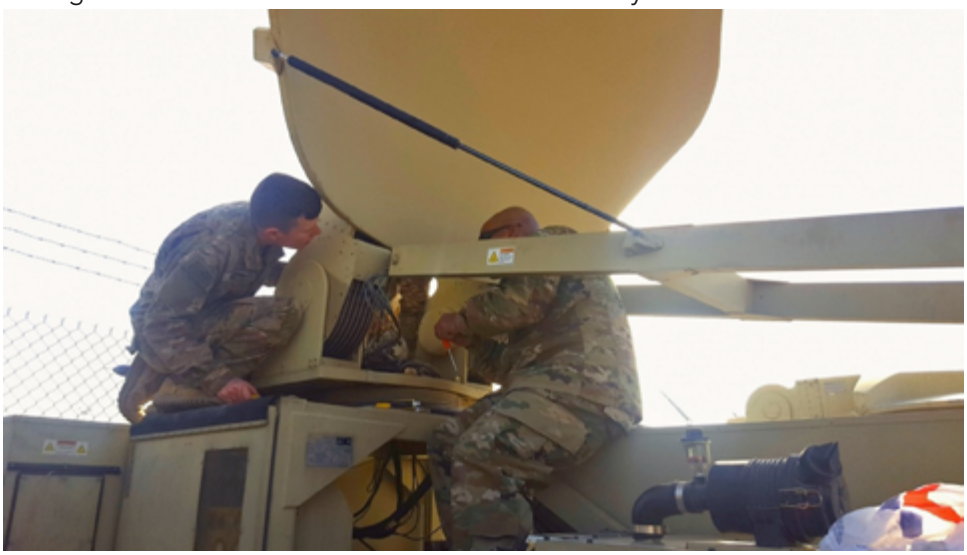
SFC Reginald Cox of 67th Expeditionary Signal Battalion, 35th Theater Tactical Signal Brigade, repairs a damaged satellite transmission terminal.

US Army photo by CW2 Brian Smith.

The 67th Expeditionary Signal Battalion, 35th Theater Tactical Signal Brigade is a key component in providing communications services deployed in support of U.S. Central Command's operations Spartan Shield, Inherent Resolve and Resolute Support, at Camp Arifjan, Kuwait.

Upon arrival to Camp Buehring, the Soldiers of the 67th Electronic Maintenance Team identified a damaged AN/TSC-185 Satellite Transportable Terminal (STT), which occurred while in transit from, the unit's home station, Fort Gordon, Georgia. The 67th EMT quickly developed an out-of-the-box strategy to repair the system.

The 67th EMT engaged with the Theater Aviation Maintenance Group (TAMG) at Camp Arifjan to fabricate a new feed tray to bring the system back online. Although out of their mission scope, the TAMG produced the new tray in less than two weeks.



Sgt. Jeremy Groff (left), and Sgt. 1st Class Reginal Cox, of 67th Expeditionary Signal Battalion, 35th Theater Tactical Signal Brigade, repair a damaged satellite transmission terminal.

US Army photo by CW2 Brian Smith.

"The repair would not have been possible, if it wasn't for the assistance provided by the 1106TH [Theater Aviation Sustainment Maintenance Group]. We feel extremely fortunate to have befriended a team with the skillset to fabricate a one-off piece, which is not available through the Army Supply System. It is evident that talent abounds in the Army. This experience is truly an example of teamwork at its finest," said Sgt. 1st Class Reginald Cox.

Using resources from the Battalion Ground Maintenance Team and the Field Maintenance Support Section on Camp Buehring, the ingenuity and technical competence of the 67th EMT procured the additional materials to repair the STT's antenna boom; well beyond the scope of battalion level repair, the EMT labored to replace each rivet to ensure full functionality of the system. After several days of trial and error, the team was able to repair all components. The operational team validated the system and deemed it mission capable.

Despite a seemingly insurmountable challenge, the 67th ESB, EMT repaired a critical system. The team leveraged the sustainment infrastructure within Kuwait to create the conditions necessary to meet the operational demand challenges while in theater.

Their efforts saved the U.S. government over $72k in repair costs and materials returning the system to the inventory in less than four weeks.

The EMT of the 67th ESB truly embraces expeditionary readiness. The 35th TTSB is one team of proud and trusted professionals delivering responsive, reliable, and operationally relevant network capabilities to our fellow warfighters "on time and on target", regardless of location or mission.

Story by 35th Signal Brigade.

DISPATCHES

GERMAN TROOPS RECEIVE FREE CONNECTIVITY

Airbus is now providing German troops with support communications at 15 sites worldwide.

With Airbus' recent support, communications to and from German Armed Forces (Bundeswehr) troops are now supplied with "Connect-D" telephone, Internet and media services to a total of 15 deployed Bundeswehr units around the world, including Mali, Iraq, Djibouti, Afghanistan, Kosovo, Cyprus and Lithuania.

The launch of Connect-D at the Lithuanian bases of Rukla and Pabrade was performed as part of a framework contract awarded by the Bundeswehr in 2015.

This framework contract ensures that soldiers have free connectivity during operations and exercises outside Germany to stay in contact with family and friends.

Mobile systems will also be made available for smaller contingents and observer missions.

Stefan Gramolla, Head of Delivery Germany for Secure Communications at Airbus Defence and Space, said Connect-D provides an important service to deployed Bundeswehr soldiers.

The service allows them to make telephone calls, surf the Internet or make video calls free of charge using their own devices.

The service is available in accommodation areas, at support facilities and Internet cafés during exercises and operations outside Germany .

Airbus has been providing Bundeswehr troops with support communications since July 2011. A service launched especially for naval units in 2015 enabled personal calls while out at sea. In addition to telephone services, Internet services are available when docked in ports.

airbus.com/

DISPATCHES

THE FUTURE OF MILSATCOM ARRIVES FOR USAF AIR CONTROL SQUADRON

The 726th Air Control Squadron, Mountain Home AFB, Idaho, received its first major Control and Reporting Center weapons system upgrade in 20 years here in May of this year as well as a new small satellite communications system.

The TYQ-23A Control and Reporting Center system replaces older and bulkier 1980s style operations modules, allowing command and control operators to control a section of air space and do battle management when called upon.

"*A couple of the benefits include reducing our logistical footprint where, before with the 4OM modules that weigh up to 14,000lbs, we were limited on how we can transport them out or how fast they can go,*" said Lt. Col. Sean Higgins, 726th ACS commander. "*With the new system, they come as desktop computers inside of pelican cases (or short mobile cases) that can be folded up, packed and sent to the field very quickly. It also reduces the size of the support equipment and trucks that we need to get from point A to point B.*"

The system has been under development for five years, contracted for four and scheduled to be delivered to the 726th for the past two years.

With Marine and other Air Force units already using similar systems, the new equipment bringvs the 726th to the same functionality as the others using this system. It is also familiarizes Hard Rockers with the set up that is already being used in deployed locations.

"*Now I don't spend as much time teaching my crew members how to use very specific switch actions,*" said Higgins. "*Basically, if they can use a mouse and a keyboard they can use the console itself. Now they can concentrate on doing battle management versus being very specific on switch actions. They can focus on what's important to them.*"

Chief Master Sergeant Mark Hurst, 552nd Air Control Wing Command Chief (Far Right) is shown how to assemble the Small Communications Package by members of the 726th Air Control Squadron May 31, 2017, at Mountain Home Air Force Base, Idaho. The 726th is the first Air Control Squadron to test the system and report whether it is something they should continue to work with.

U.S. Air Force photo by Airman 1st Class Jeremy D. Wolff

The new weapons system isn't the only improvement being made; additionally the 726th is training with another piece of technology that can make operations more efficient.

The small communications package is an inflatable satellite that was developed in support of special operations, giving them the mobile capability to be used by small teams while still being able to be used for long periods of time.

"*The GATR (Ground Antenna Transmit and Receive) ball system we have is a 2.4 meter dish. What it does is it takes the place of our small aperture antenna, which is also a 2.4 meter dish but this one makes it a lot simpler,*" said Senior Airman Jeffrey Shields, radio frequency transmissions systems technician. "*We get the same type of receiving power, but with this system we can go from the case to the satellite in 36 minutes because the inflation system makes it a lot quicker compared to the small aperture antenna, which takes from four to six hours.*"

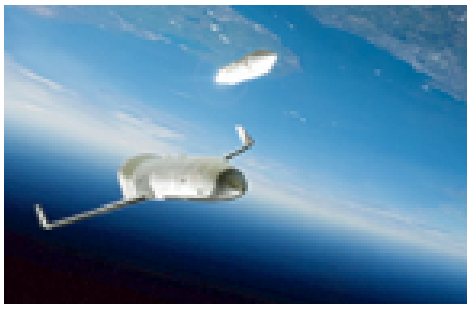
As the first ACS that is getting access to test the small communications package, the 726th will be testing it throughout the summer and later in the year for the Gunfighter Flag exercise.

"*This particular small communications package gives us the capability of having that long haul ability without using combat communications,*" said Higgins. "*What we're seeing so far is that it is probably going to work for us. So now we're less reliant on other agencies and can do most of the job ourselves.*"

Story by Airman 1st Class Jeremy Wolff, 366th Fighter Wing, USAF

DISPATCHES

PROPULSION BEHIND THE XS-1



Artistic rendition of the XS-1 Spaceplane. Image is courtesy of DARPA.

Aerojet Rocketdyne, a subsidiary of Aerojet Rocketdyne Holdings, Inc. has been selected to provide the main propulsion for the Boeing and the US Defense Advanced Research Projects Agency (DARPA) reusable Experimental Spaceplane (XS-1).

Aerojet Rocketdyne is a member of the Boeing team that recently announced an agreement to collaborate with DARPA to design, build and test a technology demonstrator for the agency's XS-1 program.

The reusable experimental spaceplane is designed to deliver small satellites into orbit with high launch responsiveness. The main propulsion is based on the legacy space shuttle main engines (SSME).

For the XS-1 program, Aerojet Rocketdyne is providing two engines with legacy shuttle flight experience to demonstrate reusability, a wide operating range and rapid turnarounds. These engines will be designated as AR-22 engines and will be assembled from parts that remained in both Aerojet Rocketdyne and NASA inventories from early versions of the SSME engines. Assembly and ground testing will take place at NASA's Stennis Space Center in Mississippi.

According to Aerojet Rocketdyne CEO and President Eileen Drake, as one of the world's most reliable rocket engines, the SSME is a smart choice to power the XS-1 launch vehicle. This engine has a demonstrated track record of solid performance and proven reusability. As threats to our nation's space systems increase, it is imperative that the ability to rapidly deploy replacement assets is available. This demonstration program is vitally important to maintaining assured access to space, which remains a top priority for this nation.

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GOING WHERE ANGELS FEAR TO TREAD
A CPI ASC SIGNAL DIVISION FOCUS

by Tony Russell, President, CPI ASC Signal Division

Disasters, natural or human-made, cause demand for communications to spike at precisely the time when the supply can drop perilously close to zero.

Floods, fires, earthquakes and storms destroy communications infrastructure as readily as roads, bridges and buildings. Even when networks survive, they are rapidly overwhelmed by the volume of traffic as people seek reassurance about those they care for and disaster relief springs into action.

Disasters are also when satellite communication (SATCOM) proves indispensable. Flexible, mobile and quick to deploy, satellite provides the vital voice, Internet and video channels needed to manage both the human and logistical challenges of disaster.

The first satellite ground systems to arrive in a disaster are typically satphones or Inmarsat BGAN terminals.

CPI ASC Signal Division mobile antenna.

Quick-deploy VSAT with sub-meter antennas quickly follow to provide more bandwidth.

However, the data and video demands of a disaster zone can quickly outstrip these portable early-response systems creating a requirement for a full-size ground segment able to get to the site fast and operate reliably in a challenging environment.

ANTENNA ORIGAMI

The biggest challenge for responders is the sheer presence and bulk of a full-size antenna's reflector and the pedestal required to stabilize the unit.

The mechanical and electrical performance of that reflector are critical to delivering the results needed in the field, particularly at the higher frequencies that are quickly growing as a percentage of total available bandwidth.

Indeed, one of the advantages of the new generation of high-throughput satellites is the ability to place beams where demand is highest, whether on a permanent or temporary basis. The higher the frequency, however, the greater the stakes for antenna performance on the ground.

CPI's ASC Signal Division has had numerous successes in meeting both the portability and performance requirements with a bit of antenna origami. The company developed nomadic antennas in the 2.4 to 2.5 meter range whose lightweight carbon-fiber reflectors are divided into as many as nine pieces.

A fully-motorized version including feeds weighs under 500 pounds and can be deployed by two trained people in under 30 minutes. But the antenna's mechanical properties and high-accuracy tracking mount ensure that it performs well across all bands as well as in low-PIM configuration.

For bigger requirements, the company developed Trifold antennas with spun aluminum reflectors that fold three ways to fit in standard shipping containers for either ocean or air transport. With three-axis motorization, they feature tracking and auto-acquisition and can be configured with C-, X-, X-band Low PIM, Ku- and Ka-band feeds. A trailer mount provides fast positioning in the field for antennas ranging from 3.9m to 4.6m — substantial workhorses able to support very high throughput requirements.

CPI ASC Signal Division Trifold Transportable antenna.

The world snaps to attention in the face of a natural or human-made disaster but interest quickly fades once those emergencies vanish from the headlines. The reality on the ground, however, can be different. Months or years may be required for disaster zones to partially or fully recover and their communications needs expand as disaster relief turns to disaster management.

One frequent change is that antennas that were "nailed up" to a satellite to meet a short-term need become more general-purpose. To serve those needs, ASC Signal designed an outdoor version of a next-generation antenna controller that can operate one or multiple antennas from a mount on the antenna structure.

This controller manages motorized mounts, stepper motors for polarization, interfacility links, and even tracking of sub-reflectors for very high performance operation. This product can turn a temporary site with one or two antennas into a functioning teleport.

SURVIVABILITY

Antennas are sophisticated pieces of metal or carbon fiber, precision-engineered to meet the need. However, they are of little use in a disaster zone without electronics rugged enough to survive.

That calls for low-noise amplifiers, low-noise block down converters, block up converters and power amplifiers able to stand up to outdoor life in climates ranging from ice and snow to rainforest.

The company's outdoor product lines ares specified to operate in temperature ranges from -40 degrees C up to 60-70 degrees C (-40 to 140-158 degrees F) and in humidity up to 100 percent. Everything is engineered to withstand operating conditions as well as the often bumpy ride on the way to and from the sites.

Flexibility is also at a premium. For disaster relief operations, the company recommends interchangeable feeds and multi-band capability.

Many of the ASC Signal systems are equipped with internal self-resetting protection that protects against temperature spikes, prime power fluctuations, RF output overdrive and open/short output conditions. There is also high value to integrated and comprehensive monitor and control functionality that can be managed remotely over a broadband or mobile connection.

LONG WALKS

The company is proud of the quality technology leaving the firm's manufacturing centers. However, delivering real value requires "feet on the street."

ASC Signal has been privileged to work with amazing integrators who get equipment into the country, get it to the site and get it up and running, each a major feat. During major disasters, confusion may reign — but some of the normal bureaucratic inertia of customs agencies can be set aside when lives are on the line. The stories colleagues bring home are remarkable.

Installing some sites in Central America has required travel by chartered plane and canoe, with a long walk at the end, lugging the antenna, racks of equipment, outdoor enclosures and portable power.

An integrator told about one site in which the installation engineer was riding shotgun with a Cessna pilot when the plane overshot the runway. The aircraft went crashing into bushes and trees and stopped just ten feet short of a river. The engineer was injured — but he hiked into the disaster site, did the installation and managed to get a plane out the next day — that's true dedication.

Bringing SATCOM to war-torn regions is equally difficult, even when guns fall silent. Another integrator described trucking in the portable equipment cross-country in a war zone only to find that the fully-laden truck couldn't navigate streams.

The team repeatedly unloaded trucks in the middle of nowhere, hand-carried electronics and antenna components across streams, and loaded them all back onto the truck before proceeding on their way. They also spent the entire time looking over their shoulders for signs of danger.

Serving disaster sites is one of the most challenging assignments in SATCOM. A favorite story comes from a satellite services company called Disaster Truck. When a 7.0 magnitude earthquake struck Haiti in 2010, CBS wanted to provide live coverage and dispatched the company to the scene.

After erecting a portable antenna, however, the personnel could not locate a generator to power the unit. With the newscaster Katie Couric soon to arrive, a solution had to be quickly invented. They ended up wiring two Haitian taxi cabs batteries together to produce enough power for the terminal and camera — the coverage went live, on schedule.

That's the spirit that the ASC Signal team, and every individual and organization in this business, brings to the locations — where angels fear to tread.

www.cpii.com/division.cfm/13

CPI ASC Signal Division, a unit of Communications & Power Industries LLC (www.cpii.com), manufactures fixed and transportable satellite antennas, high-frequency antennas, radar antennas and other specialized products. It works closely with CPI Satcom & Medical Products Division, a manufacturer of uplink amplifier products and systems for satellite communications.

ASC Signal is a sister division to CPI Satcom & Medical Products Division, a manufacturer of uplink amplifier products and systems for satellite communications.

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WHY KA-BAND HAS EMERGED AS CRITICAL FOR UAS MISSIONS
AN INMARSAT FOCUS

by Rebecca Cowen-Hirsch, Senior Vice President of Government Straegy and Policy, Inmarsat's US Government Business Unit

As global intelligence and warfighting operations are conducted increasingly through unmanned aircraft, the military is re-evaluating its future data and communication technology needs to support these efforts.

The rapidly changing global security environment is driving Airborne Intelligence, Surveillance and Reconnaissance (AISR) and other highly mobile warfighter communities to deploy as many sensors as possible to maximize their effectiveness and reach.

Further advancements in tactical Unmanned Aerial Vehicles (UAVs) and Remotely Piloted Aircraft Systems (RPAs) add capabilities to the mix, yet, also come with their own data and command and control requirements. These factors increasingly drive demand for bandwidth availability, reliability and security.

With their long reach and range, today's unmanned airborne operations require more than air-to-ground links. For Beyond Line of Site (BLOS) communications as well as high data rate exfiltration, satellite connectivity provides critical communications.

From enhanced security and reliability to the ability to interoperate with military satellite resources, Ka-band has emerged as the future of satellite communications (SATCOM) for manned and unmanned airborne missions.

Yet, some in the industry still choose to debate the value of Ka-band vs. Ku-band, despite the economic and operational advantages that Ka-band delivers.

VALUED SUPPORT PROVEN OVER TIME

Unmanned aircraft has served our nation well for more than a century. At least two years before the Wright brothers' first manned flight on December 17, 1903, warfighters deployed archaic UAV technology for combat and surveillance.

During the Vietnam War, these systems initially supported stealth surveillance. Since then, technological innovation – including SATCOM — has greatly expanded both manned and unmanned AISR capabilities to accommodate a vast array of missions, which seemingly transform by the day.

High-altitude long-endurance (HALE) AISR aircraft can fly 60,000 feet or higher, for up to 32 hours over vast stretches of oceans and terrain. Other variants of unmanned systems cover a wide range of mission profiles and geographies. These variances and complexities of missions reflect modern military operations, all of which depend upon the "anytime/anywhere" transmission of reliable and secure video and data.

As unmanned capabilities have ascended to advanced levels, so should the SATCOM solutions supporting those missions. According to Northern Sky Research's third edition of the "*Unmanned Aircraft Systems (UAS): Satcom and Imaging Markets*" report (published in December of 2016), the government sector will create the largest demand for UAS satellite services, especially with a persistent need for ISR among Department of Defense (DoD) and Intelligence Community (IC) members in hostile areas.

Historically, legacy fixed SATCOM operators have adequately responded to prior needs by supplying available bandwidth leased on a regional basis. However, this dependence upon excess broadcast capacity designed for fixed users is inefficient and opportunistic.

Current military operational tempo and highly mobile applications merit reliable and available wideband mobility and solutions for increased agility and worldwide portability. Investments and innovation within the satellite industry — such as SATCOM as a Service, with on-demand access to satellite capability, anytime — allow the DoD to strategically leverage complementary commercial satellite communication (COMSATCOM) systems. This will boost the effectiveness, flexibility and redundancy of military satellite communication (MILSATCOM) systems for dynamic and global unmanned missions.

Despite the US government's Wideband Global SATCOM (WGS) system having nine satellites on-orbit, there is often competing demand for WGS access for military geographic or mission-specific surges. When these surges occur, there must be additional flexible, reliable and accessible SATCOM capacity available, when and where required for mission success.

Senior government leadership has recognized COMSATCOM as a primary resource of the future, building a path toward enterprise-level, integrated SATCOM architecture and strategy to ensure reliable, available and resilient seamless, state-of-the-art SATCOM capabilities that are fully interoperable with their owned and operated government systems.

In fact, the ongoing analysis of alternatives (AoA) for a follow-on wideband communications system to the WGS system, which includes space, air and ground layer communication capabilities, includes industry participation to determine the right way forward, rather than simply buying more DoD-owned, purpose-built satellite assets.

As part of its analysis, the US Air Force is also exploring alternative business relationships with SATCOM suppliers rather than the traditional and dated Ku-band transponder leasing of the extended past. It is now widely acknowledged that commercially provided Ka-band proves essential for an integrated architecture.

NEW ADVANTAGES FOR A NEW ERA

In order for an integrated architecture to enable optimum interoperability, diversity and flexibility in Ka-band — with both the contiguous commercial and military frequencies — SATCOM must, and will, play a critical role for resiliency.

With this, government users achieve optimal operations at anytime, anywhere around the world by augmenting their MILSATCOM resources with seamless, globally available high-capacity wideband connectivity on land, at sea, and in the air.

Well-designed Ka-band satellite constellations establish uniform coverage in both bandwidth and power with the flexibility to move bandwidth seamlessly into demanding regions — ideal for complex unmanned missions with high data-rate requirements.

Spot beam architectures designed for mobility create a uniform distribution of power and allow for frequency of use and consistent, uninterrupted user experience.

Steerable spot beams worldwide add additional capacity and flexibility in Ka-band with the ability to "follow" the airborne platform no matter how high it flies or how many thousands of miles it must cover.

In contrast, older broadcast-transponded Ku-band satellites distribute capacity via large regional beams, resulting in irregular power distribution that rapidly degrades outside of the center of the beam, leading to widely variable data rates depending upon the user's location within the beam.

This is not the case for modern Ka-band high capacity satellites (HCS) with uniform power distribution and committed information rates, as they deliver mission assurance through highly reliable service. This implementation empowers aeronautical users with SATCOM to support high-fidelity intelligence from virtually any area of operation.

Another unique advantage of Ka-band over Ku-band is that it is the only frequency where the commercial and military bands are immediately adjacent to each other, so commercial services transparently complement DoD users' MILSATCOM capacity.

Ka-band terminals are currently available that easily tune through the contiguous 1.5GHz of Ka-band and readily switch between US government-owned systems and private-sector SATCOM systems. Transitioning between the two military Ka-band networks seamlessly affords users the ultimate in operational flexibility and network restoral options across the full spectrum of environments.

This approach is feasible with fully interoperable SATCOM and minimizes the size, weight and power (SWAP) requirements for the on-board terminals — a critical consideration for airborne and other platforms — features not afforded with legacy Ku-band lease and equipment.

The AISR community prefers smaller antennas since platform real estate is always at a premium. With Ka-band, airborne missions benefit from antennas that are as small as 30 cm, or one-quarter the size of Ku-band, another key SWAP factor.

This makes for an ideal fit on smaller airframes while blending into aerodynamic surfaces, extending fuel efficiency and range. On small antennas and high frequencies, Ka-band satellite communication networks have proven to exceed the performance of Ku-bands by four-fold with comparable atmospheric considerations.

Ka-band HCS networks also introduce a modern and responsive business and acquisition approach which increases operational flexibility with an always-on network, yet with the greater affordability of on-demand committed information rates with relevant service level agreements.

Artistic rendition of an Inmarsat I-5 Global Xpress satellite.

This methodology removes the guesswork of provisioning duplicative and costly fixed transponder leases to be used inefficiently or, in some cases, not at all. With Ka-band, users receive high-quality, consistent coverage and connectivity no matter where in the world, enhancing flexibility and resilience at reduced costs and risk.

We in the industry welcome the government's AoA, as well as other pilot programs as a forward-looking means of innovation in acquisition to extend agility for the end-user. Our industry offers a wide range of solution sets, which are well suited for government applications. There are suitable applications for broadcast-centric bandwidth. However, Ka-band systems are designed for the modern age of intelligence and highly mobile warfare. When you invest in Ka-band, you acquire capabilities on par with WGS, yet with more operational, management and business flexibility. Military users will not get shortchanged because they are outside of current active operational or "hot" zones such as Iraq and Syria.

Innovative Ka-band systems (such as SATCOM as a Service) are ideally suited for the type of business models the government is exploring to add greater efficiencies and responsiveness to meet and exceed DoD requirements.

www.inmarsat.com/government/us-government/

Ms. Cowen-Hirsch is Inmarsat's Senior Vice President for Government Strategy and Policy in the United States Government Business Unit. Previously, as a decorated member of the Senior Executive Service (SES) in the US Department of Defense (DoD), she served as the Program Executive Officer for SATCOM, Teleport and Services at the Defense Information Systems Agency (DISA). This was one of several key SES executive posts, including the first-ever Vice Component Acquisition Executive for DISA, with executive management responsibility for the acquisition oversight and horizontal integration of DISA's products, services and programs.

Among her notable achievements, Ms. Cowen-Hirsch established the Defense Spectrum Office as its first Director, where her responsibilities included the development of national security spectrum strategic plans and policies, and the national and international negotiation of defense spectrum issues. Her broad defense career ranged from systems engineering, experimental flight test, program management, spectrum management and a wide range of executive leadership positions—Ms. Cowen-Hirsch received an Exemplary Service Medal from the DoD.

SECURE AND RESILIENT FREE-SPACE OPTICAL COMMUNICATIONS
A BRIDGESAT PERSPECTIVE

by David Mitlyng, Senior Vice President, Business Development and Strategy, BridgeSat, Inc.

Free space optical (laser) communications' systems are ideally suited to provide the secure, resilient, high-bandwidth communications demanded by today's Warfighter and MILSATCOM community.

The highly directional nature of optical comms provides a Low Probability of Intercept/Low Probability of Detection (LPI/LPD) method that supports military operations in contested areas. Optical communications systems have been demonstrated for decades, but, thanks to recent technology advancements and the work of new innovative companies, they are now ready for wide-scale deployment.

This article will describe the benefits and history of optical communications, as well as the recent technology advancements that finally make this a viable solution for the next-generation of communications.

OPTICAL COMMUNICATIONS BENEFITS

Traditional radio frequency (RF) communications are subject to unintentional and intentional interference, hostile and self-jamming, and interception; all while having data rates that are limited to the available spectrum.

Optical communications provides secure, robust communications between satellites, Remotely Piloted Aircrafts (RPAs), Unmanned Aerial Vehicles (UAVs), Unmanned Undersea Vehicles (UUVs), High Altitude Platforms (HAPs), and mobile and fixed base stations.

Consider the following challenges that confront these users:

High rate data communications

The RPA/UAV/UUV primary mission is to collect Intelligence, Surveillance and Reconnaissance (ISR) data using ever more advanced radars and sensors, as well as signals intelligence (SIGINT) and electronic countermeasures (ECM) while rapidly disseminating this mission-critical data to tactical users in the theater of operations.

Implementing these capabilities provides a major challenge for traditional RF communications with limited data rates, while current optical laser comms systems offer 10 Gbps data rates using commercial hardware, with the capability to grow to Tbps data rates and beyond.

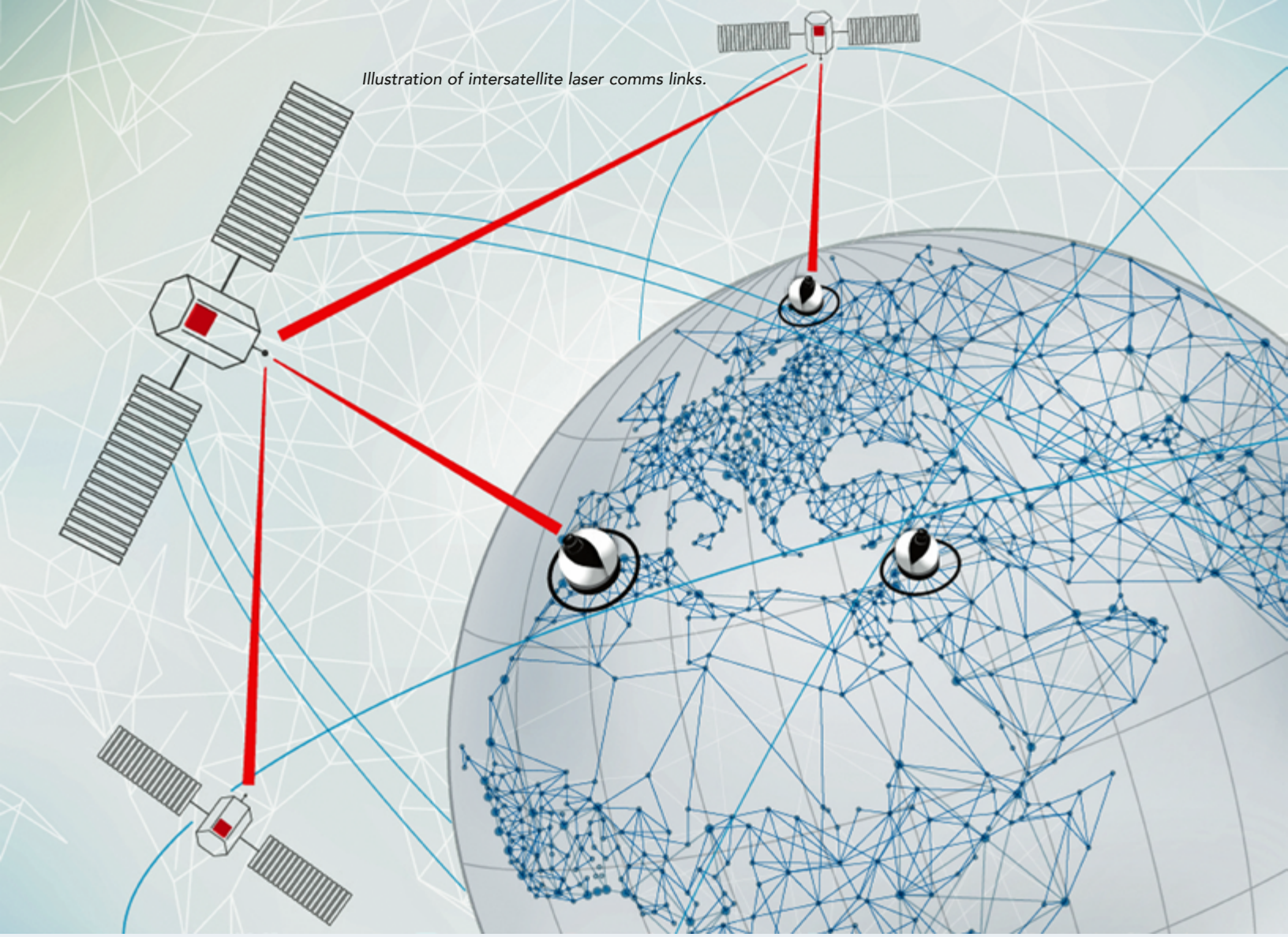

Illustration of intersatellite laser comms links.

Even with access to high-frequency RF spectrum and millimeter wave regions and state-of-the-art encoding and modulation schemes, RF signals can't match these data rates.

Jamming and Interference

An accepted part of military communications design is the problem of intentional jamming from adversaries. For the RF systems currently in use, sophisticated anti-jamming measures are implemented that add to the complexity and cost of the system and further reduces the data throughput of the signal.

The highly directional nature of communication lasers makes them resistant to jamming, as the optical receiver can easily reject all signals outside their narrow field of view.

LPI/LPD

Military communications signals must be designed so that they cannot be intercepted and decoded by adversaries. For RF systems, that is an extremely difficult objective to achieve, due to the spreading function of the RF signal. Instead, these units must employ encryption techniques and sophisticated waveforms to protect their signals from detection and interception. These functions affect the data throughput and increase cost and complexity.

Compact and power-efficient hardware

For the RPA/UAV/UUV platforms, as well as the mobile Warfighter, size and power consumption of their communications equipment is a major concern. To this end, optical communications offer a significant size, weight and power (SWAP) reduction compared to RF equipment with equivalent capabilities.

While optical communications offer these benefits, the major limitation is the inability to communicate through clouds or other obstructions. For most military users, this means optical communications must be considered as part of a larger architecture that include RF communications.

Ground stations for comms reception and delivery.

For example, aircraft, satellites and terrestrial assets can be linked as optical nodes in a resilient mesh network. Optical communications can also be considered to augment current systems in case of jamming or for specific use applications, especially with the current low-SWAP hardware.

In the commercial market, hybrid laser-RF satellite communication networks with automated hand-offs based on transmission conditions and business rules are available. The military communications community should build upon the advances in commercial laser optical communications early in their design trade spaces for future networks.

THE HISTORY OF FREE-SPACE OPTICAL COMMUNICATIONS

Free space optical communications have a long history of development, though largely limited to on-orbit technology demonstrations, such as:

- *Launched August 1994, the NICT Engineering Test Satellite VI (ETS-VI) Experiments demonstrated 1 Mbps bi-directional optical links to the NICT optical ground station*

- *Launched May 21, 2001, the Geosynchronous Lightweight Technology Experiment (GeoLITE) demonstrated high rate optical communication links at both LEO and GEO altitudes*

- *Launched July 12, 2001, ESA's Advanced Relay and Technology Mission (Artemis) demonstrated an optical inter-satellite link with the French space agency CNES's Earth observation satellite, SPOT 4, and an aircraft*

- *Launched August 2005, the JAXA Optical Inter-Orbit Communications Engineering Test Satellite (OICETS, also known as Kirari) demonstrated both inter-satellite link and satellite-to-ground downlink*

- *Launched in 2007, the Near Field Infrared Experiment (NFIRE) satellite carried a laser communication terminal developed by Tesat-Spacecom. This terminal was used for LEO-to-ground optical communication tests at up to 5.6Gb/s, and for optical crosslink tests with the TerraSAR-X satellite*

- *Launched September 6, 2013, the Lunar Laser Communication Demonstration (LLCD) revealed successful 622 Mbps downlinks from the Lunar Atmosphere Dust and Environment Explorer (LADEE) spacecraft in a lunar orbit, to NASA's Lunar Lasercom Ground Terminal (LLGT), JPL's Optical*

Communications Telescope Laboratory (OCTL), and ESA's Optical Ground Station (OGS)

- *Launched April 18, 2014, the Optical Payload for Lasercomm Science (OPALS) demonstrated 175 Mbps communications from the International Space Station (ISS) to the Optical Communications Telescope Laboratory ground station in Wrightwood, California*

Today, even more ambitious free-space optical communications systems are under development within the scientific and military communities. But there is also a lot of activity in the commercial sector, including LeoSat, Laser Light, and Facebook's Connectivity Lab.

ADVANCEMENTS IN OPTICAL COMMUNICATIONS SYSTEMS

The state-of-the-art has advanced rapidly in the past few years, led by developments in amplifiers, lasers, and acquisition tracking.

In addition to the billions of dollars invested in technology by the terrestrial fiber optic communication industry, these efforts have been augmented in the free-space domain, in part, by commercial investment from the traditional defense and aerospace companies in the US, Japan and Europe, as well as a wave of smaller companies looking to commercialize these advancements, such as BridgeSat (see below).

The focus of these commercial developments has been on compact high-data-rate free-space optical communication terminals ideally suited for small Earth Observation satellites. Previous hardware relied on large, complex steering mechanisms on heavy stable optical benches, in addition to power-inefficient multi-stage optical amplifiers.

However, current designs use fast steering mirrors (FSM), and optical closed-loop beacon tracking, to provide a tighter optical communication beam in a much smaller package. In turn this reduces the required power output for the optical amplifiers, resulting in a smaller electronics package.

These advancements have significantly reduced the SWAP, with commercially available 10 Gbps designs that are less than 5 kg with very low power consumption in a form factors that can even fit in cubesats. These compact commercial designs can meet the requirements of the mobile military on all but the smallest RPAs.

BRIDGESAT'S APPROACH TO OPTICAL COMMUNICATIONS

With this heritage and recent developments, proponents for optical communications agree that the technology is mature enough for adoption in the military realm.

Part of this maturity is led by technology adoption in the private sector, where the costs and technical risks have been rapidly reduced. But for the military to take advantage of this development, companies need to understand the strict requirements of their mission critical applications. This is where BridgeSat offers a bridge (pun intended) between the commercial state-of-the-art and the MilSat, RPA/UAV/UUV and Warfighter community.

BridgeSat was formed specifically around the development and advancement of free-space optical communications. By offering a turnkey optical comms system, BridgeSat has been awarded a number of commercial satellite missions, including some missions that will lead to space-to-ground transmissions as early as by year's end of 2017 (launch vehicle schedules permitting).

For system operators considering optical communications, BridgeSat can bring a wide range of experience with commercial programs to support the integration of optical communications into the larger communications network. In addition, optical communications is BridgeSat's singular focus, unlike other larger aerospace and defense companies.

This makes BridgeSat the ideal partner to support the early development of advanced optical communications architectures, as there is no distraction or conflict with other systems within the company portfolio.

Optical communications technology has now matured to the point where it is ready to serve the advanced needs of today's MILSATCOM, RPA/UAV/UUV and Warfighter communities. Architects of tomorrow's communications networks need to include optical communications in the early stages of their design to take full advantage of this rapidly advancing commercial technology.

To facilitate this revolution in secure, resilient communications, BridgeSat stands ready to provide access to global commercial networks for laser communications from space, integration engineering, and test resources required for a successful MilSat laser communications program.

During his more than 20-year career in the satellite industry, David has served in Systems Engineering and Business Development roles at Hughes Space and Communications (now Boeing Space Systems), Orbital ATK and SSL (Space Systems Loral). David has a BS degree in Aeronautical Engineering from California Polytechnic State University, SLO, an MS degree in Aeronautics and Astronautics from Stanford University, and an MBA from the MIT Sloan School of Management.

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INNOVATION: THE VERSATILITY OF SATELLITE COMMUNICATIONS

AN AVL PERSPECTIVE

by Krystal Dredge, Director of Marketing, AvL Technologies

Communicating with satellites is immensely versatile as there are so many options for applications, bands and service tiers.

However, moving from one application to another, or one satellite transponder frequency band to another, has previously required operators to use multiple antennas. Thanks to great new innovations, many antennas now offer multi-band and multi-application operations—thus, two or more antennas become one.

With multi-band enabled antenna operations, weather conditions and transponder capacities are less of a limiting factor. An operator can simply swap RF kits and point the antenna to a different satellite within minutes.

This is extremely useful when traveling between multiple satellite footprints, networks, and to take advantage of lower cost, higher throughput services.

GOVERNMENT AND EMERGENCY RESPONSE

Versatility with satellite communications is increasingly becoming a mandate for government and emergency response applications.

National agencies such as FEMA, small or local government agencies such as police and fire, and emergency response agencies such as the American Red Cross, all run head-first into environments with challenging conditions—floods, hurricanes and catastrophic events, to name but a few.

The locations vary widely and are often in remote areas. Responders often have the same issues as broadcasters with weather conditions, satellite transponder capacity and costs.

with a case-based transportable antenna. This adds even more versatility as agencies can restore communications with very small, compact antennas that can be shipped or flown to any location. Multi-band, auto-acquire antennas from AvL Technologies can be assembled and operating within minutes.

An example of this is AvL Technologies' new family of Integrated Terminals, or FIT antennas, which were designed specifically for this type of application. The antennas come in multiple sizes—.75, .98 and 1.35 meter.

These antennas all pack into two rugged cases and can be assembled by one person in 10 minutes or less, and users can then be on air quickly, thanks to AvL's AAQ SatCAP assisted pointing, or the AvL AAQ antenna control system.

Because the FIT antennas are multi-band, an antenna can be switched from Ku- to Ka- (or vice versa) operation with the twist of the feed and four latches holding the RF kit behind the reflector—this frequency band change only takes about 30 seconds to perform.

AvL demonstrates the ease of using the FIT antennas in a new video, which is posted at ***www.avltech.com/media***.

MILITARY MULTI-BAND

The US Department of Defense (DoD) has broad ranging needs for satellite communications — multiple bands, very high throughput requirements and ultra-rugged equipment.

Many of these agencies have a different approach to satellite communications. Instead of driving to an emergency with a vehicle-mount antenna, they may fly in

The axi-symmetric design of the 4.6 meter reflector enables feeds to be swapped through the back side of the center hub of the reflector without disengaging the elevation system.

For those who have used 4+ meter class antennas, this is a huge improvement in design. The antenna operates in C-LP, C-CP, Ku-LP, DBS-LP, Ka-CP, Ka-LP, X-CP, and feeds can be swapped out in roughly 10 to 15 minutes with a two person crew, making this 4.6 meter antenna the equivalent of seven antennas in one.

The men and women serving in the military work in environments so challenging that their duties can be hard to imagine, yet the communications teams are responsible for keeping lines open when lives are on the line.

For many years, military agencies have been carrying small flyaway antennas into danger zones to send and receive data from thousands of miles away. With the magic of satellite communications, this data can be transmitted up to a satellite — from the US, from a forward operating base, or from an unmanned vehicle—then received by troops anywhere in the world.

Flyaway antennas can have swappable feed and RF systems to enable the data to be transmitted and received by multiple networks, and switching from one network to another takes mere minutes.

In recent years, the military has recognized the benefits of multi-band and multi-application satellite communications in larger packages. An example of this is a 4.6 meter flyaway antenna developed by AvL for a US DoD customer.

The antenna is unique in that it packs into cases that qualify for commercial air freight so they do not require expensive military airlift. Each case meets standard man-lift requirements, with the heaviest cases being four-man-lift—no forklift required.

Once cases are positioned, a standard AvL 4.6 meter antenna can be assembled in 90 minutes by a crew of three and the antenna can be on-air minutes later.

Another new and unique antenna designed by AvL for a US DoD customer is a 5.0 meter fixed Earth station (***see photo on the previous page***) with a rotary multi-feed system. The antenna was designed to operate with a host of band options: L-CP, S-CP, C-LP, C-CP, X-CP, Ku-LP, Ku-CP, Ka-LP, Ka-CP.

The feed system can hold as many as six feeds simultaneously and is motorized to enable the operator to change feeds with one click, and to also reposition the antenna to point to a different satellite just as easily.

MILITARY SIMULTANEOUS MULTI-BAND

A really complex option occasionally employed by military agencies is simultaneous dual-band. Antennas using simultaneous feed systems—typically X- and Ka-bands—require rugged positioners that can manage significantly more weight on the feed boom than is necessary for a single band antenna.

Simultaneous feeds require multiple wave guides, separate amplifiers, separate filters and separate LNBs, and this dual equipment can be bulky and heavy. Simultaneous operation also has a drawback—signal degradation.

A simultaneous system increases operational capability, but also prohibits optimal operation for both bands due to interference and signal mingling. For these reasons, military agencies with significant resources occasionally operate with simultaneous bands; however, finding a reasonably priced or high performing simultaneous system for commercial operations is unlikely.

SATELLITE NEWS GATHERING (SNG)

For years, broadcasters have mounted multiple antennas onto the tops of large trucks. These trucks often have big—2.4 meter or larger—C-band antennas as well as a smaller—typically 1.2 meter—antennas for Ku-band to take advantage of multiple, competing network providers and lower uplink costs.

Large antennas with big amplifiers can often overcome issues with weather but power limitations enforced by the FCC to avoid adjacent satellite interference may be yet another limiting factor.

Some trucks also have smaller receive-only antennas and microwave masts for terrestrial point-to-point connections. All of these roof-mounted devices require SNG truck manufacturers such as Frontline Communications to reinforce for structural integrity, while maintaining ample room for amplifiers, modems and other equipment for operating simultaneously on different networks.

Newer, multi-band antennas with motorized feed selection have enabled the use of smaller vehicles such as crossovers, SUVs and transit vans to operate at Ku- or Ka-band frequencies with a single 1.2 meter antenna. An example of this in operation is Frontline Communications' Chevy Traverse, Chevy Suburban, Ford Expedition, Ford Transit and Nissan NV platforms.

These vehicles offer ample room for multiple equipment racks, camera and tripod storage, and numerous generator options. These platforms also have one 1.2 meter Ku-/Ka-antenna that can move from one service provider/satellite network to another with the push of a button. Antennas with manually swappable feeds have been available for years.

However, there's a very important reason for broadcasters to upgrade to an AvL antenna with a motorized multi-band feed selector: **SAFETY**!

Climbing on top of a vehicle is always dangerous. Add inclement weather and those risks increase dramatically. An antenna with motorized feed selection enables the operator to stay in a safe place—inside the vehicle—and change bands with the simple push of a switch.

MULTI-BAND AND MULTI-ORBIT

Another new innovation is the pairing of multi-band antennas with the tracking capabilities to communicate with satellites in different orbits. An example of this is an AvL antenna system designed and built for SES and O3b. AvL and O3b have collaborated for several years on Ka-band antenna systems that track O3b's MEO satellite.

These antennas operate in tandem pairs with make-before-break communications similar to talking on a cellular phone and seamlessly hopping from one tower to another while driving a car down a highway.

These case-based transportable MEO tracking antenna systems are available in three sizes—85 centimeters, 1.2 and 2.4 meter—with additional sizes already in development by the company.

After SES fully acquired O3b, AvL was tasked with adding Ku-band GEO operation to these antennas, which gives SES and O3b the option to use one antenna system on either network.

To move from Ka- MEO to Ku- GEO, one antenna is quickly swapped to use a Ku-band feed and RF kit to operate, and the second antenna remains idle. To move back to Ka-band MEO- operation, it's another quick swap of feeds and RF equipment, and the antennas immediately return to MEO-tracking mode.

VERSATILITY, VERSATILITY, VERSATILITY

Everyone working in satellite industry knows how versatile communications can be with satellites—any location, any condition, any application. Satellites enable communications in places and situations where terrestrial systems are vulnerable or non-existent.

As technologies evolve, more capabilities—and safety features—will continue to be brought to market, making satellite communications the most versatile, robust and reliable form of communications available in remote and harsh environments.

www.avltech.com

Krystal Dredge is the director of marketing for AvL Technologies. Krystal has 15+ years of product marketing experience in satellite and wireless communications, and most recently worked at Honeywell and EMS Defense & Space Systems prior to joining AvL in 2012. She holds a BSJ degree in Journalism from the University of Kansas and an MBA from Wichita State University.

ADRESSING MILITARY C4ISR NEEDS, AND TRENDING: GEO + MEO IMPACT ON THE FEDS

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

Hollywood loves to use the old cliché where an underestimated individual fights to get everyone's attention because — as the audience is already aware — they have the solution to the big problem that has everyone in danger.

That frustrating feeling of having a viable solution — but being cast aside — was probably how many of us in the satellite industry were feeling at the recent C4ISR Conference.

The C4ISR Conference brought private industry together with the military decision makers responsible for the DoD's Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR).

The conference featured a number of panel discussions and keynote speeches that featured a mix of representatives from both the private and public sector, and that focused on the IT, cybersecurity and communications challenges facing today's military.

Two of the main challenges that attendees heard repeated during the course of the activities were:

- *A need for a mobile communications solution that could deliver high throughput connectivity to a location quickly and without military personnel having to plug into existing transoceanic fiber.*
- *A need to ensure secure communications in theater, at a time when adversaries are actively working to take away one of the US military's largest advantages — its communications and real time intelligence capabilities.*

The first of these needs was expressed by Lieutenant General Alan R. Lynn, the Director of the Defense Information Systems Agency (DISA) and Commander of the Joint Force Headquarters - Department of Defense Information Networks (DODIN) out of Fort Meade, Maryland. Prior to beginning the Q&A portion of his presentation, the General discussed what the military need from its industry partners.

"*We need more throughput. The requirement just keeps growing. Every day we have more throughput requirements,*" The General told industry partners in attendance. "*But there are not bigger pipes being rolled out. So what's next? What comes after fiber?*"

What comes next could very well be satellites. Long perceived as a slower alternative to terrestrial networks and fiber, satellite communications have come a long way thanks to new satellite technologies and innovative new satellite constellations.

"We need more throughput. The requirement just keeps growing. Every day we have more throughput requirements," Lieutenant General Alan R. Lynn, the Director of DISA and Commander of the Joint Force Headquarters — Department of Defense Information Networks (DODIN).

THE SOLUTION TO MORE THROUGHPUT

Today, Medium Earth Orbit (MEO) and Low Earth Orbit (LEO) satellite constellations are being launched that drastically reduce latency thanks to their closer proximity to the Earth.

These constellations offer fiber-like connectivity and throughputs from space, meaning that they can deliver bandwidth similar to a terrestrial network anywhere within their constellation's coverage area — and these constellations cover a large portion of the Earth.

Furthermore, these satellites can deliver that bandwidth to any location with the requisite satellite terminal and antennas, meaning that a bubble of connectivity can be created, even without connections back to existing fiber networks.

However, MEO and LEO constellations aren't the only solutions that can offer high bandwidth anymore. The next-generation of satellites — known in the industry as high throughput satellites (HTS) — is capable of delivering just what its name promises — high bandwidth from geostationary (GEO) orbit.

These satellites — which use concentrated spot beams to deliver high bandwidth connectivity — are being launched across many satellite providers today, with some already in orbit, and a large number slated to launch in the very near future.

Fighting through the hurt, it's becoming clear that we're going to have to do that," Rear Adm. Danelle Barrett, Director of the Navy Cyber Security Division in the Office of the Chief of Naval Operations.

How to Best Operate in a Contested Environment

The second pain point or challenge that was mentioned numerous times at the event was the need to ensure communications at the edge, where enemy combatants and adversaries would be looking to deny or degrade them to eliminate our military's network connectivity and IT capabilities.

There was an overarching sentiment that the military should be prepared to fight in environments where IT solutions and capabilities weren't available in theater. This was reflected in comments by Rear Adm. Danelle Barrett, Director of the Navy Cyber Security Division in the Office of the Chief of Naval Operations, during a panel focused on security.

"*You're never going to have an impenetrable network, that is a fool's errand. You will have the ability to fight through the hurt, and that's where we focus our effort in the Navy*," Admiral Barrett said. "*It's been clear that we're not used to operating in a contested environment… so all of our branches are working on this — what does their cyber key terrain look like. Fighting through the hurt, it's becoming clear that we're going to have to do that.*"

This is another area where satellite could be beneficial. The sheer number of satellites in orbit — between the military's WGS satellite constellation and commercial communications satellites — delivers the redundancy and resiliency needed to ensure that essential communications aren't lost in theater.

The new generation of HTS doubles down on the ability to deliver assured communications through the use of harder-to-jam spot beams and other built-in security advancements.

Ultimately, even in a more contested space domain and environment, new technologies could make satellite a more resilient way to deliver fiber-like connectivity to the battlefield. Despite this, satellite seemed like an afterthought for many of the speakers and panelists, many of which were lamenting the same challenges that satellite can help the military overcome.

"*Fighting through the hurt, it's becoming clear that we're going to have to do that*," Rear Admiral Danelle Barrett, Director of the Navy Cyber Security Division in the Office of the Chief of Naval Operations.

To understand why the military may be eschewing satellite, we asked Tim Deaver of SES GS, one of the industry representatives on the conference's lone satellite-focused panel, why this is so...

"*Satellite has always been essential for the military and an important part of delivering communications to the tip of the spear, but cost and concerns about bandwidth and latency may have some military technology decision makers looking elsewhere*," Deaver explained. "*But those concerns really aren't as viable or relevant today as they have been in the past. High throughput satellites and MEO constellations are offering fiber-like connectivity to practically any location on Earth, and these new technologies are lowering prices and making satellite a much more reasonable, cost-effective solution than ever before.*"

Paving the Way Forward

If this past C4ISR Conference was aimed at those in the satellite industry that felt overlooked, there could be some relief on the horizon in the form of the Air Force's wideband analysis of alternatives — or AoA.

As discussed in the past, the AoA will help the Air Force establish a new path forward for the military when it comes to how it acquires and uses satellite services, and the advanced MEO and HTS satellites that are being offered by commercial satellite providers could see their role in military communications increase as a result.

Colonel George R. Nagy, the Chief of the Space Support to Operations Division within the Office of the Deputy Under Secretary of the Air Force for Space, was met following his participation on the space panel and was asked why he felt these new satellite technologies weren't being mentioned as solutions for the challenges facing today's military.

According to Colonel Nagy, "*Those emerging capabilities are being looked at within the wideband AoA. That was part of that space renaissance that I mentioned (during the panel discussion). Non-GEO systems, something that gets us to a heterogeneous architecture – we have that together today with WGS and commercial transponders – but we have many more options to choose from as a lot of those systems come online. And that's within the study timeframe of the AoA.*"

In early March, there was some major news announced by satellite communications company Intelsat — the company was to receive a cash infusion from SoftBank and then combine with OneWeb in a share-for-share transaction. This deal has now dissipated.

However, the concept of a satellite communications provider with GEO satellite constellations purchasing or merging with a smaller satellite provider using satellites closer to Earth to deliver high throughput, low latency connectivity, is not really new.

SES managed this action when they invested in — and then later acquired — O3b Networks, a satellite communications provider that operates a constellation of MEO satellites.

O3b's satellite constellation augmented the existing GEO constellation that SES already had in orbit and gave the company the ability to offer customers fiber-like connectivity anywhere on Earth that a satellite could place a beam.

This is starting to look like a trend in the industry. But why?

GETTING DOWN WITH GEO/MEO/LEO

The beauty of MEO and LEO satellite constellations is their ability to deliver extremely high throughputs and incredible bandwidth through their use of concentrated spot beams.

Their closer proximity to the Earth also allows them to deliver that bandwidth with much less latency, in contrast to a GEO satellite constellation.

This may not seem like as big of a deal with the next generation of HTS coming on line, which also use spot beams and offer higher bandwidth. However, there are still differences between what HTS offers and what MEO and LEO constellations offer.

THE FIRST IS OBVIOUS — LATENCY

Although HTS satellites deliver higher bandwidth, they're still positioned in GEO, far away from the Earth's surface. The physical location — less than half the distance from Earth as GEO — ensures that MEO will always be lower latency than even HTS satellites.

"*There is no question an increasing proportion of defense applications — including many of the military's mission-critical ones — are and will be based in the Cloud*" said Nihar Shah, the VP of Strategy and Market Intelligence at SES. "*With applications and databases now hosted in the Cloud, reducing latency and improving network performance is more essential than ever before, since fast, real-time decision making in a tactical environment has lives depending on it.*"

Then there's the issue of flexibility. Although GEO HTS satellites use spot beams — much like MEO and LEO satellites — commercial satellite communication providers don't have same ability to navigate or 're-assign' those beams to exactly where their users need them.

Ultimately, by augmenting existing GEO satellites with MEO and LEO constellations, these providers are giving their customers the benefits of one system or another — or both — based on what their particular needs are and which system will best do the job. The US government is the perfect example of a customer that can benefit from both.

Even better, thanks to the strategic mergers and acquisitions, customers can now get that flexibility all from one provider.

Who really benefits? The end user. Especially government end users.

WHAT THIS MEANS TO GOVERNMENT AND MILITARY

Today's military is vastly more dependent on IT services and capabilities than ever before. High throughput, low latency COMSATCOM connections in theater are essential for the military when fiber-like connectivity and latency is required, but fiber simply isn't available.

That being said, not all military operations and troop positions will require the same level of service and same amount of bandwidth as others.

For forward operating bases and other troop locations where a large amount of bandwidth is needed for both official military communications and operations — as well as the personal use of warfighters in theater — a MEO spot beam can be 'dropped' into the base and deliver high-density, fiber-like connectivity capable of handling terabytes of information.

When a smaller, lighter footprint of troops and equipment is needed — the needs are less densely aggregated and positioned, a GEO solution could be sufficient to provide the connectivity and capability necessary in that situation.

"*Different operational requirements drive different satellite requirements – some are better addressed via GEO and some are better served by MEO or LEO, but it's clear the future points to the importance of both,*" said Shah. "*Regardless of which satellite architecture the military may utilize at a given time or in a given scenario, they must integrate into a flexible and unified network so that mission-critical applications and information are shared and accessible in real time between all DoD users.*"

Ultimately, when COMSATCOM providers augment their GEO fleets with MEO and LEO constellations, they give their military and federal government customers the flexibility to use the correct solution in the appropriate situation through a trusted provider and partner with whom they already have a relationship. The existing relationship is really key, as that makes it easier and faster for the government to acquire and use these services.

Then there's the ever-important issue of security. In an era where space is an increasingly contested environment and the nation's adversaries are working to compromise space capabilities, the military now has to consider space a warfighting domain and protect satellite resources.

Disaggregating, proliferating and distributing military communications across both commercial and military GEO satellites helps provide increased resiliency and makes it harder for adversaries to target military communications. Further disaggregating military communications across both GEO and MEO can foster additional resiliency and redundancy and help ensure space capabilities are always available to the warfighter in theater.

The combination of LEO, MEO and GEO satellite systems is a trend that will most likely represent the future of the COMSATCOM industry — and the government is poised to benefit.

For additional information about O3b, go to
ses-gs.com/govsat/resources/white-paper-on-o3b-fiber-like-satellite-communications-for-u-s-government-applications/

Select the following link to listen to an exclusive podcast that features O3b CEO, Steve Collar...
ses-gs.com/govsat/news/podcast-o3b-ceo-discusses-delivering-fiber-like-bandwidth-anywhere/

The preceding articles are republished courtesy of The Government Satellite Report (GSR) and Executive Editor ***Ryan Schradin****.*

Ryan 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 HPA CORNER

HOSTED PAYLOAD PROTOTYPES AND THE SPACE ENTERPRISE CONSORTIUM

by Colonel Jody Merritt, US Air Force

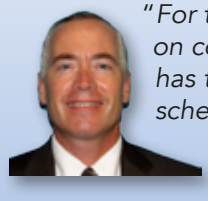
I had a chance to meet with the Hosted Payload Alliance during this year's Space Symposium in Colorado Springs to speak about the Space Enterprise Consortium.

The purpose of the consortium is to build space-related prototypes for the DoD space community and enable the DoD to move more quickly with a broader set of companies. This entity will manage risk-reward to optimize outcome, as well as to leverage free and open competition when it comes to prototype projects. The consortium intends to award multiple prototype projects (including but not limited to hosted payload prototype projects).

According to 10 U.S.C. 2371b and Section 815 NDAA 2016 grants service level authority for prototype projects above $50M and less than $250M. Specifically, the grants would help "…carry out prototype projects directly relevant to enhancing the mission effectiveness of military personnel and the supporting platforms, systems, components or materials proposed to be acquired or developed by the DoD, or to improvement of platforms, systems, components, or materials in use by the armed forces."

As a result of this model, this will offer a rapid requirement-to-award process, broader access to innovative solutions for the U.S. Government, create a prototype development environment for the DoD and require no FAR or supplemental process/coordination to follow. Open interaction is encouraged throughout the process.

This column's question for HPA Members is…
What are examples of DoD missions that can best benefit from a hosted payload prototype? How?

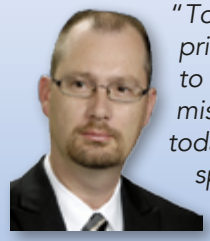


"For the DoD, hosting payloads on commercial satellites has the potential to shorten schedules, lower costs, and enable greater resilience through disaggregation and proliferation. There are many DoD missions that can benefit from this model, including communications, space situational awareness, intelligence, surveillance and reconnaissance, missile warning, and environmental monitoring.

"The DoD also has the opportunity to augment satellite navigation systems with hosted payloads that provide signal diversification, jam resistance, and increased signal integrity. Civil systems, such as EGNOS, MSAS, and WAAS, are already using hosted payloads for this purpose.

"An architecture that uses hosted payloads distributed across multiple satellites in a variety of orbits will be more resilient against the vulnerabilities of space, and will expand mission capability. Just as terrestrial networks use alternative paths to improve the ability to deliver data in the event of intended or unintended disruption, hosted payloads are a clear solution to provide alternate paths for collection and distribution of mission information over satellites.

"SSL has experience in integrating a wide variety of hosted payloads for both governmental and science missions, including x-ray sensors, imagers, and fully processed communication payloads. As commercial satellites are expected to continue launching at a consistent rate with a wide range of accommodation offerings in multiple orbits, government payloads can be developed in advance of host satellite selection with the opportunity to benefit from shared resources and a shared ride to space."—***Tim Gillespie***, Vice President, Business Development for National Programs, **SSL Government Systems**



"Today hosted payloads provide primary missions as adjuncts to the Space Vehicle's anchor mission—Aireon is proving this today aboard the Iridium NEXT spacecraft. Hosted payload prototypes also have a demonstrated role to play in risk management: showing that emerging capabilities are robust so they can be relied upon as a part of a higher-value satellite.

"Laser communications and transition to higher frequency spectrum such as V/W band are in the 'sweet spot,' with NASA's Laser Communications Relay Demonstration (LCRD) anticipated to launch as a hosted payload in 2019.

*"Hosted payload prototypes can also lead to hosted payload production units as done for Aireon's mission. For example, the initial deployments of improved weather sensors and space situational awareness sensors are both good hosting candidates to prove the technology advances. Subsequent production units can be deployed as hosted payloads too, establishing a cost-effective network of distributed sensors."—**Rob Clark**,* Hosted Payload Manager, **Harris Corporation**

hostedpayloadalliance.org/

Established in 2011, The Hosted Payload Alliance (HPA) is a satellite industry alliance whose purpose is to increase awareness of the benefits of hosted government payloads on commercial satellites.

The HPA seeks to bring together government and industry in an open dialogue to identify and promote the benefits of hosted payloads.

The HPA:

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

Hosted Payloads — also known as rideshares — continue to make their presence known — for example, a Request for Proposal (RFP) from the USAF's SMC encompasses ridesharing for the future.

The Space and Missile Systems Center (SMC) recently released a final request for proposal (RFP) for the Long Duration Propulsive Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapters, or LDPE.

The foundational technology for the LDPE is the EELV Secondary Payload Adapters, or ESPA, which is an Air Force Research Laboratory (AFRL) initiative to host auxiliary payloads on primary spacecraft launch missions.

This SMC acquisition responds to the Air Force Space Command (AFSPC) standard service policy that requires rideshare services on launch missions when feasible.

The LDPE leverages propulsive ESPA technologies developed by AFRL's Space Vehicles Directorate. The product of this procurement represents significant progress toward AFSPC objectives to provide secondary payload rideshare opportunities on Department of Defense launch missions.

The LDPE program will be a competitively bid acquisition for an EELV-compatible payload adapter with power, attitude control, and propulsive capabilities.

The effort will include integration services for government-furnished payloads and one year of early orbit checkout and operations. The contract will have options for two additional LDPE systems that would be manifested on future AFSPC missions.

SMC, located at Los Angeles Air Force Base in El Segundo, California, is the US Air Force's center of acquisition excellence for acquiring and developing military space systems. SMC's portfolio includes the Global Positioning System, military satellite communications, defense meteorological satellites, space launch and range systems, satellite control networks, space based infrared systems, and space situational awareness capabilities.

HOW SATCOM BENEFITS APAC GOVERNMENT SERVICES
A SPEEDCAST PERSPECTIVE

by Mike Carew, Vice President, Government Services, Speedcast

The need for satellite communications (SATCOM) in Australia and the APAC (APAX) region continues to increase.

Due to the geography in these locations, which includes vast remote land and maritime regions, and large rural and densely populated urban areas, many villages and cities are inaccessible by road and, therefore, have a difficult time communicating with the outside world in cases of disaster or simple day-to-day needs.

Along with topographic considerations, budget and funding play a significant part in the final solutions when it comes to the varying SATCOM requirements within and across governments. However, whether military or civilian, budget-conscious government customers demand reliability, scalability and the ability to operate globally when required.

As populations and economies grow, driven by industries such as oil, gas, mining and tourism, organizations and governments in the APAC region are reaching out to SATCOM service providers to help supplement connectivity.

This is where Speedcast stands ready to deliver. With a global network of 40 teleports supporting 8.5 GHz of capacity across global X-, C-, Ku-, Ka-, UHF- and L-band networks and access to more than 70 satellites, Speedcast is uniquely positioned to deliver services across the full range of government requirements.

By rolling out satellite broadband to remote locations that lack sufficient access and infrastructure, Speedcast helps connect communities with communications for areas such as healthcare, education and commerce.

An example of this is Speedcast's recent work with the Australian government to leverage the service provider's Ka-band network to provide wireless and 4G network Internet services to residents and businesses on Christmas Island when local infrastructure became unavailable.

Delivering services within the APAC region also means understanding the specific contracting regulations and processes, including how to integrate the solution within each country's unique telecommunications architectures. Coupled with budgetary restrictions and capabilities, across both civilian and military, governments are being forced to do more with less.

Securing government contracts, as a result, is traditionally a much longer process than that of commercial contracts. Years can be spent developing and demonstrating services and capabilities with no guarantee of being successful on a resultant tender.

However, government contracts remain active and viable for several years, as well as help build strong, trusted relationships as critical capabilities are delivered to end-users, making it worth the effort and investment.

THE APPLICABILITY OF SATCOM

Speedcast's investments in its people and networks allow the service provider to deliver across the full range of government requirements. Military and humanitarian assistance and disaster relief (HADR) are two such mission-critical segments.

Military

Militaries are continually reviewing needs and incorporating new SATCOM capabilities into their overall communications posture as the demand for big data grows. Military customers typically have a more rigorous set of requirements than those of civilian and local governments.

In many cases, militaries have much higher throughput needs in order to execute intelligence, surveillance and reconnaissance (ISR) assignments. With the type of reconnaissance militaries are responsible for in order to provide safety and security to their country, there is a significant push towards big data, especially in video streaming.

With a seemingly insatiable desire for throughput, High-Throughput Satellites (HTS) are coming more into play as they are introduced to the market. Militaries and other organizations are moving toward more managed end-to-end services.

With fewer firms building their own teleports, managing their own hubs and procuring their own bandwidth, the need for improved connectivity, efficiency and cost-effective networks increases, making the use of HTS an important part of meeting these needs.

How is the need for speed, managed services and security in addition to the interoperability with the NATO and US forces accommodated? Speedcast's work in Australia with the Australian Border Force (ABF) is a good example.

Speedcast has incorporated the latest technology, specialized networks and monitoring software to meet the rigorous requirements of military organizations, either on land, at sea or in the air.

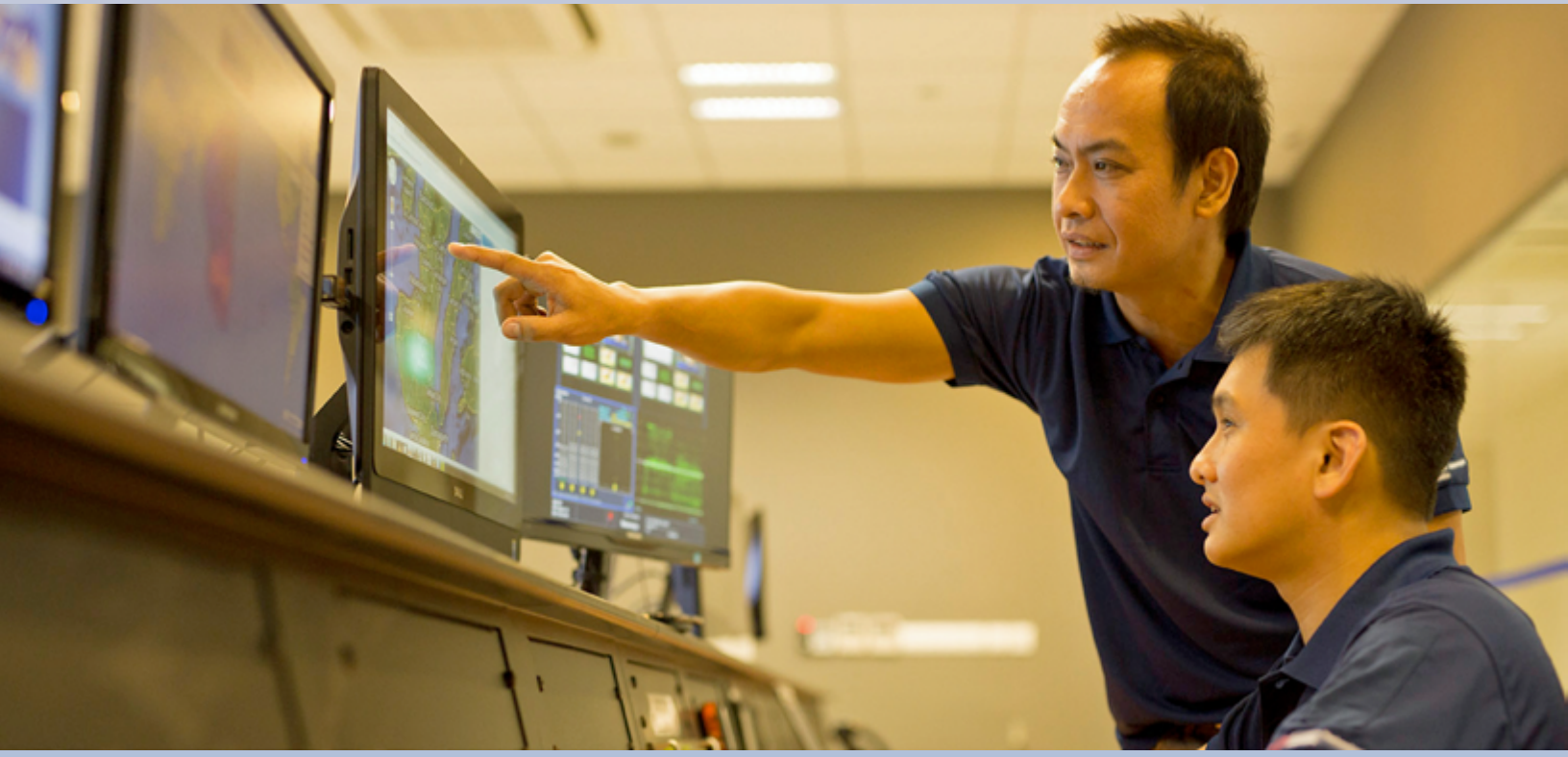
In October of 2016, Speedcast was awarded a tender for delivery of customized Wideband Management Systems for military and commercial satellite networks used by the ABF for the delivery of SATCOM to their Cape Class Patrol Boats, augmenting their existing military SATCOM services. Since then, Speedcast has begun implementing a full network management system that includes equipment, software and support, as well as providing a secure network integration strategy to satisfy ABF's stringent security and quality requirements.

With a maritime domain exceeding 10 million kilometers, Speedcast's delivery of high-quality services for ABF's Patrol Class vessels through sophisticated equipment and superior network monitoring allows the border forces to be more efficient in how they patrol and protect this vast area from a wide range of civil maritime security threats. In addition to these benefits, this service has also brought new capabilities to ABF that could expand to the Royal Australian Navy and other navies within the region.

Civilian

The requirements change when considering the needs of the civilian side of government. HADR is central to governments in the region. Unpredictable weather, natural disasters and other emergency situations require rapid response and connectivity for the safety and security of civilians. This is especially evident when it comes to tsunamis and earthquakes in Southeast Asia. Rapid deployment capability is essential to call for aid and emergency assistance.

The Save The Children Organization, an international NGO with its central office in London, UK, required a connectivity network for 35 sites across Africa. The rollout of the new service was particularly complex, as it involved the migration from an existing service provider to SpeedCast. The migration process required work across multiple countries and had to be completed in a highly efficient manner, due to a tight deadline to complete the roll-out before the previous provider switched off the existing service.



In cases where such communications infrastructures are compromised, portable SATCOM devices like fly-away kits are great to have on hand. These kits are secure communications devices that are a combination of very small aperture terminal (VSAT) technology, innovated with solar panels, battery packs and wide area network (WAN) technology that gives a complete solution to the end-user — all about the size of an airport carry-on suitcase.

For most HADR agencies and first responders, they don't have the requirement, or budget, to utilize SATCOM services on a daily basis. While they may not need the service to be "always on," they absolutely do need it to be "always available."

This availability, should an incident or natural disaster occur, allows agencies to plan and execute their missions with confidence — delivering emergency services quickly to the affected region and allowing work to begin toward a permanent solution.

The Benefits of a Local Presence

Having a local presence is essential to maintaining a strong relationship and building trust with governments in this region of the world, as is true elsewhere. With the years it can take to make headway in government contracts, operating locally demonstrates an investment in the community and delivers real, tangible value to the customer.

As is true with fly-away kits, Speedcast is constantly working with specialized local partners in the APAC region to deliver unique and innovative solutions. Speedcast engages intimately with agencies, building strong partnerships, trust and relationships in the region.

This approach affords Speedcast insight into the specific needs of the country or area and, consequently, an intimate understanding of the real problems the local agency faces — sometimes before the government agency has fleshed out what requirements are needed to fix the problem.

Due to these varying requirements, there is no one-size-fits-all SATCOM solution across all governments in the APAC region. Each opportunity requires hard work from teams of sales, engineering and service delivery professionals, with trusted relationships across partners and government agencies in each of the affected areas.

www.speedcast.com/industries/government/

Mike joined Speedcast in March 2017 and is the Vice President of Government Services. In this capacity, he is responsible for the positioning and sale of Speedcast products and services to governments globally.

Mike has more than 20 years' of experience in sales, service delivery and support of satellite communications services to government customers, both directly and through channel partners. Prior to joining Speedcast, Mike spent four years at Inmarsat and 17 years at Stratos.

At Inmarsat, as Vice President of Sales for the US government business unit, he was responsible for the sale and distribution of all Inmarsat products and services, via wholesale distribution partners, into all US government verticals. At Stratos, Mike held several senior positions across sales, engineering, and operations over 17 years, with a focus on US government maritime sales.

Prior to joining Inmarsat, Mike spent six years as Director of Maritime Sales — US government, driving revenue through both direct and indirect sales. He was awarded the US Navy Space and Naval Warfare Systems Command (SPAWAR) "Lightning Bolt Award" in recognition of his efforts delivering satellite communications services to the US Navy in 2002. Mike holds a Bachelor of Engineering degree in electrical engineering from Memorial University of Newfoundland, Canada.