SATCOM For Net-Centric Warfare – February 2018

MilsatMagazine

ULA's Atlas V Evolved Expendable Launch Vehicle (EELV) 411 configuration vehicle with the SBIRS GEO Flight 4 payload for the U.S. Air Force launches from Cape Canaveral AFS. Photo is courtesy of United Launch Alliance.

MilsatMagazine

February 2018

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MilsatMagazine is published 11x a year by Satnews Publishers,
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Phone: (707) 939-9306 — Fax: (707) 939-9235 —

Table of Contents

Advertiser Index

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DISPATCHES

National security success with United Launch Alliance SBIRS GEO Flight 4 push

ULA enjoyed the second successful launch of this year on January 19 with the SBIRS GEO Flight 4 Mission for the U.S. Air Force.

This launch came after a delay due on the previous day's scheduled activity, due to a ground issue associated with the booster liquid oxygen system... ULA has now completed two launches from the two opposite coasts in a single week.

SBIRS is considered one of the nation's highest priority space programs, and is designed to provide global, persistent, infrared surveillance capabilities to meet 21st century demands.

"*Meeting the challenge of launching two critical national security missions from opposite coasts within a week, the entire ULA team once again demonstrated its unwavering dedication to 100% mission success*," said Laura Maginnis, ULA Vice President of Government Satellite Launch at ULA. "*Thank you to our U.S. Air Force and industry teammates for their outstanding partnership in successfully delivering SBIRS to orbit today.*"

This mission was launched aboard an Atlas V Evolved Expendable Launch Vehicle (EELV) 411 configuration vehicle, which includes a 4-meter Payload Fairing (PLF).

This is the 75th launch of the Atlas V rocket, ULA's 2nd launch in 2018 and the 125th successful launch since the company was formed in December 2006.

The EELV program was established by the U.S. Air Force to provide assured access to space for Department of Defense and other government payloads.

The commercially developed EELV program supports the full range of government mission requirements, while delivering on schedule and providing significant cost savings over the legacy launch systems.

Built by Lockheed Martin Space, SBIRS consists of a network of satellites in geosynchronous orbit, sensors in highly elliptical orbit and a sophisticated ground control system.

The SBIRS architecture includes a resilient mix of satellites in Geosynchronous Earth Orbit (GEO), hosted payloads in HEO orbit and ground hardware and software.

The integrated system supports multiple missions simultaneously, while providing robust performance with global, persistent coverage.

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The ULA Atlas V awaiting the launch sequence with the Lockheed Martin-built SBIRS GEO-4 payload aboard for the U.S.A.F. Photo is courtesy of United Launch Alliance.

The Space Based Infrared System is considered one of the nation's highest priority space programs and is designed to provide global, persistent, infrared surveillance capabilities to meet 21st century demands in four national security mission areas:

- *Missile Warning: Reliable, unambiguous, timely and accurate warning for theater and strategic missile launches.*
- *Missile Defense: Delivery of critical information supporting the effective operation of missile defense systems.*
- *Technical Intelligence: Ability to characterize infrared (IR) event signatures, phenomenology and threat performance data.*
- *Battlespace Awareness: Delivery of comprehensive IR data to help characterize battlespace conditions.*

The SBIRS team is led by the Remote Sensing Systems Directorate at the U.S. Air Force Space and Missile Systems Center.

Lockheed Martin is the prime contractor, with Northrop Grumman as the payload integrator. Air Force Space Command operates the SBIRS system.

Aerojet Rocketdyne, Inc., a subsidiary of Aerojet Rocketdyne Holdings, Inc., played an integral part in this launch of the U.S. Air Force's newest missile warning satellite, including a role in helping to minimize the mission's impact on Earth's orbital environment.

The Atlas booster for this mission was powered by the RD AMROSS RD-180 engine. Aerojet Rocketdyne provided the AJ-60A solid rocket booster (SRB) and RL10C-1 engine for the Centaur upper stage.

The mission differed from previous SBIRS launches aboard the Atlas V rocket in that an Aerojet Rocketdyne AJ-60A solid rocket strap-on motor was used to increase the vehicle's lifting capability.

The added power from the single AJ-60A reduced the amount of fuel needed by the rocket's Centaur upper stage to place the Lockheed Martin-built SBIRS GEO Flight-4 satellite into its proper transfer orbit.

Once the satellite separated, the Centaur had sufficient fuel left over to propel itself into the ocean, so that it will not pose a collision threat to spacecraft in an increasingly congested orbital environment.

"*As space becomes increasingly congested, it is important to recognize propulsion systems play an important role in supporting efforts to minimize orbital congestion that otherwise could hamper future operations*," said Eileen Drake, CEO and president of Aerojet Rocketdyne.

The Centaur is powered by Aerojet Rocketdyne's RL10C-1 upper-stage engine, which generates 22,890 pounds of thrust.

Variants of the RL10 have been in service for more than 50 years on multiple vehicles, including ULA's current Delta IV, which is used along with the Atlas V to launch the vast majority of U.S. national security satellites.

Both stages of the Atlas V used Aerojet Rocketdyne-supplied helium pressurization tanks, while the company's 12 MR-106 hydrazine thrusters provided roll, pitch and yaw control, as well as settling burns, for the Centaur's phase of the mission.

Aerojet Rocketdyne's propulsion products were not limited to the launch vehicle. The SBIRS GEO Flight-4 satellite is equipped with 18 Aerojet Rocketdyne hydrazine thrusters that will maintain its orbit and orientation during a mission lasting up to 12 or more years.

These include 12 MR-103 thrusters providing .2 pounds of thrust each, and six MR-106L hydrazine thrusters, each providing 5 pounds of thrust.

In addition to maintaining the satellite in its orbital position, these thrusters provide attitude control during orbit raising as well as the boost needed to decommission the satellite at the end of its service life.

The SBIRS' primary mission is to provide timely warning of missile launches throughout the world.

Once it completes on-orbiting testing, GEO Flight-4 will round out the initial SBIRS constellation, providing global coverage.

"*The SBIRS satellites help safeguard the nation's homeland and deployed forces against the threat of ballistic missile attacks. It is critical to have reliable propulsion systems on every satellite to ensure they maintain a watchful eye and are able to detect a threat at a moment's notice*," added Drake.

Aerojet Rocketdyne is a world-recognized aerospace and defense leader that provides propulsion and energetics to the space, missile defense and strategic systems, tactical systems and armaments areas, in support of domestic and international markets.

ULA's next launch is the GOES-S mission for NASA and NOAA on an Atlas V rocket. The launch is scheduled for March 1 from Space Launch Complex-41 at Cape Canaveral Air Force Station, Florida.

Later on January 19, the U.S. Air Force's 460th Space Wing reported their command is now "talking" with the fourth Space Based Infrared System (SBIRS) Geosynchronous Earth Orbit (GEO) satellite after the successful launch of the satellite from Cape Canaveral Air Force Station, Florida.

The SBIRS GEO Flight-4 satellite is responding to the Wing's commands as planned.

Signal acquisition was confirmed approximately 37 minutes after the satellite's 7:48 p.m. EST launch aboard a United Launch Alliance (ULA) Atlas V rocket.

Back on the ground at Buckley Air Force Base, a sophisticated new SBIRS ground control system — also designed by Lockheed Martin — serves as the nerve center for the entire SBIRS satellite constellation and receives large amounts of data from the satellites' powerful sensors.

The SBIRS control system and its operators convert this data into actionable reports for defense, intelligence and civil applications.

"*SBIRS is the nation's 24-7 global watchman, with infrared eyes ready to detect and deliver early warning and tracking of ballistic missiles. A cornerstone of the nation's missile defense system, SBIRS is proving even more precise and powerful than expected*," said Tom McCormick, Vice President of Lockheed Martin's Overhead Persistent Infrared systems mission area.

McCormick added, "*Space is a place to do great things, and we're already improving on SBIRS, upgrading our fifth and sixth SBIRS GEO satellites to our modernized LM 2100 satellite bus at no additional cost to the Air Force. On SBIRS 5 and 6 the Air Force saved $1 billion through improved production and management efficiencies.*"

In late 2016, Lockheed Martin also completed a major upgrade SBIRS' ground control system.

The new "SBIRS Block 10" system includes enhancements like faster data collection times, improved threat detections, and improved target tracking and infrared information to enable troops to see dimmer targets faster.

SBIRS Block 10 also provides the Air Force with greater efficiency by consolidating ground control for the legacy Defense Support Program, as well as SBIRS satellites and payloads in GEO and Highly Elliptical Orbits.

Next, the SBIRS GEO Flight-4 will begin transitioning to its final location in geosynchronous orbit, approximately 22,000 miles above the Earth. There, the satellite's solar arrays, light shade and antennas will be deployed to begin on orbit testing.

SBIRS GEO Flight 4 encapsulation. Photo is courtesy of Lockheed Martin.

The SBIRS GEO Flight 4 satellite. Photo is courtesy of Lockheed Martin

The satellite will join SBIRS GEO Flights 1, 2 and 3, which were launched in 2011, 2013 and 2017 respectively and continue to meet or exceed performance expectations.

Lockheed Martin manufactured the SBIRS GEO Flight-4 satellite at the company's Sunnyvale, California, facility.

The satellite was delivered to Florida on October 31, 2017.

The 460th Space Wing (460 SW) is located at Buckley AFB, Colorado, and is an Air Force Space Command base that serves Active Duty, National Guard, Reserve and retired personnel throughout the Front Range community.

The wing defends America through its air operations, space-based missile warning capabilities, space surveillance operations, space communications operations and installation support functions. The wing provides a number of deployed Airmen to Combatant Commanders to accomplish warfighter missions around the globe.

The Wing supports a Joint, Total Force and coalition base in all but name. This includes 3,500 active duty members from every service, 4,000 National Guard personnel and Reservists, four commonwealth international partners, 2,400 civilians, 2,500 contractors, and approximately 88,000 retirees, veterans and dependents combined. The base contributes nearly an estimated $1 billion annually to the local economy.

The 460th Space Wing falls under the direction of 14th Air Force and Air Force Space Command. For the wing's day-to-day operational mission, the 460th SW directly supports Combatant Commands across the globe.

The 460th Operations Group (460 OG) provides missile warning, missile defense, technical intelligence, satellite command and control, battle space characterization, and robust communications.
The group's team of space professionals operates the Defense Support Program (DSP), Space-Based Infrared System (SBIRS) Geosynchronous Earth Orbit (GEO) satellites, and SBIRS Highly Elliptical Orbit (HEO) payloads, which provide continuous global surveillance, tracking and targeting.

The 460th Mission Support Group (460 MSG) provides trained personnel to support the Air Expeditionary Forces and Homeland Defense. The group is responsible for force protection, quality of life, human resources, contracting, logistics, base infrastructure and environmental stewardship support to the 460 SW and personnel throughout the Front Range area.

The 460 SW is unique in that it supports more than 90+ base partners located both on base and in the local community.

The 460th Space Wing hosts five major base partners, known as Big 5: 140th Wing, Colorado Air National Guard (COANG); the Navy Operational Support Center; the Aerospace Data Facility-Colorado; the Army Aviation Support Facility and the Air Reserve Personnel Center.

Full rate production by PacStar for U.S. Army's T2C2 Program

PacStar has announced that the firm's 400-Series small form factor (SFF) tactical and deployable communications modules will move to full rate production for the U.S. Army Transportable Tactical Command Communications (T2C2) program.

PacStar modules — which provide baseband networking for the T2C2 program's Lite and Heavy systems — satisfactorily completed operational testing with the 4th Brigade Combat Team, 25th Infantry Division at Joint Base Elmendorf-Richardson.

PacStar equipment, when paired with T2C2 satellite terminals, will enable early entry forces to access the Army's tactical communications network.

The program will field two variants: a soldier-portable T2C2 Lite for early entry forces and a T2C2 Heavy for company-level command post/forward operating base communications.

PacStar's baseband system consists of routing, switching and servers based on the patented and field-proven PacStar 400-Series solutions, incorporating Cisco networking and switching technologies and Intel advanced processors in rugged, small form factor modules.

A patented snap together design allows multiple modules to share power from a common set of rechargeable batteries. All components and modules are fully interchangeable across Lite and Heavy variants.

This interchangeability reduces training time, improves logistics, maximizes flexibility and supports ongoing program growth and development while protecting the investment.

During 2018, the U.S. Army plans to field T2C2 to 15 operational elements including seven brigade combat teams, four division headquarters, one corps headquarters, one military intelligence brigade and one expeditionary signal battalion.

The Army plans to procure T2C2 until early 2025.

Peggy Miller, the CEO at PacStar, said that the company has a long and successful track record of delivering innovative, state-of-the-art tactical networking gear to military and civilian organizations.

She continued by stating that the U.S. Army's selection of PacStar for the T2C2 program validates the savings in SWaP and modularity of our designs and also underscores the firm's commitment to quality, responsive technical support and significant investment in ongoing product advancement.

pacstar.com/

DISPATCHES

DARPA has a new deputy director — Dr. Highnam

The director of the U.S. Defense Advanced Research Projects Agency (DARPA), Dr. Steven Walker, announced the appointment of Dr. Peter Highnam as deputy director of the Agency.

Highnam, a former DARPA program manager, is expected to help advance critical research in several fields including artificial intelligence, data analytics, communications, reconnaissance, electronic warfare, bio-security, and warfighter health.

Highnam succeeds Dr. Stefanie Tompkins, a ten-year veteran of DARPA, who has served as the acting deputy director of the Agency since January 2017..

Highnam comes to DARPA following an assignment from the Office of the Director of National Intelligence (ODNI) to the National Geospatial-Intelligence Agency (NGA) where he was responsible for the Agency's research organization for the past two and a half years.

Prior to this assignment, he served six years at the ODNI Intelligence Advanced Research Projects Activity (IARPA), initially as an office director, and then as director.

While at IARPA Highnam was also involved in government-wide high performance computing (HPC) activities, including the National Strategic Computing Initiative and the Department of Energy exascale initiative.

Before IARPA he worked for six years in the U.S. Department of Health and Human Services (HHS). As a senior advisor in the National Institutes of Health (NIH), Highnam had responsibilities in multiple areas where high performance computing intersects with biomedicine and public health, including computational epidemiology. From 1999 to 2003, Highnam was a DARPA program manager working in electronic warfare and airborne communications. His research in electronic warfare (Advanced Tactical Technology (AT3) program) focused on inexpensive approaches to rapidly and accurately target enemy air defense radars from greater standoff distances.

www.darpa.mil

DISPATCHES

NSR's Government and Military Markets: An Evolving Capacity Acquisition Paradigm

As the satellite industry and the U.S. Government start to kick things off for a New Year, planners continue the process of creating the next-generation of Government and Military network designs.

With a renewed focus on the importance of space to executing the national security missions of countries across the globe — and 'assured access' to space-based connectivity not a guarantee, where does that leave the role of industry and commercially-focused offerings?

According to NSR's *Government and Military Satellite Communications, 14th Edition* report, the SATCOM industry is entering a period of renewed growth in the Government and Military markets.

Focused on 'connecting things that move', there is a clear path for commercial-sourced offerings to enable the missions of Government and Militaries across the world such as ViaSat's award for Air Force One and other Senior Leadership Airframes.

With VSAT Capacity Revenues expected to exceed $1 billion by 2026 for Government and Military markets, HTS on the horizon and an increasingly complex operations environment for these end-users, network designs and operational flexibility/complexity will only increase over the next ten years.

Following that growth, new connectivity technologies in GEO and Non-GEO will enter the supply picture and become a (slow) growth factor in an ever-shifting marketplace.

With HTS adoption lagging behind the commercially-equivalent markets, Government and Military end-users remain constrained in deploying new equipment to take advantage of new technologies available in the market today.

While those constraints will naturally solve themselves through the evolution of platforms, (especially in the UAS markets where new airframes will be 'HTS-ready' from day 1), Government and Military users will be strong consumers of legacy FSS capacity — just at a time when satellite operators continue to face monetization strategy questions around 'still good' legacy assets.

Just how much FSS capacity will be available to Government and Military markets remains to be seen, but as hot-spots such as the Korean Peninsula, Southern Africa, or ongoing struggles in the Middle East are any indication, bandwidth demand will continue to be limited almost entirely by budgets and compatibility issues.

Growth is on the horizon for Government and Military markets — especially bandwidth demand. Yet, just as FSS connectivity will still remain a core component of the market — acquisition through bulk-leasing of capacity remains a strong segment of the market.

Although declining capacity pricing will reduce its overall share in the capacity revenue mix, falling prices will allow end-users to continue to connect legacy or near end-of-life assets with greater capabilities and throughputs — enabling better lifecycle economics as military planners look to acquire next-gen manned and unmanned platforms.

Just as Government and Military planners in key markets settle on a future architecture for their own proprietary capacity, acquiring 'raw' or 'lightly managed' capacity from mostly satellite operators will continue to enable a sub-set of demand.

These applications will be varied across the spectrum of platforms and applications, whose connectivity requirements continue to increase.

With more spending on the horizon for proprietary capacity acquisition programs ('WGS 2.0', 'Skynet 6', etc.), bulk leasing will continue to fill an important middle ground between terminals and platforms that live within fully government-owned/managed/controlled environments and those fully-outsourced in a managed service model.

The near-future for Government and Military markets is transition — transition from FSS to HTS, legacy MILSATCOM systems to next-gen capabilities, and from 'business as usual' to commercial best-practices.

Overall, evolving threats are changing the operational landscape. New commercial and proprietary capabilities are helping to meet those challenges — and the acquisition framework linking bespoke military capacity with commercial capabilities continues to evolve.

www.nsr.com/research-reports/satellite-communications-1/government-and-military-satellite-communications-14th-edition/

Information authored by Brad Grady, Senior Analyst, NSR — USA

Atlas V sales and marketing moves to United Launch Alliance from Lockheed Martin

United Launch Alliance (ULA) has now assumed responsibility for the marketing and sales of Atlas V from Lockheed Martin Commercial Launch Services.

In addition to performing all of the operational activities related to Atlas V launch services, as ULA has done since the company's formation in 2006, ULA now has the full authority to market and sell Atlas V launch services to commercial customers.

ULA is an industry leader in mission and schedule reliability, building on a successful heritage of nearly six decades. ULA's Atlas V has flown 75 missions with 100 percent mission success, from numerous GPS satellites flying today to exploring the solar system and beyond, and has the highest reliability with the lowest insurance rates in the industry.

ULA offers extensive experience from a long heritage of launching communications and Earth imaging commercial missions for customers around the world.

Tom Tshudy, ULA's vice president and general counsel, will lead the new global commercial sales organization. Before joining ULA, Tshudy served as senior vice president and general counsel for International Launch Services (ILS) as well as Vice President and general counsel at Lockheed Martin while ILS was a subsidiary to sell and market launch services using the Atlas II, III and V launch vehicles.

Tory Bruno, ULA's president and CEO, noted that the company has undergone a tremendous transformation over the last two years. With ULA's innovative techniques, coupled with world-class reliability and schedule certainty, the company is well positioned to offer Atlas V launch services to current and potential commercial customers. ULA will serve as a business partner committed to building a launch strategy that maximizes the commercial provider's profits and positions them above their competition.

Bruno added that the value of a launch is a lot more than its price tag. ULA Atlas V launch services help customers capture savings and added value by delivering spacecraft to orbit earlier, extending mission life, and providing unsurpassed schedule certainty. Lockheed Martin's Commercial Launch Services organization served their customers well with a flawless record of mission success and strong customer partnerships for more than a decade. ULA looks forward to continuing that legacy of performance, service and precision.

www.ulalaunch.com

DISPATCHES

U.S. Army 'Dagger' brigade puts mission command systems to the test during exercise

The Secure Mobile Anti-jam Reliable Tactical Terminal team leader, 82nd Brigade Engineer Battalion, 2nd Armored Brigade Combat Team, 1st Infantry Division, stands ready for employment at Hohenfels Training Area, Germany, January 25, 2018, during Allied Spirit VIII. Allied Spirit is a U.S. Army Europe-directed, 7th Army Training Command-conducted, multinational exercise series designed to develop and enhance NATO and key partners interoperability and readiness.
U.S. Army photo by Staff Sgt. Wallace Bonner.

U.S. Soldiers from 82nd Brigade Engineer Battalion, 2nd Armored Brigade Combat Team, 1st Infantry Division, continue to test the limits of their equipment with the deployment of a Secure Mobile Anti-Jam Reliable Tactical Terminal to Hohenfels, Germany, in support of multinational exercise Allied Spirit VIII running from January 15 through February 5 to validate their ability to communicate with the brigade's second SMART-T in Zagan, Poland.

The SMART-T is a satellite communications system that can provide voice and digital transmission in jamming, nuclear or chemical environments, and even remain operational through a high-altitude electromagnetic pulse incident.

The team responsible for operating the SMART-T is attached to the Polish 12th Mechanized Brigade, supporting their communications and mission command enabling operations for the duration of Allied Spirit.

The 82nd BEB is exercising the SMART-T to test a proof of concept, said 2nd Lt. Justin Horton, platoon leader, 44th Expeditionary Signal Battalion. "*What they are going to do is put the SMART-T through our Single Shelter Switch to reach the SMART-T in Poland. The SMART-T is a very good piece of equipment, and very durable. It can even resist EMPs and a lot of countermeasures taken against it*," Horton said.

The system's operators also appreciate the system's capabilities. "*It provides communications through the Milstar satellite*," said Cpl. Koty Kennedy, SMART-T team leader, Company C, 82nd BEB.

The Milstar satellite provides the military with assured, survivable satellite communications with low probability of interception and detection, according to U.S. Air Force Space Command. "*This system is older, but pretty reliable*," Kennedy said. "*It will allow you to have communications in some really adverse conditions.*"

The 82nd BEB additionally deployed two HCLOS operator teams and systems, also capable of both voice and digital transmissions, to Hohenfels to support their fellow battalion, 1st Combined Arms Battalion, 18th Infantry Regiment, 2nd ABCT, and 12th Mech. Bde. during Allied Spirit.

Horton explained the benefits of having a redundant system. "*If our Phoenix (satellite system) goes down, 82nd BEB will still be able to provide a continuous connection between 1st Bn., 18th Inf. Regt., and 12th Mech. Bde. with the link provided by their HCLOS systems*," Horton said. "*The HCLOS is the back-up to a back-up, so we can still talk to the Polish brigade.*"

The Phoenix system is another capability that provides ESB units with high-capacity, inter- and intra-theater range extension for networked battle command and control information, including logistical, operational, intelligence and administrative data, according to Program Executive Office Command, Control, Communications-Tactical (PEO C3T).

Approximately 4,100 participants from 10 nations are taking part in Allied Spirit, providing its participants hands-on experience and opportunities to test secure communications between NATO allies and partners.

The 2nd ABCT is participating in the exercise as part of their deployment to Central Europe in support of Atlantic Resolve, a mission intended to provide a tangible expression of U.S. commitment to strengthening the defensive and deterrent capabilities of the NATO Alliance.

Story by Staff Sgt. Wallace Bonner
2nd Brigade Combat Team,
1st Infantry Division Public Affairs

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Solving the MILSATCOM vs. COMSATCOM "Culture War"

By Rebecca M. Cowen-Hirsch, Senior Contributor and a Senior Vice President of Government Strategy and Policy, Inmarsat

Since 9/11, demand for satellite communications (SATCOM) significantly increased and warfare changed dramatically. Yet the business model of buying commercial SATCOM (COMSATCOM) on the spot market using operational contingency or supplemental funds has not changed.

Over this same time period, cultural misperceptions became deeply ingrained leaving end users to perceive that military SATCOM (MILSATCOM) resources are "free," while commercial services had a "fee."

The time has come to dispel this myth of "fee" vs. "free" and provide these end users performing critical operational missions with diverse, assured and resilient SATCOM capabilities.

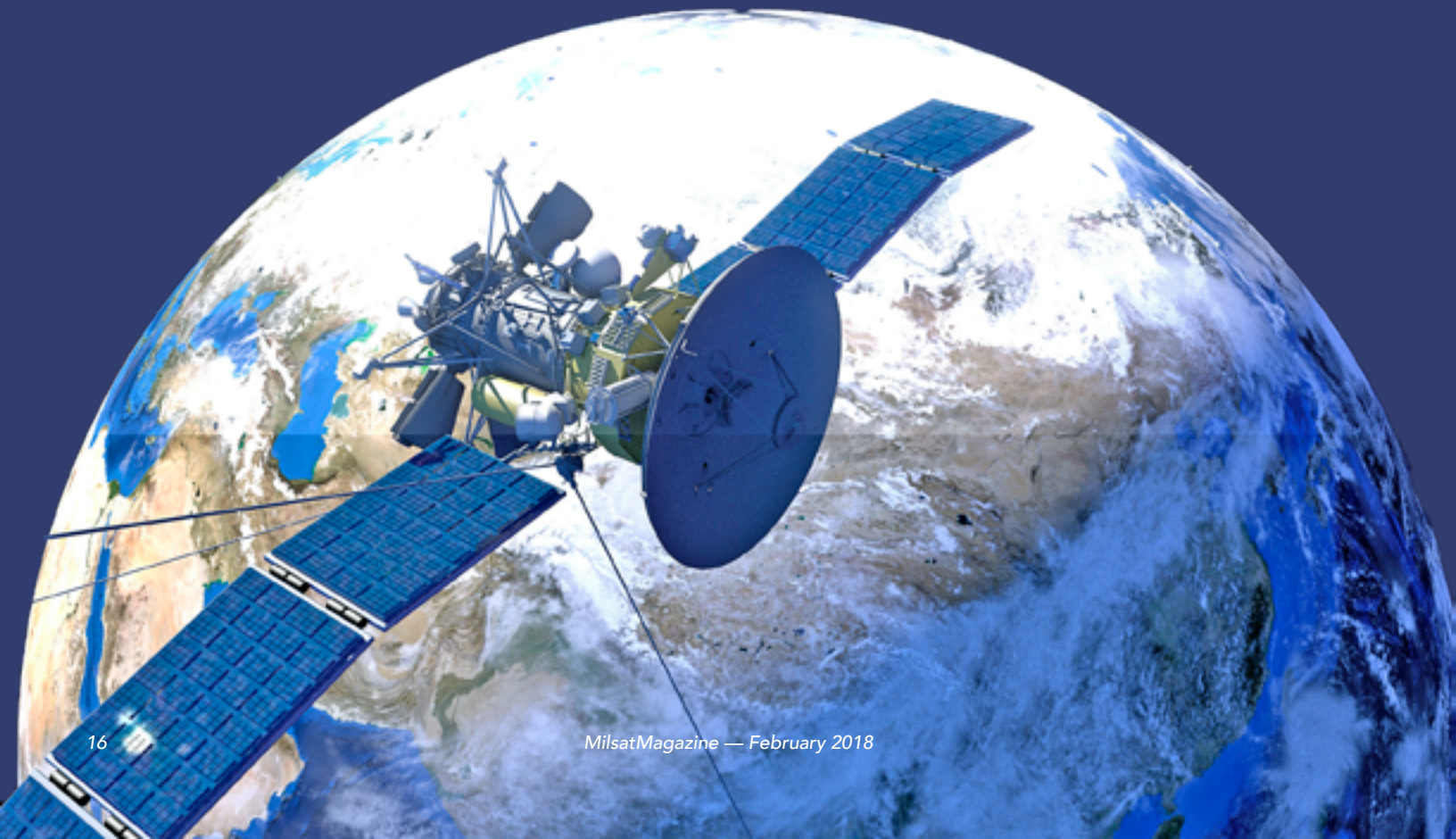
How do we go about changing this cultural misperception?

First, by viewing SATCOM as a critical enabler for mission success rather than an end unto itself. The best path forward is to incorporate industry innovation into the integrated SATCOM architecture, and strategically manage those SATCOM resources for decentralized execution. This will, however, require a significant shift in processes and planning, and, dare I say a cultural transformation!

Military planners struggle to manage intense competition for capital to fulfill future Department of Defense (DoD) modernization needs while still restricting spending to within limits established by the Budget Control Act (BCA) of 2011. They also face pressures due to declining Overseas Contingency Operations (OCO) funding.

These challenges particularly impact space procurements, where new threats are driving changes in the U.S. operating posture. For space programs, it remains imperative to incorporate advancements from the commercial sector into the baseline DoD architecture as a means of reducing strains on an overstretched budget and inserting optimum capability, flexibility and resilience for end users.

Ease of operation in a complex operational environment is required, and SATCOM must be readily accessible wherever they go; employing smaller, agile, easy-to-use equipment and multi-band terminals to ensure systems stay up and running no matter how challenging the situational or geographic conditions, or mission priority.



Even given the operational imperatives, the changing threat environment and an increasingly robust and innovative commercial SATCOM industry, the U.S. government has been slow to change their approach. Similarly, the well-documented challenges associated with fragmentation, delays and cost overruns of MILSATCOM system acquisitions and lack of user terminals or ground segment result in inaccessibility of the space segment.

This significantly impacts and limits the operational advantages needed by today's modern military. Many of those government programs began before some of the modern concepts of operations, such as unmanned Airborne Intelligence, Surveillance and Reconnaissance (AISR) were envisioned.

As a result, programs such as the Mobile User Objective System (MUOS) can only access the legacy UHF capability. Even the wideband workhorse, the Wideband Global SATCOM (WGS) system with its nine satellites on orbit cannot flexibly meet all requirements with often competing demand for WGS access for military mission-specific surges in some geographies.

Each of these MILSATCOM systems, once finally deployed and ideally employed, also require numerous airmen and countless man-hours to operate these satellites. Given the tens of billions of dollars and decades of programmatic history, this is what is perceived as "free" SATCOM.

At the same time, COMSATCOM providers are making a high standard of performance possible, to a large degree by investing in solutions with government users in mind, thereby, augmenting military satellite resources cost-effectively, wherever and whenever needed. With a strong business case supported by clear demand signals, industry can innovate more rapidly than the public sector. Average time from concept to launch for COMSATCOM takes three to four years, as opposed to five to 15 years for MILSATCOM projects.

Senior government leaders, on both executive and legislative branches, have recognized COMSATCOM as an essential resource for the future, which is foundational for establishing a path toward enterprise-level, integrated SATCOM architecture. This supports a strategy to ensure reliable, available and resilient seamless, state-of-the-art SATCOM capabilities that are fully interoperable with military-owned and operated government systems.

Taking this unified architecture approach will enable the DoD to consider MILSATCOM and COMSATCOM as a holistic capability to best support military missions. The advent of a unified architecture, supported by strategic planning and innovations in acquisition, is essential for this cultural shift to centralized management and decentralized execution of SATCOM.

Acknowledging the need, governments seek a forward-looking means of innovation in acquisition to bring more modern capability and agility to the end user. While the industry welcomes the pathfinder and other pilot programs, it is critical that they evaluate SATCOM for its effects rather than to perpetuate the status quo; or worse, attempt to solve yesterday's problems and create unnecessary costs well into the future.

It is incumbent on the DoD and the Air Force to seek timely results that inform the ongoing Wideband Communication System (WCS) Analysis of Alternatives (AoA) as well as shape the investment and operational budget in accordance with congressional timelines. The opportunity also exists to model the business arrangements prevalent in the COMSATCOM industry for speed, relevancy and affordability.

A DoD shift in mindset towards acquiring SATCOM as a Service versus the spot market leasing of spectrum for ad hoc "fees" will lead to a greatly enhanced SATCOM capability accessible when and where needed with enhanced assured access, flexibility and resilience — all attributes of merit for today's military operational environment.

With the WCS AoA currently underway and unprecedented industry and Allied participation offering expanded space, air and ground layer communication capabilities, this cultural shift towards enterprise-level strategically planned and managed SATCOM for the fight is possible.

This AoA could significantly impact the future of government SATCOM, presenting an opportunity to define — arguably for the first time — a new approach that harnesses the scale, scope and innovation of the satellite industry to achieve required effects, interleaved with unique military-exclusive capability. This would be consistent with General Jay Raymond, Commander, Air Force Space Command statements that such innovation serves a vital purpose at a time when space is "*contested, degraded and operationally limited.*"

"*When our battlefield airmen go into the fight today they do so with air, space and cyberspace in their quiver,*" General Raymond said, as he announced the formation of the Space Warfighting Construct, which will combine improved situational awareness and responsive command and control in the interest of space superiority. "*Space and cyber are the DNA of multi-domain integration. … Our joint warfighting partners need to have space all the time. That is not a given anymore, we are hard at work to make sure that it is. And it is going to take the support of government, industry and the support of our international partners.*"

As government leadership moves forward with studies on alternatives and other pilot programs, we see tangible evidence of commercially available, end-to-end capabilities including ground, terminal and space segments, delivered as service [SATCOM as a Service] at a much more affordable cost and faster rate than the current acquisition model allows. The SATCOM as a Service model provides mobile, high-throughput, easy-to-use connectivity the way government users seek it: easily, affordably and operationally available – anytime, anywhere.

Strong commercial owner operators that are committed to serving the government understand the requirements and invest ahead of time to deliver needed capabilities. Based upon extensive market research and trusted long-term relationships with end-users and agency leaders, these companies make organic, internal, on-going investments for networks that are fully compatible, and in many cases, interoperable with military satellite systems.

With innovations in the commercial SATCOM industry that provide game-changing capability affordably and at the speed of need, there is much to be gained by harnessing these capabilities more strategically and intentionally as part of a centralized management of an integrated architecture. Leveraging these capabilities benefits end users, who no longer have to build and manage their own satellite and ground networks as they have done for years.

They can now focus on their core mission knowing that they have affordable always-on access to reliable, secure and interoperable SATCOM capabilities that improve the resilience and responsiveness of the critical communication infrastructure supporting the full spectrum of global military operations.

We are committed to dispelling forever the myth of "fee" vs "free" where the end user focuses on his/her mission and its success, employing the right SATCOM and the right time for greatest effect. Now this cultural shift is not only desirable but an imperative for the future of national security operations.

Rebecca M. Cowen-Hirsch is Senior Vice President for Government Strategy and Policy of Inmarsat's United States Government Business Unit and a Senior Contributor to MilsatMagazine.

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AN AMERGINT TECHNOLOGIES FOCUS

SmallSats: Can an enterprise ground system keep pace?

By Rob Andzik, Amergint Technologies

Traditionally, government satellites required five to 10 year development cycles, and the completed spacecraft was factored with an operational lifespan of 10 to 15 years.

Some of the large satellites in orbit today have exceeded 20 years in space. That is impressive, to say the least, and speaks highly of the engineers who designed them. These satellites were expensive to develop, have complex mission capabilities and often have dedicated ground systems.

As these missions evolved, new, large satellites were designed on similar timelines. Each evolution represented its own multi-year program with well planned changes to match the mission, the vehicle, operations, and the ground systems.

Those older vehicles were designed for missions that existed in the 1990's. The world has since changed and a more responsive approach is needed today. Space is now a contested environment. The U.S. military needs responsive missions as well as resilient architectures. To ensure success, these new architectures must be driven with the same philosophies, provide identical agilities as well as accommodate an accelerated rate of change, both in space and on the ground.

Small satellites (smallsats) offer a potential solution in space. They are less costly to develop and launch and have sufficient capacity for a wide range of sensors. With a lifespan of from three to five years, a frequent refresh of on orbit capabilities is attainable.

These smallsat features combine today to meet changing mission requirements and provide a natural resiliency in space. Functionality in traditional large satellites can be disaggregated, presenting a distributed attack surface. Smallsats can be more quickly replaced and those replacements can evolve the mission.

Ground Systems Impact

Ground systems have similar concerns — antenna sites and control centers can be targeted by an agile adversary. The associated computers, software, and networks can be attacked. Resiliency is even more important; however, instead of disaggregating, the current focus is on defining a common enterprise ground system architecture. Multiple missions are being combined into a common control center. Alternate ground networks are being integrated and multipurpose antennas are being designed.

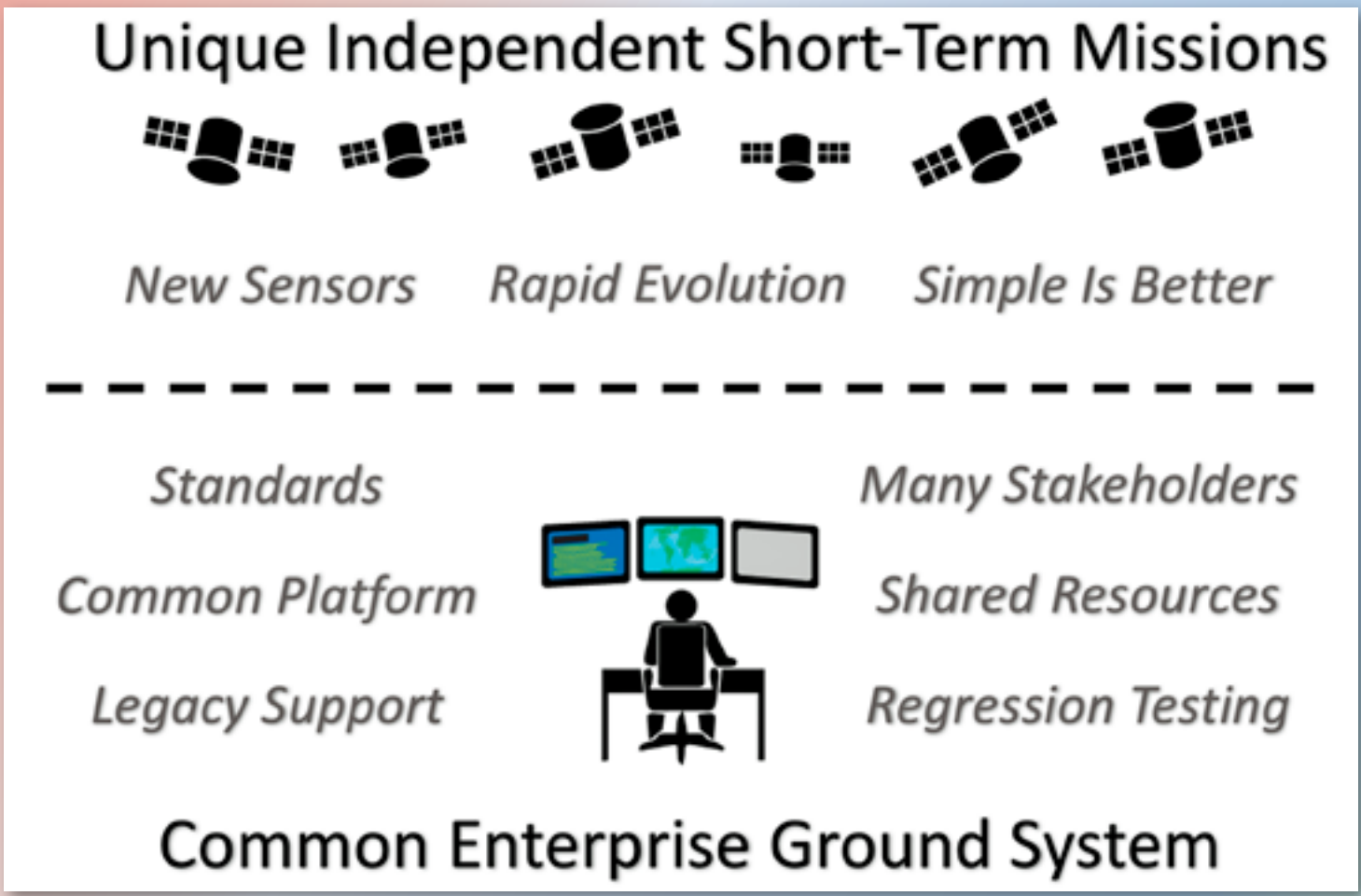
The new philosophy is commonality. Ground systems are being designed to support pluggable functionality, use generic message buses and require standard interfaces between components. On the surface, this has the appearance of a solid solution. The ground system can adapt to an attack. If one ground network is compromised, another is seamlessly switched in. Components can be quickly replaced, added, and upgraded. New missions can be integrated as new vehicles are launched.

However, the quest for resiliency on the ground is riddled with traps. If a common architecture or multi-mission control center is desired, a common baseline must be created. As more missions are added, the size and complexity of that baseline grows. Adding or changing a component requires increasing amounts of analysis and configuration management.

As part of even a small change, every requirement must be regression tested to ensure there is no impact to the operational system. The number of potential interactions between numerous components quickly becomes challenging — if not impossible — to manage. Enhancement of capability slows to a crawl. Unforeseen vulnerabilities become more likely, which in turn makes resiliency even more difficult.

These challenges are exacerbated when considering common IT functions, such as hardware refresh cycles, security patches and network upgrades. These form an additional dimension that is rarely thought about in the system level architecture.

A simple security patch can result in unscheduled, unplanned and unfunded changes. Upgrades to the operating system can potentially impact the software applications and the underlying, likely aging, hardware. The desire for a common architecture and a unified operating environment can make the system more exposed. The smallest vulnerability can bring the entire enterprise down.



Modern technologies, such as containers, virtualization and cloud-based computing, can be used to help alleviate this problem. These technologies separate software from hardware constraints. They create unique environments that allow hardware and software to be updated independently. Computing resources can be managed to meet changing demands and functionality can quickly be recovered in the event of a failure.

Unforseen Complexities

The time and cost involved in testing all possible scenarios, as services come and go, is prohibitive. The resulting complexity can make even the most basic of services unknowingly critical in the overall architecture.

Every interface, every abstraction and every virtualized service establishes new connections and creates new opportunities for failure. Ideally, regression testing accounts for this, but schedules, resources and, frankly, a lack of desire can dramatically limit effectiveness.

The potential benefits of smallsats may actually make the problem on the ground worse. If the future rate of change in space is considered, the timelines for a few programs are overlayed, the challenge can be quickly assessed.

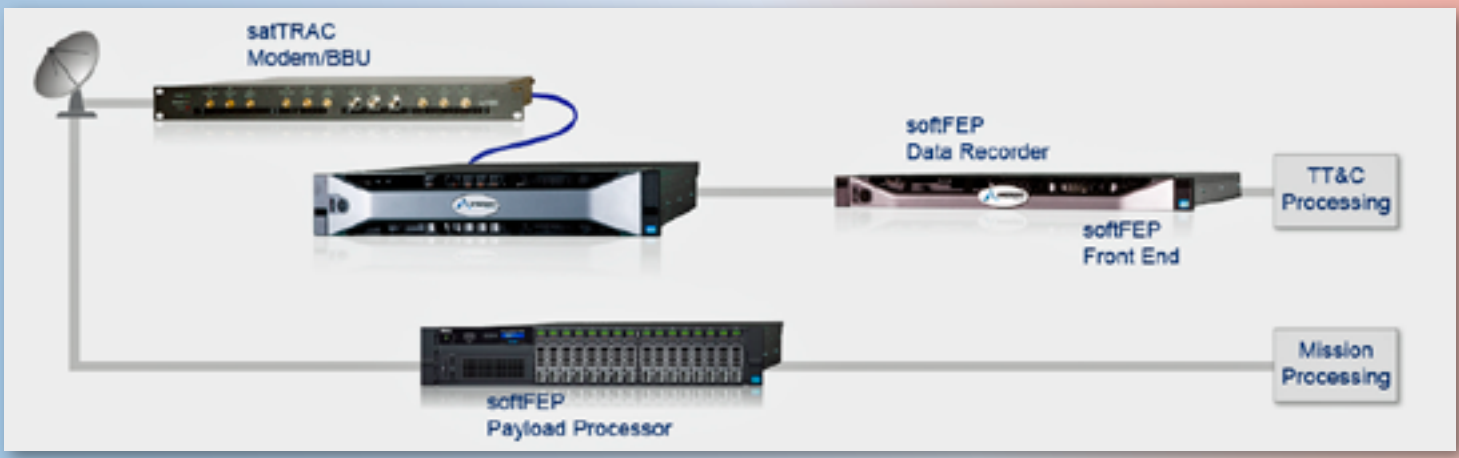
The amount of change could overwhelm a common ground system's ability to keep up — each new vehicle has the possibility of using a new waveform, higher data rates, new operational concepts, and alternate data formats. Standards can help, but standards take time and they establish an anchor. The benefits of smallsats become limited if they cannot take advantage of new technologies, prototype new concepts and meet an ever changing mission.

Traditionally, each mission had a dedicated control center and possibly their own ground network. Shared resources focused on the most common needs of each mission — monitor and control. Everything else was unique to the mission.

The technology available in space changed slowly and dedicated ground systems could easily keep up with the status quo. This paradigm changes with smallsats. The paradigm on the ground must similarly change.

The Solution is in Simplicity

As a software application product vendor, AMERGINT faces such challenges every day. AMERGINT supports more than 50 various satellite programs with mission-critical telemetry, command and payload processing systems. These include critical systems that support manned space flight, launch systems, Earth Observation (EO), and TT&C links on numerous programs.



Every customer is on their own timeline, has their own mission constraints, processes and security considerations. Each delivery has unique requirements, often stretching the bounds of current technologies and computing platforms. Yet, each delivery is verified, and updates are fully regression tested. Support calls are quickly handled and even larger system-level issues, beyond the scope of the applications the company provides, are rapidly resolved.

The key is in AMERGINT's SOFTLINK™ architecture. By minimizing the hardware required to interface with the physical world, and using common, atomic, software building blocks, the company's engineers are able to rapidly construct unique applications.

Each application is tailored to meet a customer's exacting requirements. The underlying building blocks, or software devices, are optimized, fully unit tested, and used across multiple systems.

Applications are designed to support specific vehicles and combined to create larger systems. Interfaces are well defined and the system architecture is open. Using RedHat Enterprise Linux, AMERGINT's products are security hardened and OS patches are kept up-to-date. As the customer's mission changes, their application is safely upgraded without fear of impacting other customers. The ripple effect is minimized and complexity is managed.

No application is more complex than it needs to be to meet the requirements of a single mission. That underlying philosophy, more than any other, is how AMERGINT has succeeded. And that philosophy may very well be the solution to providing a resilient enterprise-level ground system for the U.S. government.

Admittedly AMERGINT's SOFTLINK architecture is not the solution for a full enterprise ground system. The architecture is designed specifically for high performance, real-time, pipeline processing.

Yet, the philosophy of simplicity, agility, and openness that helped AMERGINT succeed is easily extended to meet the fundamental goals inherent in a common ground system.

Taking advantage of small, independent building blocks and constructing custom, virtualized ground systems for each vehicle is absolutely possible using today's technologies. These virtualized ground systems need to only meet the requirements of a single mission and extend all the way from the antenna to the operator. They can evolve through the life of that mission without impacting other users of the architecture. Even waveforms, data rates, network protocols, and other mission specific functionality can evolve independently with the mission.

A philosophy of simplicity is vital. The space industry is realizing this and sees smallsats as playing a pivotal role in enabling a more resilient space enterprise. They are easier to replace, create a smaller target, and enable an evolving space warfighting capability that matches an ever changing environment.

However, the rate of change this imposes means the ground system must be equally dynamic and a desire for a one-size-fits-all architecture may actually hinder this. Combining rapidly changing small satellites with legacy program requirements, then factoring in government procurement cycles and oversight may simply do nothing more than bring the ground system to a halt.

This must be solved — a proven approach is in defining an architecture specifically designed to allow each mission to independently evolve.

Smallsats provide rapidly-evolving resiliency in space. They will not wait patiently as the ground system attempts to keep pace.

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A PACSTAR/PKI PERSPECTIVE

Best Public Key Infrastructure practices for tactical networks

By Charlie Kawasaki, Chief Techincal Officer, PacStar, and Mark B. Cooper, President and Founder, PKI Solutions, Inc.

The U.S. Department of Defense (DoD) is increasingly concerned about security and the availability of tactical networks and tactical communications for traditional command and control (C&C), surveillance and reconnaissance activities, while simultaneously increasing the reliance on networking for new capabilities such as coordination of joint/coalition warfighting, electronic and cyber warfare, and fielding unmanned and robotic systems. Recent advances in mobile devices also increase the DoD's reliance on secure wireless networking.

When warfighters operate in forward positions or contested territory, their communications networks are exposed more directly to adversaries as a simple result of proximity. Furthermore, lack of terrestrial infrastructure and the need for mobility increase their reliance on wireless communications, exposing tactical communications and networks to interception and wireless attack. To ensure the security of these communications, encryption is a first line of defense.

To meet the increasing security needs of tactical networks and to enable the proliferation of new devices and capabilities using secure tactical networking, the DoD is increasingly looking to Public Key Infrastructure (PKI) as a primary means to manage identity/authentication and encryption.

PKI is making its way into tactical networks and onto devices used in tactical settings to enable:

a. *Access to enterprise applications — frequently using web servers with PKI enabled HTTPS security.*
b. *Tactically deployed applications, also using web servers protected with HTTPS.*
c. *Encryption of long-distance wireless communications links enabling communications between tactical units and bases or HQ — such as with satellite communications (SATCOM).*
d. *Encryption for wireless devices such as smart phones, tablets and laptops — in command posts or for dismounted soldiers.*
e. *Encryption for communications between coalition forces.*

PKI-enabled security is replacing older security technologies based on passwords, "pre-shared keys" (PSK), and government-developed classified encryptors. PKI is today's technology of choice because of its wide support in enterprise and internet-based companies, abundance of mature commercial technologies and strong security properties.

However, PKI is poorly understood and has complexities that have slowed adoption in tactical networks — challenges that

An example of the small form factor server running PKI technology as compared to a standard size server.

are now being addressed, in part, by new Commercial-Off-The-Shelf (COTS) technologies that aim to ease deployment. This will pave the way to make the benefits of PKI-based security available to tactical networks with a minimum of cost and difficulty.

Screen capture of the integrated user interface for managing tactical PKI infrastructure including Certificate Authorities and VPN gateways.

What is PKI?

At the highest level, PKI is a set of software and hardware technologies designed to manage the creation, storage, transmission and authentication of digital certificates and their associated encryption keys. A real world analogy to a digital certificate is a driver's license.

In the digital realm, a digital certificate serves as a way for a person or device to prove who they are, because a part of the PKI known as a Certificate Authority (CA) has issued and "signed" the certificate vouching for the person.

PKI-enabled systems provide strong authentication and encryption of data by using cryptographic functions. Unlike traditional identity processes, where users are identified by passwords, a PKI issues a certificate via known, trusted channels and binds the certificate to a cryptographic key pair. The key pair consists of a widely shared public key, and the holder of the certificate maintains a private key that is unknown to anyone else. A cryptographic function ties these two keys together so that actions performed by one, can be verified or decrypted by the other.

Why is PKI better?

PKI-based networks have significantly stronger security than networks that rely on passwords (and all of their known weaknesses) and has significantly better manageability properties than other encryption schemes such as pre-shared keys. Specifically:

- *PKI-based systems enable authentication and encryption to occur without the need to ever share highly confidential private keys.*
- *The keys in PKI-based systems can be used for one-way encryption functions where only the designated owner of the key can decrypt data. This prevents Man-in-the-Middle attacks without knowledge of the key pair.*
- *Certificates used in PKI-based systems can be easily revoked (such as in the event of a lost or stolen device).*
- *As opposed to PSK-based systems, PKI-based systems do not require unique sets of keys for all combinations of devices that must communicate with one another.*

Instead, a server only stores its own key pair and does not have to store all of the clients' keys. This dramatically reduces the workload required to manage sets of keys, and allows the number of network devices and users to scale to large numbers.

By leveraging a PKI, VPN environments can vastly improve their security posture. Cryptographic keys can't be socially engineered or easily stolen, so by requiring a certificate to authenticate to a VPN, organizations can have a much higher level of assurance of who or what is connecting to the network.

For applications such as HTTPS protected web sites or web applications, Transport Layer Security (TLS) uses certificates to identify hosts providing TLS services and to bootstrap the encryption process for clients and servers. TLS can also be used to support client-side authentication where clients must present a certificate to authenticate to a website rather than using password based authentication. This mutual authentication ensures both parties are able to positively identify the other.

Challenges with Tactical PKI

Similar to most advanced technologies, to gain the benefits of PKI in tactical networks, DoD organizations must implement technology, processes, procedures and training. While PKI provides a compelling set of scalability, manageability and security improvements over alternative key management schemes, rollout and deployment has side effects that require careful planning and consideration.

Some of these challenges include requirements to:

- *Acquire, configure, integrate, secure and manage multiple Certificate Authorities (with matching hardware security modules)*
- *Enable network access to CAs and the systems managing lists of revoked certificates*
- *Provisioning of devices including infrastructure and end-user devices, to use certificates and key pairs*
- *Developing certificate handling procedures and policies, including processes to monitor and renew expiring certificates*
- *Training security and system administrators to configure, monitor, and troubleshoot PKI-based systems*

Without careful attention to all of the items above, tactical communications systems may fail to establish encrypted communications or may expose security vulnerabilities.

Common failures include:

- *Generation of certificates that are incompatible with PKI-enabled devices/infrastructure.*
- *Device certificates expiring (each certificate must include an expiration date) during critical operations or at a location where a Warfighter does not have access to systems enabling renewal.*
- *Mismatches between the date/time settings of devices, causing communication failures.*
- *Inability of devices to communicate with systems providing certificate revocation status.*
- *Loss or theft of certificates.*

Tactical PKI Solutions to Consider

To successfully deploy tactical PKI, organizations should consider new developments in commercial-off-the-shelf technologies that can ease the complication and expense of deploying tactical PKI, while maximizing the security benefits. These technologies include:

Small form factor tactical PKI appliances
These appliances can host Certificate Authorities, Certificate Revocation List and PKI-enabled authentication systems. These solutions can minimize the size, weight and power impacts of the added security components required to forward deploy PKI, ensuring certificate generation and renewal can be accomplished in the field.

Small form factor tactical network appliances
PKI-enabled network appliances include VPN gateways, wireless mobility controllers, and web servers. These solutions can minimize the size, weight and power impacts of the added security components required to deploy PKI-enabled encryption.

PKI-optimized network and device management software
This type of software can simplify the management of certificates, streamline the device provisioning and certificate renewal process, and configure network devices to use PKI correctly. These solutions can reduce the training burden and eliminate configuration errors common with PKI administration tasks — enabling lightly trained communications specialists to use PKI with confidence.

Maximizing PKI's Benefits

PKI is increasingly in use by tactical networks and devices because of its maturity, interoperability, security and scalability.

To maximize the benefit from PKI's advantages, tactical network programs should consider using new COTS technologies to reduce the SWaP impact of fielding PKI systems and to reduce the added complexity and training associated with using the systems. Doing so will enable tactical networks to modernize their security posture, enable new secure communications capabilities and assist our defense organizations in meeting their mission.

pacstar.com/

pkisolutions.com/

Charlie Kawasaki is CTO for PacStar, a developer of secure tactical communications solutions. He has 35 years' experience in the software, networking and cybersecurity industry. He is a subject matter expert in the NSA Commercial Solutions for Classified program that makes extensive use of PKI for transmission of classified information.

Mark B. Cooper, President and Founder of PKI Solutions, Inc., has 27 years' experience in the IT industry and is an internationally recognized expert in PKI, including 10 years' experience at Microsoft where he advised Enterprises in their Microsoft-based PKI design and implementation.

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AN ATLANTECRF FOCUS

Drone SATCOM RF testing — A "Sparrow" becomes an "Eagle"...

By Geoff Burling, Chief Executive Officer, AtlanTecRF

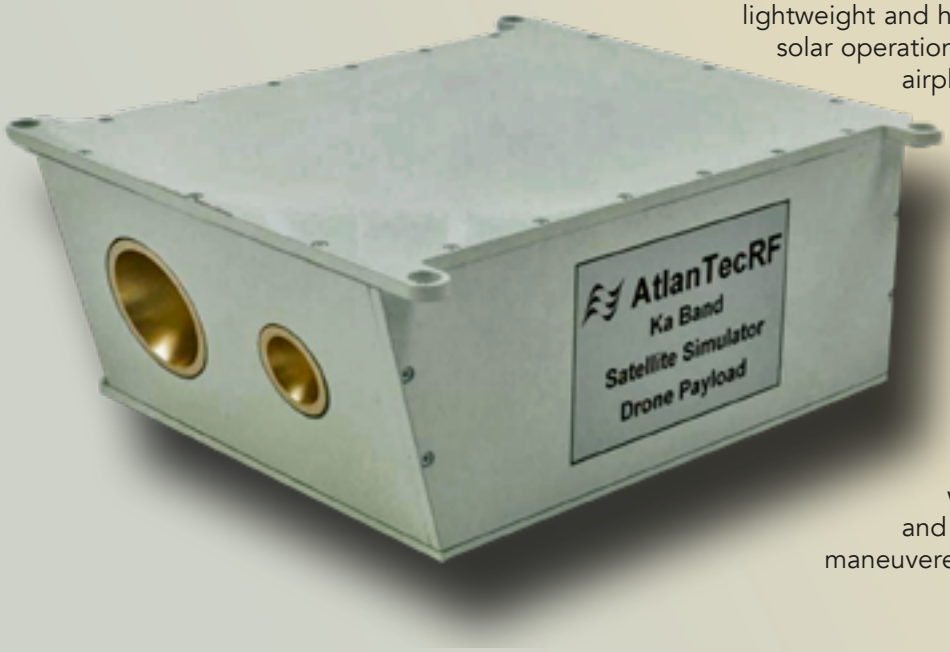
Off-air testing of 'ground station' equipment has come a long way since the dawn of geostationary satellite communications nearly half a century ago.

In those early days, the term 'ground station' meant precisely that — a large parabolic antenna along with the edifice's transmit and receive electronics, firmly anchored into the Earth's crust.

Each element of the station, more often than not a one-off design, would be individually tested before being assembled into a system. At that point, an occasional test on a less-than-overcrowded satellite transponder might be the final set up check before going live. Makeshift loop back tests using a basic RF mixer and microwave signal generator were also in evidence.

Today, the term 'ground station' has grown significantly in meaning to include any part of the link which is non-satellite. Mobility is the key word and, aided by the electronics miniaturization revolution, SATCOM-On-The-Move (SOTM) is a reality — platforms now including ships, aircraft, road vehicles, trains and manpacks.

Likewise, the testing of SATCOM systems has had to evolve to meet the needs of the modern user and, indeed, manufacturers. Equipment is now mass produced, on-satellite testing is frowned upon and the range of test parameters has outstripped the capabilities of that 'good old' mixer/LO check.



For the major terrestrial teleports, the rack mounted loop test translator still provides a cost-effective, easy-to-use, wired-in facility; however, attempting to use these, where the whole station is both compact and mobile, can be quite cumbersome.

What is required is a device that can quickly and efficiently test the entire system by accomplishing exactly what the satellite transponder does, but managing to do so locally and at a small fraction of the cost.

The UK based SATCOM RF Test company, AtlanTecRF, has pioneered the development of such instruments for several years with the company's Satellite Simulator products, such as the firm's LSS series, originally designed to tackle airborne, internet connectivity systems and its SNG series is driving down the cost of checking out van mounted news gathering rigs ready for broadcast, completed while the van is still in the depot.

Movement is the essence of the majority of current satellite communications systems and, therefore, test products have literally had to accommodate this trend. Carrying out the RF test while the platform is in transit has now become the order of the day, as antennas are often steerable, either mechanically or electronically, in order to keep the 'Bird' in view under all likely aspects.

To meet this challenge, AtlanTecRF has taken to the air with the company's Satellite Simulators. New compact lightweight and high efficiency flight models for battery or solar operation are now being produced for carriage by airplanes, helicopters and balloons (both low and high altitude), in all cases pretending to be a satellite for the purposes of testing the full capabilities of the ground/ mobile based terminal.

There are further complications — suppose a surface based platform is large and set on a course —– a train or a large ship, for example. Going through the entire process of orientation of an antenna, all the while mounted on such a moving platform, would be unbelievably time-consuming and costly. If the platform cannot be easily maneuvered, then the test gear must be agile.

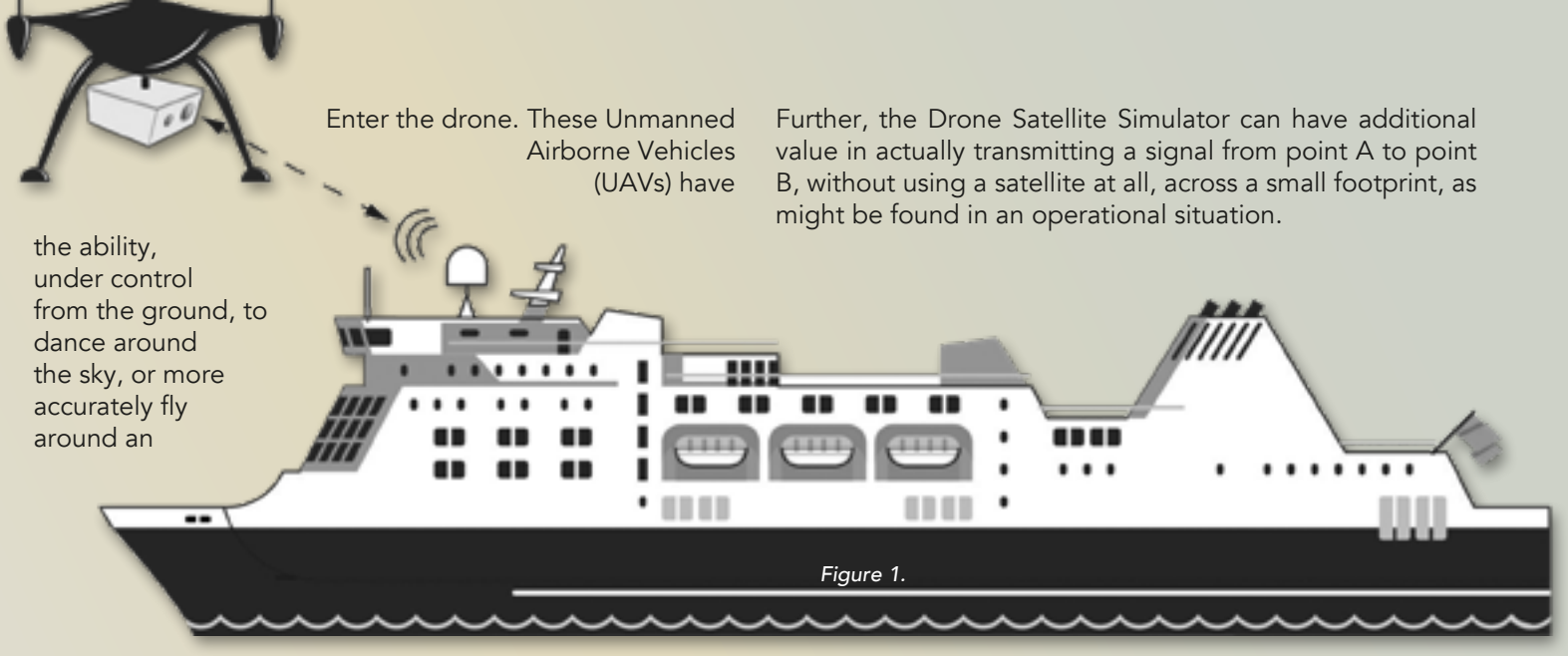


Figure 1.

Enter the drone. These Unmanned Airborne Vehicles (UAVs) have the ability, under control from the ground, to dance around the sky, or more accurately fly around an antenna platform in a way that will directly mimic the altitude change of that platform in service, but without the need for extraneous diversions from the UAV's normal course.

Designated the Drone Satellite Series (DSS Series), AtlantecRF's addition to the growing family of satellite simulation and loop test products has become the 'Sparrow' fluttering around, essentially emulating the 'Big Birds' that sit 22,000 miles away (***see Figure 1, above, which shows the DSS maneuvered to align with the ship's antenna prior to testing. Maneuvering the drone enables the testing of the terminal satellite tracking***).

The compatibility of this drone-mounted payload includes operation in either Ka-band (30 GHz uplink and 20 GHz downlink) or Ku-band (14 GHz uplink and 11 GHz downlink) with options of both circular and linear polarization.

In order to cover all of the probable operating frequencies of the antenna or system under test (AUT or SUT), the DSS may have a fixed turn-around or Local Oscillator (LO) frequency. In many cases, there will be a requirement for LO frequency tuning, which is effected by means of a low frequency command radio link to the drone. Data relating to the length and quality of the transmitted signal can also be gathered at the drone and returned to base via a telemetry channel.

In some cases, the DSS will draw its power from the same batteries providing lift to the UAV but it can also be supplied as self-sufficient with integral, rechargeable power storage.

Military Maneuvers

Such agility in SATCOM testing has obvious attractions for the military. The vast majority of systems for the army, navy, air force and marines are constantly on the move with little or no time available for testing and set up. Steerable antennas are commonly part of the kit and therefore AtlanTecRF's DSS 'Sparrows' fulfill the test function in all respects of agility and speed.

Further, the Drone Satellite Simulator can have additional value in actually transmitting a signal from point A to point B, without using a satellite at all, across a small footprint, as might be found in an operational situation.

If, in that situation, there is no geostationary or Low Earth Orbit 'Bird' available, the DSS 'Sparrow' is launched to bridge that short-hop communications gap.

The DSS also has a role to play in the interception of enemy satellite transmissions, picking up the uplink from foe SATCOM stations and transmitting a downlink to a friendly receiver who can either listen in to gain advantage or, indeed, transmit back false data for confusion effects. The applications for the military are wide ranging and very cost effective.

AtlanTecRF's 'Sparrow', a would-be 'Eagle', therefore provides a neat and economical solution to the testing of satellite communications terminals 'on-the-move.'

AtlanTecRF is a leading global manufacturer of RF and microwave equipment, components and interconnects. The company specializes in providing SATCOM RF test equipment to the Military, Government and Commercial organizations.

The firm's comprehensive range of equipment includes Loop Test Translators, Frequency Converters, Signal Generators, Noise Injection Translators, Noise Generators, Line Amplifiers and Satellite Simulators. Equipment covers bands L-, S-, C-, X-, Ku-, DBS-, Ka- and Q-.

Atlantecrf.com/satellite-equipment.htm

Geoff Burling is AtlanTecRF's CEO. His role, to drive growth across all aspects of the business by bringing to market a range of new and high quality RF and microwave components, interconnects and equipment. Geoff sets the company's long-term business strategy and takes the lead in building customer relationships and developing employees.

A passionate engineer, who uses his in depth knowledge and market expertise to ensure AtlanTecRF delivers the highest quality products, technical expertise and customer service demanded by today's engineers.

DEMYSTIFYING THE CNSSP-12, PART 2, WITH ANDREW D'UVA OF PROVIDENCE ACCESS COMPANY

By Ryan Schradin, Executive Editor, Government Satellite Report, and Senior Contributor

In the January issue of *MilsatMagazine*, the Ryan Schradin of the *Government Satellite Report* presented part one of a two-part conversation with Andrew D'Uva, the President of the Providence Access Company.

During Ryan's interview with Mr. D'Uva, discussed was CNSSP-12, a cybersecurity policy that impacts military satellites and commercial satellites that are used for national security missions.

During the first part of this discussion, Ryan and Andrew defined and explained CNSSP-12 and discussed how the technology has evolved and changed as the technology has been reevaluated and refreshed over time to keep up with shifting threats. Also examined was how the policy has helped commercial satellite communications providers service the military more securely.

In part two of this discussion, presented here, Andrew shares his predictions for what the next iteration of CNSSP-12 will look like, discusses how CNSSP-12 will impact the industry as well as provides his insights into how CNSSP-12 can shape space policy across the military in the very near future, thanks to the ongoing Wideband Satellite Analysis of Alternatives (AoA) being conducted by the U.S. Air Force.

Government Satellite Report (GSR)
The updated CNSSP-12 hasn't been released yet, but can you tell us what changes you're anticipating for commercial providers when the new, updated policy is revealed?

Andrew D'Uva (AD)
When the policy is released, I anticipate that we'll see an increased focus from the government on verifying the security posture of these commercial solutions. In the past, industry designed their systems and then — if they were going to play in the government and military market — they would go back and try to implement U.S. Government security requirements at a later stage. Now, they're working to incorporate these things into these satellite systems at design time and maintain them throughout the system lifecycle This shows industry is starting to think about security up front.

I anticipate that the new CNSSP-12 guidance will take advantage of that new attitude and incorporate much more information sharing between industry and government. This will ensure that the government is aware and informed about the steps that industry is taking to make their solutions reliable, robust, and secure.

This will lead government to require more security assurance systems in place for commercial satellite solutions, and more auditing. What I expect to see is much more focus on formalizing processes, taking a quality management approach, documenting things and making security part of the daily activities of managing these systems.

GSR
Will the CNSSP-12 refresh have any impact on the developing Wideband AoA and the USG's ability to better harmonize commercial and military space architectures?

AD
This is really an important question due to what is currently happening across the military in regard to satellite architectures. Up until now — in terms of SATCOM — the U.S. military has first relied on purpose-built satellites that they own and operate and looked to commercial meet excess demand. I'm talking about AEHF, WGS, and MUOS, which are used for different missions, including strategic nuclear command and control, tactical protected SATCOM, wideband SATCOM, and narrow-band, tactical SATCOM. All of those have performed well, and have their benefits and drawbacks.

Commercial wideband systems have been, until the recent introduction of managed services, largely transponded capacity where the Government's focus was ensuring positive control of the commercial satellite bus, not necessarily the underlying communications services.

Looking forward, the government is trying to figure out if it makes sense to continue to use these siloes of purpose-built constellations and use commercial to fill in the rest, or, to what extent should commercial infrastructure solutions be part of meeting the baseline demand and integrated into an enduring architecture that spans both government and commercial capabilities.

Despite there being a two-decade track record of success in using commercial solutions securely, for the government to be really comfortable in advocating for an integrated architecture — which is supported by industry — they need to be confident in the level of security and mission assurance.

The security requirements like those in CNSSP-12, NIST cybersecurity framework and other cybersecurity guidance and policies will ensure that the SATCOM industry can continue to participate in an environment that is increasingly non-benign. The environment that we're in and are moving into in the future is one in which our adversaries are seeking to do us harm through cyber effects. In this environment, the government needs to know that the security posture of wideband COMSATCOM systems is on par with purpose-built MILSATCOM systems.

I believe that many commercial systems are on par, but that's not the perception of some military decision makers. I've had senior level defense decision makers tell me that MILSATCOM is held to a higher cybersecurity standard than COMSATCOM. However, COMSATCOM satellites are held to the same requirements contractually by DOD. A lot of government personnel don't realize that – they think commercial is lesser than and not as secure as MILSATCOM.

They don't realize that COMSATCOM typically has secured locations, cleared personnel and high security standards. I've seen cases where once that's understood, military leaders are willing to consider commercial solutions, including their unique benefits. As CNSSP-12 applies to both military and commercial satellites, it should help military decision makers to adopt an enduring role in an integrated wideband SATCOM enterprise architecture for qualified COMSATCOM solutions.

Now, there are certain military SATCOM missions — such as nuclear command and control that are designed to work in a nuclear war environment — that requires a higher level of mission assurance than will ever be offered by commercial providers. Those special missions will always require costly, custom-built government satellites. But for most missions, COMSATCOM can fill that need if operators have implemented these security requirements. If some commercial offerors haven't implemented them, those solutions may be fine for other commercial or government uses, but not for national security missions.

GSR

What does the COMSATCOM industry need from the military to make this a reality? How can the military incentivize the industry to incorporate CNSSP-12 requirements into their systems and service offerings?

AD

The government needs to match its acquisition policy and practice to the policies that are levied. The government needs to move away from simply looking at the lowest priced solution as being the best solution. They first need to look at effectiveness and cyber security before looking at price. If there are participants in the acquisition process that don't meet these security requirements, they need to be ruled out as not technically acceptable. Then the military can focus on competition among the multiple compliant suppliers.

That has not yet happened. There are many reasons, but they primarily have to do with the way that COMSATCOM typically has been funded. COMSATCOM is typically funded from Overseas Contingency Operations money, which is short-term money that is available to a Combatant Command and it's not in the baseline DoD budget. Military purpose-built SATCOM programs, which are programs of record, don't charge fees to the user when they're utilized. This makes it seem that – from a user perspective – MILSATCOM is free while COMSATCOM costs money. The truth is that everything costs the taxpayer money. So, it's a function of how these budgeting processes work, and we need to fix that.

If you look at the FY18 NDAA, there is a section in there — Section 1601 — that assigns the Commander of Air Force Space Command as the DoD acquisition authority for COMSATCOM leases, in consultation with the DoD CIO. That is a major change and will be a very important one to watch in 2018. For the very first time — when that change is done — the organization that builds the wideband SATCOM programs of record will be the same as the organization that has authority to lease COMSATCOM capacity.

In the past, DISA handled commercial leases and Space Command handled programs of record. The two sides never needed to make a budget or resource decision about how to best spend taxpayer dollars between those two acquisition approaches for SATCOM capabilities. But, a year from now, there will be one acquisition authority.

This will be the first time the DoD will be organizationally structured to make those decisions and spend the taxpayer's money more effectively while still getting the resources and capabilities it needs. That also means that 2018 will be the first time that the government will be able to drive industry into participating in an integrated architecture. It's a great opportunity for all of us to ensure the nation has the SATCOM capabilities it needs.

www.providence-access.com/

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

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

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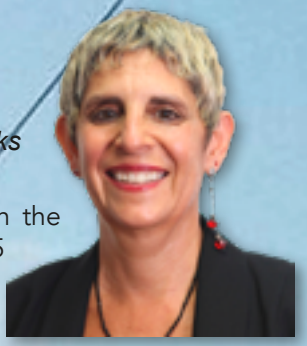
The Power of Satellite

Communication in Times of Emergency

By Doreet Oren, Director, Product Marketing and Corporate Communications, Gilat Satellite Networks



The fourth largest island in the Caribbean and home to 3.5 million people, the U.S. territory of Puerto Rico is best known for tropical landscapes and resort hotels — the perfect spot for a relaxing vacation.

All of that drastically changed when the island was hit by two Category 5 storms during the first three weeks of September.

The first, Hurricane Irma, passed just north of Puerto Rico, lashing the island with wind and rain without any loss of life or major damage to the island's infrastructure. Unfortunately, the same cannot be said of Hurricane Maria, which caused a level of destruction and chaos paralleled by few storms in American history.

Winds reached 155 miles per hour, causing tornado-like damage, while parts of Puerto Rico saw an unprecedented 30 inches of rain in a single day.

Gilat's SATCOM support in Puerto Rico for SPRINT's Emergency Response Team mission after the devastating hurricanes.

Gilat VSAT in position on St. John for SPRINT's ERT missions.

Two weeks after the storm abated, most of the island's residents still lacked access to electricity and clean water.

Communications Paralyzed by Hurricane Maria

Cellular service across Puerto Rico was almost completely wiped out by Hurricane Maria. According to the U.S. Federal Communications Commission (FCC), 95.2 percent of the cell sites in Puerto Rico — or 1,703 out of 1,789 — were knocked out of service, mainly due to widespread power outages.

At the same time, severe flooding, fiber disconnects and windblown microwave antennas brought down the terrestrial backhaul networks used to connect the cell towers to the various mobile service providers' core networks. FCC Chairman Ajit Pai called the storm's impact on communication networks "catastrophic."

Sprint Emergency Response Team Leads Network Recovery

Given the magnitude of the damage and required recovery effort, many of Puerto Rico's mobile providers are sharing resources to try to get people back online as quickly as possible.

Among those mobile providers, Sprint has played a vital role in restoring communications on the island, deploying Gilat's satellite communications to restore its cellular backhaul services. Sprint's skilled and battle-tested Emergency Response Team (ERT) specializes in providing critical communications in the toughest conditions.

Prior to hitting the ground in Puerto Rico and the U.S. Virgin Islands following Hurricane Maria, Sprint's tireless ERT already had deployed satellite communications in the aftermath of Hurricane Harvey in Texas and Hurricane Irma in Florida.

Satellite Backhaul was a Viable Option

As soon as conditions were safe enough to fly engineers to Puerto Rico, Sprint began to assess damage and restore service.

In spite of the devastation across the island, most of Sprint's towers remained standing and largely intact. This mini-miracle allowed Sprint to focus their initial efforts on restoring backhaul and power, starting with the most populous areas and then building out from that base.

Due to the extent of the damage to the terrestrial backhaul network, Sprint realized that satellite-based cellular backhaul was the fastest method to get critical voice and data networks back up and running.

"*Gilat's satellite backhaul gave us the flexibility to bring communications into hard hit areas using SatCOLTs (Satellite Cell on Light Trucks) and Fly Away Kits (FAKs) to provide cellular, LTE and IP data services during times of emergency and disaster*," said Tanya Jones, National Manager of Emergency Response Team Operations at Sprint.

Gilat's Fast, Reliable Cellular Backhaul Deployment

With millions severed from mobile and broadband services, Sprint could not afford delays in setting up its satellite-based backhaul solution — and that is why the company decided to work with Gilat, an end-to-end satellite connectivity solution provider with proven fast deployment capabilities for emergency scenarios.

"*We are currently working with Gilat on several projects using satellite backhaul in our network. Disaster recovery is an extension of those projects, and Gilat's solution allows us to quickly deploy satellite connections for cell sites without terrestrial backhaul*," added Jones.

Gilat's satellite-based solution consists of high-speed Capricorn VSATs at each cell site, centrally connected and managed by the SkyEdge II-c hub platform. While Gilat's satellite backhaul solution supports both 3G and LTE networks, Sprint deployed 3G services in most of the affected areas and LTE over satellite services in a handful of areas.

High Performance Capricorn VSAT

Gilat's high-performance Capricorn VSAT transmits data from the cell site via satellite to Sprint's satellite network hub. Designed to work with High Throughput Satellites (HTS), Capricorn's advanced adaptive transmission technologies maximize performance, improve service availability and reduce operational costs.

The Capricorn VSAT eliminates satellite latency concerns by using patented acceleration techniques over GTP/TCP in remote terminals and hubs. Currently used for high-speed broadband services in Sprint's nationwide LTE network, Capricorn supports 4G/LTE networks with speeds of up to 150 Mbps to the handset.

Using Gilat's VSAT, Sprint can provide reliable, high-speed voice, data and video services on a par with terrestrial performance. This includes the smooth running of data and video applications with a high-quality user experience.

VSAT Comms as a Critical Disaster Recovery Tool

"*Gilat's satellite backhaul solution allowed us to restore key cell sites within hours in areas where there were no communications*," said Jones.

Satellite connectivity has been deployed on the main island of Puerto Rico, as well as on Vieques, Culebra and the U.S. Virgin Islands. In addition to restoring cell sites and broadband connectivity, satellite backhaul is also being used to assist emergency management officials.

www.gilat.com

*Doreet Oren (**doreeto@gilat.com**) is Director of Product Marketing & Corporate Communications for Gilat Satellite Networks. Doreet Oren has been in this role since 2012 and has been responsible for defining product positioning, messaging, go-to-market strategies, market research, and analyst relations.*

Oren has more than 20 years of industry experience, and has held management positions in R&D, product management and product marketing for international high-tech companies. In this capacity she contributed to next-generation product definition and was responsible for delivering the company's vision to the media and analyst community.

Oren has published thought leadership articles in renowned international journals and has spoken at numerous industry conferences worldwide. Oren received a BSc in Computer Science from George Washington University.

Restoring Broadband Connectivity in Schools for the Deaf

The effects of Hurricane Maria were not limited to Puerto Rico's mobile communications; many schools, businesses and other institutions also lost their internet connectivity. Using Gilat's versatile Capricorn VSAT, Sprint was able to quickly restore broadband connectivity for some of these users as well.

Without a doubt, the most unforgettable installation of these satellite broadband solutions took place at two Puerto Rican schools for the deaf. Sprint's ERT engineers arrived at the schools, unpacked the Gilat equipment and installed a satellite dish on the roof connected to a Capricorn VSAT, providing connectivity for Video Relay Service devices.

But that's not all they brought — they also surprised the students with a gift of dozens of brand new tablets. While part of Sprint's team was busy setting up the satellite broadband service, two ERT members gave the children a lesson in satellite communications. In a few hours time, Internet connectivity was restored and the students were busy checking out the apps and features on their new tablets.

SPRINT's ERT team springs into action for comms support in Puerto Rico, post hurricane catastrophe.

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SatCom Frontier

PERSPECTIVES: 2018 IN SPACE... PROGRESS AND PROMISE

By Skot Butler, President, Intelsat General Corp.

The space industry is going through an exciting period of innovation and growth.

New technology, such as high-throughput satellites (HTS), have transformed space architecture and fundamentally changed what had been a fairly static sector. Technology in space is belatedly catching up to the profound advancements in terrestrial IT networks, something many have called the fourth Industrial Revolution.

In 2017, Intelsat and our partners led by example. The company continued to build out our fleet of HTS satellites. In the summer, the Intelsat EpicNG satellite Intelsat 35e was launched, powering Ku-band services for mobility and government applications in the Caribbean, trans-Europe to Africa, and on the African continent.

This past fall, the company launched Intelsat 37e, the fifth and largest Intelsat EpicNG satellite to be placed into orbit, featuring the globe's first all-digital HTS platform.

In June, Intelsat partner Kymeta began shipping its flat-panel antennas, which use electronic beam-steering instead of mechanical parts to follow a satellite across the sky. Kymeta's design makes satellite communications a viable option for new airborne, maritime, and ground-mobile use cases.

Partnerships with other antenna developers will facilitate the availability of flat, light-weight antennas that will be well-suited for in-flight communications from aircraft carrying government officials, as well as a smaller class of unmanned aircraft systems that could be used for non-military operations anywhere in the world.

Projecting forward into 2018, the Horizons 3e satellite is expected to launch in the second half of 2018, and will provide Intelsat EpicNG service to the Asia Pacific region completing our global HTS platform.

Artistic rendition of the Intelsat-37e satellite. Image is courtesy of Intelsat.

And, in mid-2018, Intelsat General will be launching IntelsatOne Flex for Aero, a new managed service that gives customers the flexibility to respond to surges in demand and shifts in geographic coverage under a predictable cost structure.

Customers will purchase "SATCOM as a Service," as opposed to simple bandwidth. Here again this brings space up to date with the overall trend towards "Everything-as-a-Service" in the broader IT market. This new model will, hopefully, be supported by potential change evolving on the SATCOM procurement front.

In May, all expert feedback and technical reporting is expected for the anticipated DoD wideband SATCOM Analysis of Alternatives (AoA) report. Once this data is collected, the report itself can be assembled.

In December, there could also be the beginning of DoD's implementation of Section 1601 of the National Defense Authorization Act. Among other things, this language assigns acquisition authority for COMSATCOM leases to the Commander of Air Force Space Command in consultation with the DoD CIO as of December 12, 2018.

Before the close of 2018, the company expects to launch the first Mission Extension Vehicle (MEV). This spacecraft uses a docking system that attaches to existing features on a satellite, providing life-extending services by taking over the orbit maintenance and attitude control functions of the satellite. At the end of service life the MEV can then guide the satellite to a safe graveyard orbit, preventing any potential orbit congestion or debris issues. Extending the lifetime of on orbit assets enhances operational flexibility and allows us to be more agile and responsive to customer requirements.

2018 also puts the launch of Intelsat partner OneWeb's LEO satellite constellation just a year away. We look forward to collaborating with OneWeb to develop integrated GEO/LEO services that will enable government customers to have critical fixed and mobile communications anywhere around the globe. Adding OneWeb's low-latency LEO broadband capacity to Intelsat's global fleet of GEO satellites will offer government customers an unprecedented level of coverage.

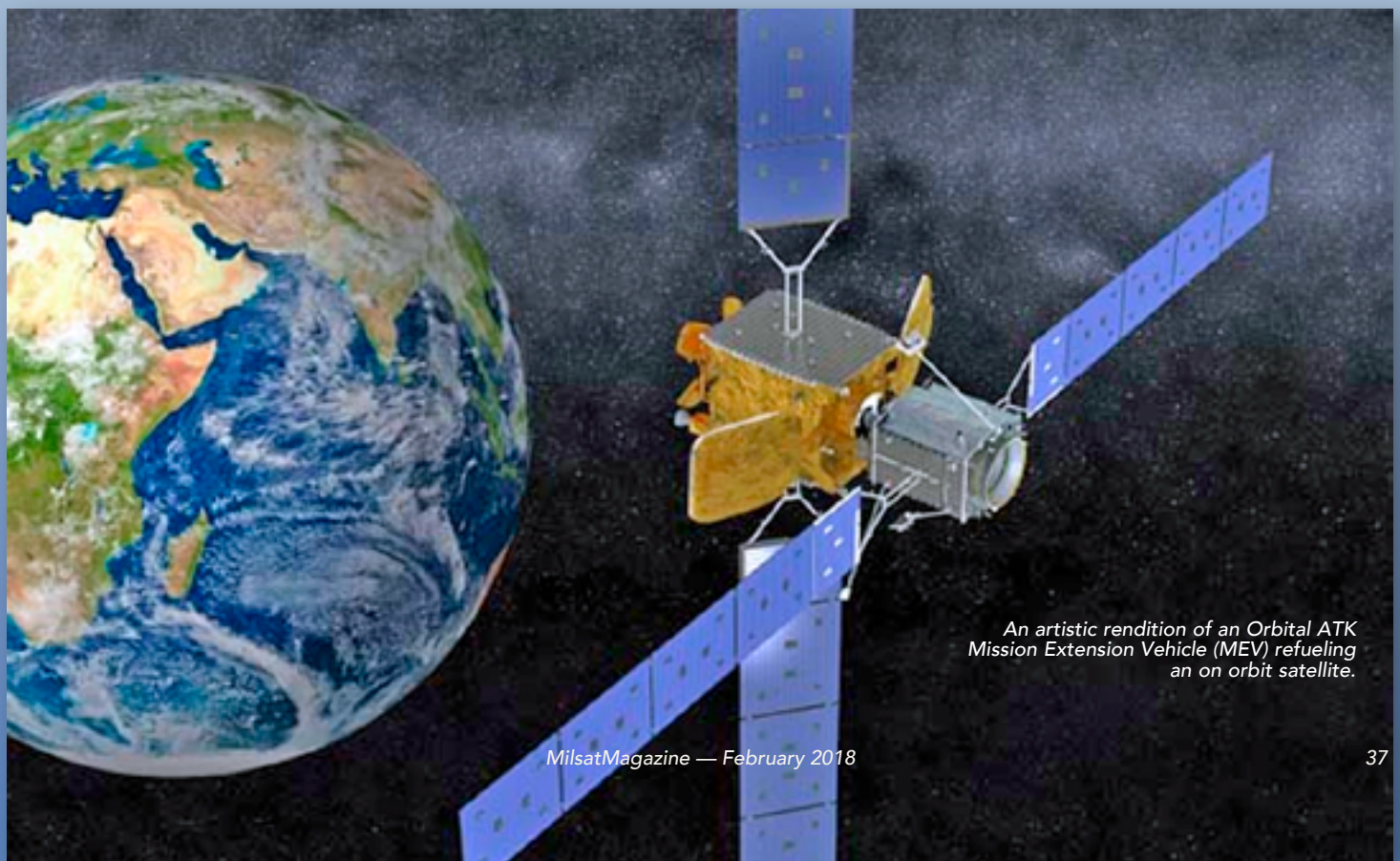
Intelsat General is working hard to make 2018 a big year in space. We're pushing forward on all fronts — new spacecraft, new terminal technology and new business models.

At Intelsat General, we understand the innovative power that reliable, secure and cost-effective satellite connectivity delivers. Better technology in space better supports the mission, and better defends our country.

Change of course takes time, especially for an organization as vast and complicated as the DoD. But the accelerating rate of technological change has fundamentally changed space, and commercial assets are becoming increasingly important as part of the overall architecture. The Intelsat General team will continue to look for opportunities, whether through internal development or commercial partnerships,to expand SATCOM capabilities to the company's government customers.

www.intelsatgeneral.com/

The preceding article is courtesy of Intelsat General's SatCom Frontier infosite and editorial team.



An artistic rendition of an Orbital ATK Mission Extension Vehicle (MEV) refueling an on orbit satellite.