SATCOM For Net-Centric Warfare

February 2014

MilsatMagazine

Changing The Way The DoD Buys SATCOM
PoV by SES GS' Osterthaler

Amplifiers For Troposcatter + COTM
CPI's' Cascone + McGovern

Security In A Global Network
Karl Fuchs

Government + Military SATCOM
NSR's Rousseau

Afghan Pullout Effects On SATCOM
NSR's Del Rosario

The New Faces Of Satellite
SSPI's Bell

The HPA Corner
Hosted Payloads Are From Mars. Mission Platforms Are From Venus.

Dispatches
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DISPATCHES

USAF 45TH SPACE WING—A MAJOR ASSIST FOR TDRS-L

Photo is courtesy of United Launch Alliance/Ben Cooper.

The 45th Space Wing provided flawless Eastern Range support for NASA's successful launch of the Tracking and Data Relay Satellite-L mission aboard a United Launch Alliance Atlas V rocket from Launch Complex 41 at Cape Canaveral Air Force Station, Florida, at 9:33 p.m. on January 23rd.

A United Launch Alliance Atlas V rocket launches January 23, 2014, at 9:33 p.m. Easter Standard Time, from Cape Canaveral Air Force Station, Florida.

The rocket carried NASA's Tracking and Data Relay Satellite payload into geosynchronous orbit, the normal drop-off point for communications satellites.

The rocket flew in the 401 vehicle configuration with a four-meter fairing, no solid rocket boosters and a single-engine Centaur upper stage. Airmen, Air Force civilians and contractors from throughout the 45th Space Wing provided vital support, including weather forecasts, launch and range operations, security, safety, medical and public affairs.

The wing also provided its vast network of radar, telemetry, and communications instrumentation to facilitate a safe launch on the Eastern Range.

The Atlas 5 rocket will carry the spacecraft on a two-hour flight to geosynchronous transfer orbit, the normal drop-off point for communications satellites. From there, TDRS-L maneuvered itself into a circular orbit and will undergo several months of testing before being declared operational.

"What an outstanding performance by an outstanding team," said Brigadier General Nina Armagno, the commander of the 45th Space Wing, who also served as the launch decision authority for the 45th Space Wing's second launch of 2014.

On January 6th, the 45th Space Wing Sharks supported a SpaceX launch of the Thaicom 6 communications satellite from Space Launch Complex 40 here.

The TDRS-L spacecraft is the second of three new satellites designed to ensure vital operational continuity for NASA by expanding the lifespan of the fleet, which consists of eight satellites in geosynchronous orbit.

The spacecraft will provide tracking, telemetry, command and high bandwidth data return services for numerous science and human exploration missions orbiting Earth. These include NASA's Hubble Space Telescope and the International Space Station.

TDRS-L has a high-performance solar panel designed for more spacecraft power to meet the growing S-band communications requirements.

Story is courtesy of 45th Space Wing Public Affairs.

45th Space Wing's control room. Photo courtesy of Patrick Air Force Base.

DISPATCHES

LLNL—Small Satellite Collision Patrol

From left to right: Brian Bauman, Vincent Riot, Darrell Carter, Lance Simms and Wim De Vries have developed and tested land-based mini-satellites that eventually will be used in space to help control traffic in space.
Credit: Photo by Julie Russell/LLNL

A team of Lawrence Livermore National Laboratory scientists are using mini-satellites that work as "space cops" to help control traffic in space.

The scientists used a series of six images over a 60-hour period taken from a ground-based satellite to prove that it is possible to refine the orbit of another satellite in LEO.

"Eventually our satellite will be orbiting and making the same sort of observations to help prevent satellite-on-satellite and satellite-on-debris collisions in space," said Lance Simms, lead author of a paper appearing in an upcoming edition of the Journal of Small Satellites.

To help satellite operators prevent collisions in space, the Space-Based Telescopes for Actionable Refinement of Ephemeris (STARE) mission, which will consist of a constellation of nanosatellites in LEO, intends to refine orbits of satellites and space debris to less than 100 meters. STARE is an ongoing LLNL project led by Wim de Vries, with Vincent Riot as lead engineer.

The Livermore team refined the orbit of the satellite NORAD 27006, based on the first four observations made within the initial 24 hours, and predicted NORAD's trajectory to within less than 50 meters over the following 36 hours. By refining the trajectory of NORAD 27006 with their ground-based payload, the team believes they will be able to do the same thing for other satellites and debris once their payload is orbiting Earth.

The tools and analysis used to capture the images of NORAD 27006 and refine its orbit are the same ones that will be used during the STARE mission. "This leads credence to the capability of STARE to accomplish its mission objectives," De Vries said.

Accurately predicting the location of a satellite in LEO at any given time is difficult, mainly due to the uncertainty in the quantities needed for the equations of motion.

Atmospheric drag, for instance, is a function of the shape and mass of the satellite as well as the density and composition of the unstable atmosphere. These uncertainties and the incompleteness of the equations of motion lead to a quickly growing error in the position and velocity of any satellite being tracked in LEO.

To account for these errors, the Space Surveillance Network (SSN) must repeatedly observe the set of nearly 20,000 objects it tracks; however, positional uncertainty of an object is about 1 kilometer. This lack of precision leads to approximately 10,000 false alarms per expected collision.

With these large uncertainties and high false alarm rates, satellite operators are rarely motivated to move their assets after a collision warning is issued.

The STARE mission aims to reduce the 1 kilometer uncertainty down to 100 meters or smaller, which will, in turn, reduce the number of false alarms by roughly two orders of magnitude, Riot said.

In the case of the Livermore team, they were able to reduce the uncertainty to 50 meters, well below the 100-meter goal.

DISPATCHES

USMC—Copernicus Award For Satellite Engineering Excellence

James Mayers (right), lead satellite communications engineer, and Martha Lively (left), satellite communications logistician, both in Marine Air-Ground Task Force Command, Control and Communications at Marine Corps Systems Command, set up the an inflatable satellite communications antenna Nov. 18 in Huntsville, Alabama. Mayers was selected by the Armed Forces Communications and Electronics Association and U.S. Naval Institute to receive the 2014 Copernicus Award for his contributions to the satellite communications field in 2013.

The lead satellite communications engineer for Marine Corps Systems Command's Networking and Satellite Communications will receive the 2014 Copernicus Award on February 11th, in San Diego, California.

James Mayers, who works in Marine Air-Ground Task Force Command, Control and Communications — or MC3 — at MCSC, will receive the honor for his role in helping the Marine Corps transition to lighter, more efficient consolidated satellite communications terminals.

"It feels good to be recognized," Mayers said. "But there were many others — from the logisticians, capabilities officers and the policy folks, as well as Capt. Kelly Haycock who did the cost and analysis — who deserve recognition for these accomplishments. I share this recognition with them."

The Armed Forces Communications and Electronics Association and U.S. Naval Institute present the Copernicus Award annually for individual contributions to naval warfare in command, control, communications, computers and intelligence, information systems and information warfare. They awarded 31 Navy, Marine Corps and Coast Guard active-duty military and civilians for superior performance in those fields in 2013.

"James' receiving the Copernicus Award comes as no surprise to us in MC3 or in the engineering competency," said Colonel Peter Reddy, program manager for MC3. "James is recognized across the Marine Corps and in many joint forums as a premier satellite communications engineer."

In 2013, Mayers served as lead engineer on an integrated product team charged with evaluating the cost, benefits and risks of consolidating the family of wideband satellite systems into a single program.

The team's goal was to provide recommendations that would significantly reduce the satellite communications footprint and cost, and lighten the transportation load for the MAGTF.

"Before [Operations Enduring Freedom and Iraqi Freedom], the Marine Corps relied on X-band satellite terminals, but after OEF and OIF, there were not enough terminals or bandwidth to go around," Mayers said.

As a result, the Corps expanded its use of satellite terminals, such as Support Wide Area Network Variant 3, or SWAN/V3, which operate on commercial bandwidth versus strictly military bandwidth. As the number and type of SATCOM terminals grew, so did the need to upgrade and maintain them.

"Rather than upgrade all the different terminals, we decided to do a consolidation that allowed us to select the best terminal and shed some of the older systems — which were larger and weighed more — while keeping the needed capabilities," Mayers said.

One such terminal, the Phoenix Tactical SHF Satellite Terminal, weighs 24,000 pounds and has to be transported using two Humvees and a generator trailer.

The team is in the process of upgrading SWAN/V3, which weighs only 5,000 pounds and can be transported using a trailer with an onboard generator, with an X-band satellite link to allow the Corps to retire the Phoenix and other legacy SATCOM terminals still in use by Marines.

Part of Mayers' job is to look at Marine Corps satellite communications systems and consider what commercially available systems can be folded into the military systems.

Another accomplishment that earned him Copernicus recognition is leading an effort to have Marines test the suitability of an inflatable satellite communications antenna, or ISA, in the field.

"I'm really excited about the ISA because it's far more portable than other systems," Mayers said. "It packs up into a 100-pound case and really drives toward the commandant's vision of a lighter, more expeditionary force."

Mayers hopes it will one day be available throughout the Corps.

"What's most rewarding is when we get to field something to the fleet that helps users," Mayers said. "In the engineering field, very few things happen quickly, so it's nice when you get to actually see [the systems] being used by Marines. Our work is never done. We have to keep improving things for our users."

Story by Monique Randolph, Marine Corps System Command

Satellite Interference Reduction Group—GAP Approval By ITU

The Satellite Interference Reduction Group's (IRG) newly formed advisory committee, End Users Initiative (EUI), has announced a major milestone, the approval by the ITU of recommendations for General Access Procedures.

The End Users Initiative (formerly RFI-EUI) has worked with the ITU to advise the technical requirements of updated access procedures, to ensure reduced risk of issues, such as satellite interference.

The recommendation provides access procedures for fixed-satellite service (FSS) occasional use (OU), transmissions to geostationary-satellite orbit space stations, in the 4/6GHz and 11-1/2 / 13/ 14GHz FSS bands.

An occasional use transmission is a telecommunication application in the fixed-satellite service where the transmission lasts a limited period of time ranging from minutes to months.

"We are delighted at the news from the ITU," said Dick Tauber, Co-Chair, EUI.

"We believe that these recommendations will have a significant impact on reducing satellite interference, by ensuring a certain number of requirements at the point of access," he said.

The full recommendation can be viewed via the ITU infosite via this direct link.

The IRG infosite is located at:
http://www.satirg.org/

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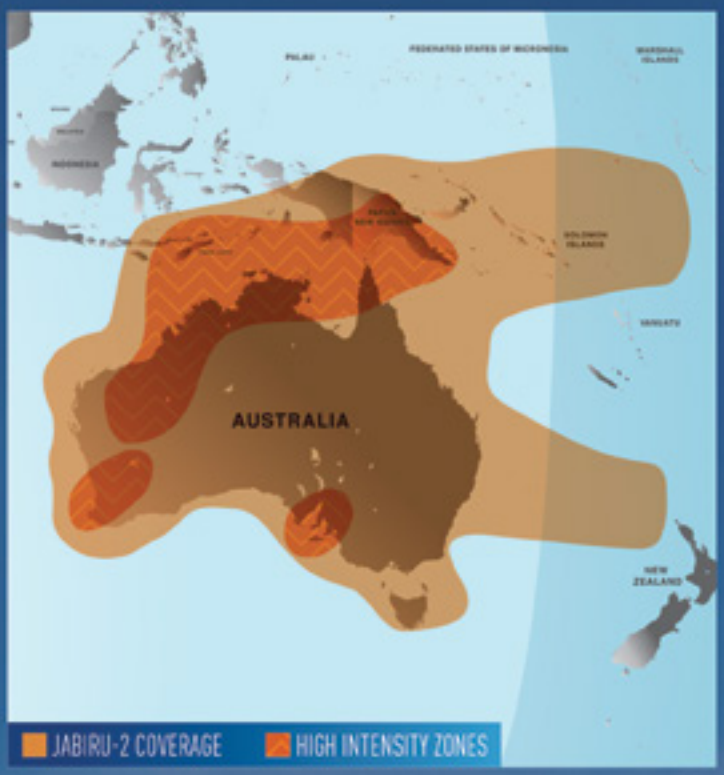

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DISPATCHES

Penn State + USAF—Students Recruited For SATCOM Ops Center

New York native Heather Nelson is the second student to participate in the Air Force Tactical Exploitation of National Capabilities Program, which is allowing her to earn her master's degree in aerospace engineering at Penn State while gaining hands-on experience working at the Swift satellite's Mission Operations Center on campus.
Image: Curtis Chan

Penn State University

Penn State and the U.S. Air Force are offering select students an opportunity to earn their graduate degrees while gaining hands-on experience working in the Swift satellite Mission Operations Center (MOC).

Swift is NASA's versatile multi-wavelength observatory combining a new technology gamma-ray camera with sensitive telescopes in the X-ray and ultraviolet-optical bands, on a robotic fast-slewing spacecraft. It is the premier observatory for discovery and follow-up of gamma-ray bursts (GRBs) and other transient sources.

Since its 2004 launch, the satellite has been exclusively controlled and operated by the Penn State MOC.

Tom Taylor, senior research engineer at the Applied Research Laboratory and Swift's project manager, explained, "Every two years NASA reviews the project, and over time, financial support has declined. We needed to figure out how to be efficient and effective with our funds."

He and John Nousek, Swift's principal investigator and professor of astronomy and astrophysics in the Eberly College of Science, worked with representatives from the Air Force Academy, Air Force Space Command and the Air Force Tactical Exploitation of National Capabilities Program (TENCAP) office at Schriever Air Force Base to create a process for competitively selecting students from the academy to complete a Swift MOC internship while pursuing an advanced academic degree at Penn State.

Taylor said, "Senior-level Air Force personnel had previously expressed an interest in Swift, so it made sense to approach them. Col. Rex Kiziah played a very pivotal role in establishing the program."

Kiziah, professor and head of the Department of Physics at the academy, explained, "The idea was appealing because there are a lot of capabilities at the Swift MOC for exactly what Air Force Space Command needs: Junior space professionals who have a broad education in addition to operational experience. It was definitely a unique and perfect partnership." He added that there are not enough national scholarships for top-notch academy students who are ready to go on to graduate school. "This program provides another opportunity for our cadets to get an advanced education."

Students are selected based on their experiences and performance at the academy, leadership potential and academic achievement.

The Air Force TENCAP subsidizes the student's tuition and internship expenses. In turn, the student, upon earning a graduate degree, goes to work for three years on a special assignment in the TENCAP.

Chris Hassa, who received his master's degree in aerospace engineering last December, was the first student selected to attend Penn State through the program.

The Lyons, Colorado, native noted that working on Swift was a little different from what he was used to at the Air Force Academy. "Swift has a highly automated operations center. So, I went from working with a team of about 30 to a team of five."

Hassa added that Penn State is far more research oriented than he anticipated. "It was interesting to look at some problems that haven't been explored yet."

He is spending the next three years at Schriever in the TENCAP, working to improve existing systems and implement new systems for classified projects.

Aerospace engineering graduate student Heather Nelson currently works in the MOC. Her responsibilities include working on the science operations team, which meets every morning to discuss requests from scientists around the world, investigate GRBs and review daily plans. The upstate New York native said, "Then I do my best to help implement them."

A member of the fencing team, Nelson joked that she is busier with her three graduate courses than she was when she took seven undergraduate classes at the academy. She will graduate with her master's degree this December and relocate to Schriever, where she will follow in Hassa's footsteps. Nelson said with a smile, "Chris and I are essentially second lieutenants in a group that's typically comprised of senior billets."

Nousek explained the students' experiences in the MOC give them specific knowledge that will help them advance in their careers. "Working on Swift provides them with a skill set that makes them more competitive."

Established in 1977, the Air Force TENCAP searches for emerging technologies that can rapidly translate into a capability. It takes a diverse group of people, including aviators, space operators, cyber operators, intelligence officers, scientists and acquisition program managers, and places them in a close environment along with senior leader oversight.

Sven Bilén, head of the School of Engineering Design, Technology and Professional Programs, served as Hassa's academic adviser and co-advised Hassa's master's thesis with David Spencer, professor of aerospace engineering. Hassa's thesis work involved estimating the drag coefficient of satellites using Swift satellite attitude and orbit data.

Bilén said the University hopes to continue a pipeline of Air Force students through the initiative. "This program aligns well with Penn State's mission to be a top military-friendly university."

Story by Stefanie Tomlinson, Penn State University

DISPATCHES

Airbus Defense & Space—Making Good MUSIS Together

Airbus Defence and Space, number two worldwide in space technologies, has been selected by the French armament procurement agency DGA to build the user ground segment (UGS) of the MUSIS (MUltinational Space-based Imaging System for surveillance, reconnaissance and observation) satellite program.

This new deal includes providing through-life support for the user ground segment for 12 years.

In 2010, Astrium signed the contract with the French Space Agency CNES to manufacture the satellites. The MUSIS program satellites are set to progressively take over from the Hélios program satellites.

This ground segment will allow programming commands to be sent to the MUSIS satellites and to receive, generate, distribute and store the images they acquire.

The UGS will also enable the French armed forces to access all the existing and future satellite observation sensors.

The ground segment is set to become operational by 2017, the year in which the first satellite of the MUSIS program will be launched.

"This contract has been secured thanks to the technological excellence and reliability of Space Systems in the space domain, which is currently experiencing especially intense competition in major institutional markets," said François Auque, Head of Space Systems (formerly Astrium).

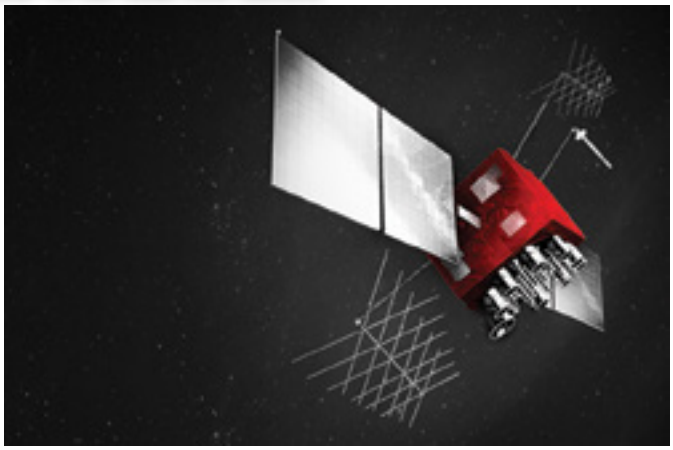
"Astrium's know-how and that of our partners, chief among them the teams at Cassidian—with whom we now work together in the same division—made all the difference with our customer, the DGA. I would like to thank the DGA for renewing the faith they have shown in us for more than 25 years now."

The industrial team put together by Airbus Defence and Space in building the UGS is made up of leading defence and network infrastructure specialists (Capgemini, CS, etc.) and innovative SMEs such as Magellium.

The Airbus Defence and Space infosite is accessible at: ***http://www.airbus-group.com/***

DISPATCHES

McMurdo Group's Search... Technologies + More Prove To Be Real Life Savers



A new global leader in end-to-end search and rescue (SAR) and maritime domain awareness (MDA) solutions has debuted—McMurdo Group.

Comprised of Orolia's former Positioning, Tracking and Monitoring Division1, McMurdo Group combines proven brands Boatracs, Kannad, McMurdo and Techno-Sciences, Inc. into the industry's first, single-vendor provider of end-to-end life-saving and tracking solutions including distress beacons, satellite connectivity infrastructure, monitoring/positioning software and emergency response management.

"The formation of McMurdo Group is an opportunity to lead, simplify and educate a fragmented, complex market with a unified strategy and an expansive solutions offering unparalleled in the industry today," said Jean-Yves Courtois, CEO of McMurdo Group. "The end result will be the acceleration of more effective and innovative SAR and MDA solutions that will create benefits for our customers today and in the future."

With more than 140 years of collective experience in emergency preparedness, vessel management and rescue operations, McMurdo Group will focus on three key strategic areas:

- • Search and Rescue—improving the rescue chain to further expedite recovery times
- • Maritime Domain Awareness—driving convergence of fleet/vessel management, intrusion detection and coastal surveillance solutions to improve operations and enhance security
- • Technology Partner Solutions—integrating technology, component and software platforms into third-party solutions to extend SAR and MDA systems into new markets and geographies

McMurdo Group' Search + Rescue currently manufactures nearly 25 percent of the world's emergency beacons, which are used by major aviation, marine and military customers including Airbus, Boeing, the U.S. Coast Guard, the British Royal Navy and several government agencies.

The group recently announced its intention to acquire Techno-Sciences Inc. (TSi), one of the world's top providers of ground station infrastructure for the International COSPAS-SARSAT satellite-based search and rescue system, which has helped save nearly 35,000 lives since 1982.4

In a typical satellite-based search and rescue scenario, ships, aircraft or individuals transmit distress signals from an emergency location beacon via satellite to a fixed ground receiving station.

The ground receiving station calculates the location of the emergency and generates an alert for the appropriate rescue authorities.

Today, the beacon-to-alert process can take several minutes or longer. McMurdo Group's involvement in the development and implementation of the next-generation COSPAS-SARSAT system (MEOSAR) will reduce this time to a few seconds.

"McMurdo Group will soon be able to provide the entire COSPAS-SARSAT ecosystem—from the beacons to satellite ground station infrastructure to mission and rescue control center software—resulting in seamless integration and enhanced performance between the various SAR ecosystem components," said Jeremy Harrison, President, McMurdo Group SAR Solutions. "We are also very excited about the role we will play in delivering an end-to-end next-generation MEOSAR solution to our customers."

The current fragmentation of environmental, security, safety and SAR situational awareness systems provides an opportunity for convergence. McMurdo Group plans to contribute to this effort by integrating its broad range of MDA, SAR and Automatic Identification System (AIS) technologies into solutions that streamline operations and protect assets.

For example, McMurdo Group's fleet/vessel management software, currently used on thousands of vessels and in five of the six top inland waterway transportation companies in the U.S., includes AIS beacon and man overboard (MOB) functionality.

McMurdo Group also provides an offshore safety/security solution used to manage the world's longest contiguous coastal surveillance system (3,000km) and maintain simultaneous AIS tracking on up to 60,000 vessels.

Irwin Rodrigues, President, McMurdo Group MDA and Technology Partner Solutions, said, "By having a common software platform, for example, the entire user experience becomes less complex resulting in unified interfaces, better adoption levels and reduced costs. Customer support will also be key to provide the proper service levels required for these mission critical applications."

Through its Technology Partner Solution strategy, McMurdo Group will offer customized products and expertise in hardware/software product design, development, engineering and manufacturing to partners.

McMurdo Group's specialized industry knowledge will be critical as partners integrate SAR and MDA functionality into their current and future offerings. A large provider of satellite systems and services, for example, partners today with McMurdo Group to design and supply specialized beacons to monitor fishing fleets in over 70 countries.

"Whether it is a beacon, satellite infrastructure or monitoring software, we will have a solution," said Jean-Yves Courtois, CEO McMurdo Group. "This will allow our existing customers and partners as well as those in new markets or geographies to confidently build solutions for remote or high-risk environments knowing they are backed by the intelligence and technology of the SAR and MDA industry leader."

For more information about McMurdo Group, please visit ***http://www.mcmurdogroup.com***.

DISPATCHES

C2SAT + IAI—Into Stabilization

C2SAT + IAI—Into Stabilization
C2SAT has signed a major contract with Israel Aerospace Industries (IAI) for the delivery of 1-meter stabilized antennas based on the company's new P9 platform.

The market has embraced the new 4-axes stabilized platform for VSAT antennas, the P9, a small pedestal for dishes up to 1.3 meters. While the larger P7 platform has demonstrated the benefits of C2SATs patented 4-axis technology in Ku-, X- and C-band applications, the market has requested a smaller platform for the majority of often crowded Navy and Coast Guard vessels.

In August of 2013, Israel Aerospace Industries (IAI) signed a three year contract with C2SAT for delivery of 1-meter stabilized VSAT antennas based on the P9 platform.

The Security and Defence branch of Indra has, for several years, been using C2SATs P7 platform to support an X-band application used by the Spanish Navy. Indra supplies its own X-band solution for high performance redundancy integrated with stabilized platforms and radomes from C2SAT.

The BAM (Buque Action Maritima) vessels are 94 meters in length and 2575 tons in displacement and are modern offshore patrol vessels with mission versatility operated by the Spanish Navy. Photo courtesy of Navantia.

Download the product datasheet and read more about C2SAT's OEM products at ***http://www.c2sat.com/products***

Airbus Group—Group Dynamics

Taking off into the New Year, the EADS group has been rebranded as "Airbus Group" and unites all the company's activities under a single and strong brand—Airbus Group also renames two of its three Divisions. Going forward, the Group is home to:

—Airbus, focusing on commercial aircraft activities

—Airbus Defence and Space, integrating the Group's defence and space activities from Cassidian, Astrium and Airbus Military

—Airbus Helicopters, comprising all commercial and military helicopter activities

Joining forces under the strong Airbus brand gives all our operations and employees the thrust and lift to capture global markets.

In the course of this rebranding, the GEO-Information Division of Astrium Services becomes the program line "Geo-Intelligence," part of the "Communication, Intelligence & Security" business line of Airbus Defence and Space. This new branding will neither impact the way that this part of the company operates, nor its legal structure, or its customer's points of contact into the organization. Customers can be assured that, while they will see a logo change, they will continue to receive the level of service they are used to.

Furthermore, the Airbus Group is launching procedures to change the legal form of its holding by 2015: Once renamed, Airbus Group N.V. shall turn into a European Company, Airbus Group SE (Societas Europaea) which will continue to be registered in the Netherlands.

This legal conversion has no impact on the organization or operations of the Group. Both the legal name change into Airbus Group N.V. and the conversion of the legal form into SE are subject to approval of the Annual General Meeting (AGM) of Shareholders: while adoption of the new name is expected at the AGM in May 2014, the legal conversion is targeted for approval in May 2015.

Airbus Geo-Intelligence infosite is located at:
http://www.astrium-geo.com/

DISPATCHES

Thales Alenia Space + Arianespace—Dual Mission Includes Italian + French Defense Payloads

The launch of Arianespace' VA217 mission. Photo courtesy of Arianespace.

The French-Italian dual (defense-security) broadband telecommunications satellite Athena-Fidus was successfully launched on February 6 by Arianespace from the Guiana Space Center, Europe's spaceport in Kourou, French Guiana, using an Ariane 5 launch vehicle.

Thales Alenia Space is the program prime contractor on behalf of the French and Italian space agencies, CNES and ASI respectively, and the French and Italian defense ministries (procurement agency DGA for France and Segredifesa for Italy).

The Athena-Fidus satellite operates in the EHF and Ka bands, and features the latest civil telecom standards, DVB-RCS and DVB-S2. It will provide services to the French and Italian defense ministries, as well as to these countries' security organizations (homeland security, police, firefighters and other civilian organizations).

Built on a Spacebus 4000 platform, the satellite weighed over 3,000kg at launch and offers a design life exceeding 15 years Athena-Fidus marks the first European collaboration (Franco-Italian) on a military/dual space telecom program.

Arianespace opened a busy year of mission activity in 2014 with another Ariane 5 success today that added key numbers to the company's commercial launch services track record.

This 250th launch performed by Arianespace lifted off from the Spaceport in French Guiana at 6:30 p.m. local time on February 6th, delivering a dual-satellite payload into geostationary transfer orbit: ABS-2 for global satellite operator ABS, and Athena-Fidus for the defense/homeland security needs of France and Italy. The mission's duration was just over 32 minutes.

Ariane 5 provided another highly accurate performance, with the following estimated orbital parameters at the injection of its cryogenic upper stage:

- Perigee: 244.4 km. for a target of 244.4 km
- Apogee: 35,937 km. for a target of 35,934 km
- Inclination: 6.00 deg. for a target of 6.00 degrees

Released first during Flight VA217 was the ABS-2 relay spacecraft, which had a mass at liftoff of approximately 6,330 kg. and was the first satellite for which ABS directly awarded the launch contract—selecting Arianespace. As a result, Arianespace continued its support of new and developing communications market entrants, with more than 80 percent of satellite telecommunications operators selecting the company for their first launch milestones–placing the emphasis on quality, reliability and availability.

ABS-2 was produced by SSL (Space Systems/Loral) and will deliver optimized telecommunications, direct-to-home (DTH) broadcasting, multimedia, and data transmission services for Africa, Asia Pacific, Europe, the Middle East, Russia and the Commonwealth of Independent States (CIS). Its operational geostationary orbital slot will be at 75 degrees East.

Deployed at the conclusion of Flight VA217 was the Athena-Fidus payload–the 50th satellite launched by Arianespace for European defense purposes. Thales Alenia Space built the 3,080-kg.-category spacecraft as prime contractor to customer Telespazio, working on behalf of the French CNES and Italian ASI space agencies, as well as the French DGA and Italian Segredifesa defense ministry organizations.

Athena-Fidus is to deliver telecommunications services to both armed forces and homeland security units in France and Italy, operated from a geostationary orbit position of 38 degrees East.

In orbiting Athena-Fidus, Arianespace opened a key year at the service of European institutions. Included in the company's planned 2014 mission manifest are flights for the European Commission's Galileo and Copernicus flagship programs, along with launches with the European Space Agency's final Automated Transfer Vehicle and the Intermediate eXperimental Vehicle (IXV) atmospheric reentry demonstrator.

This launch was the 216th flight of an Ariane-series vehicle. It marked the 72nd Ariane 5 mission overall, and the 58th consecutive success for Arianespace's workhorse heavy-lift vehicle.

The next Arianespace mission is planned for March 7, using another Ariane 5 to orbit the ASTRA 5B and Amazonas 4A relay satellites. Amazonas 4A–built by Orbital Sciences Corporation for Hispasat–arrived in French Guiana this week aboard a cargo jetliner.

Ariane 5 has been successfully launched from Kourou, French Guiana, for the 58th time in a row, once again confirming the reliability of the European launcher developed and built by Airbus Defence and Space, the world's number two space technology company.

This launch brings Airbus Defence and Space one step closer to delivering its Comcept system. The Comcept system will allow the French armed forces to join their counterparts from the United States and the United Arab Emirates (UAE) in a very select group of armed forces with military Ka-band networks.

Awarded by the French defence procurement agency DGA, the development of Comcept is set to draw on the additional Ka-broadband satellite capability brought to the French armed forces.

The required performance for this, the 216th Ariane flight—for which Arianespace conducted launch operations—was 10,214 kg in geostationary transfer orbit, including 9,410 kg for the two satellites, ABS2 and Athena-Fidus, on board. The remaining mass was for SYLDA dual launch system and satellite integration hardware.

Airbus Defence and Space has unique expertise in new Ka-band satellite communications networks, acquired notably through its work on the UAE's Yahsat system and Eutelsat's KA-SAT satellite. The Comcept contract, which will run for 17 years, will be compatible with future commercial satellite networks operating in Ka-band, and will provide global coverage.

Airbus Defence and Space has been overseeing Ariane 5's industrial network since 2003, covering more than 550 companies (more than 20 percent of them SMEs) in 12 European countries. Airbus Defence and Space also manages the entire industrial supply chain, from the manufacture of equipment and stages to the complete integration of the launcher in French Guiana, in line with the customer's specifications.

DISPATCHES

Lockheed Martin—Plying The Polar Regions With WCDMA + MUOS

Lockheed Martin recently demonstrated that the U.S. Navy's Mobile User Objective System (MUOS) satellites may help solve communication challenges in the arctic.

Now people spread over thousands of square miles could have access to more secure, reliable communications.

During company-funded tests, MUOS voice and data signals reached much farther north than previously thought, just 30 miles and 0.5 degrees of latitude shy of the North Pole.

A team demonstrated Wideband Code Division Multiple Access (WCDMA) capability using three different radios as far north as 89.5 degrees, under peak orbit conditions.

This inherent voice and data access is well beyond the 65-degree system requirement. The additional coverage comes at a time when demand is surging for dependable polar communications.

"As the arctic becomes more accessible, the U.S. and its allies need reliable communications to maintain a safe and secure presence," said Paul Scearce, director of Military Space Advanced Programs at Lockheed Martin. "Demand for consistent voice and data services will only increase. The area is experiencing more shipping, tourism and natural resource exploration, which will also likely increase demands for search and rescue."

The demonstrations show MUOS has an advantage over legacy satellite communications.

Dr. Amy Sun, Narrowband Advanced Programs lead at Lockheed Martin said, "We did these evaluations to explore growing arctic communication demand, yet it also highlighted the dramatic capability improvements the WCDMA architecture will provide. Using MUOS, we were able communicate from the aircraft at high latitudes, which wasn't the case for the legacy Ultra High Frequency signal."

Lockheed Martin performed two rounds of testing late last year aboard an L-100 aircraft, the commercial variant of the C-130 Hercules. Multi-hour flights set out from Barrow, Alaska to test transmit and receive capabilities.

Three terminal providers developing MUOS-compatible radios were on board, including the General Dynamics PRC-155 Manpack, the Harris PRC-117G Manpack and the Rockwell Collins ARC-210 V5 airborne terminal.

Anticipated shipping lanes will see full coverage 24 hours a day, with signal gradually dropping off farther north to 89.5 degrees, which can be achieved at peak orbit conditions. Airborne terminals can connect further north than sea level terminals, but at reduced durations. The Antarctic should see similar performance results. Lockheed Martin plans on evaluating MUOS signal strength there, as well.

Lockheed Martin's MUOS infosite is accessible at ***http://www.lockheedmartin.com/us/products/mobile-user-objective-system--muos-.html***

DISPATCHES

Air Force Space Command—50th Space Wing—New Antennas Added

A Remote Tracking Station Block Change, or RBC, antenna is installed at Kaena Point Tracking Station in Hawai'i. Photo courtesy of USAF.

The 50th Space Wing has earned operational acceptance for four of its remote tracking station antennas from Air Force Space Command January 29th, signaling the start of full operations for the Air Force's newest satellite communication assets.

The Remote Tracking Station Block Change, or RBC antennas represent the latest telemetry, tracking and command technologies in the Air Force.

The RBC antennas work as part of the Air Force Satellite Control Network, or AFSCN, of ground stations located around the world.

These ground stations are vital to space operations because they allow satellite flyers in the Air Force's space operations squadrons to communicate with the satellites they command and control.

"Spacecraft owners must periodically perform telemetry, tracking and commanding supports," said Brian Bayless, the 22nd Space Operations Squadron AFSCN integration chief. "The AFSCN operations fall under 22 SOPS. The AFSCN provides access to more than 150 Department of Defense, national intelligence, civil and allied nation satellites. Now, we have four new technologically advanced systems to accomplish that mission."

The effort to bring the RBC antennas fully online represents the first upgrade to remote tracking station antennas since Automated Remote Tracking Station 1 antennas were installed in 1987.

"We've earned operational acceptance for our RBCs at New Boston Air Force Station, N.H, Oakhanger, England, Guam and Kaena Point, Hawaii," Bayless said. "They are significant upgrades to our legacy ground system."

The new antennas offer the AFSCN a non-keyhole environment, in other words, they can track an orbiting satellite during its entire pass over a tracking station.

"The legacy antennas moved up to 87.5 degrees, but then they have to be manually rotated to 92.5 degrees and reacquire the satellite before tracking the remainder of the pass," Bayless said. "That's just the way the old tracking mechanism worked. With the RBC antennas, we don't lose track of the satellite as it passes over. So, the new antenna gives us an additional five degrees of telemetry."

U.S. government contractors built and installed the RBC antennas at a cost of approximately $25 to $35 million at each site.

"These aren't trivial upgrades," Bayless said. "We've replaced the antennas and the hardware, software and control equipment needed to operate them."

These are just the latest AFSCN antennas to earn operational acceptance. The Air Force began installing RBC antennas at remote tracking sites back in 2004, when the first was constructed at Vandenberg Tracking Station.

"We've been turning over antennas sequentially at AFSCNs sites since then," Bayless said.

Following installation, antennas are tested and operated for a matter of time before Air Force Space Command leaders deem them ready for operational acceptance.

"Operational acceptance is a basically a formal turnover of a weapon system to the command," Bayless said. "Air Force leaders are saying, 'you now have a top-rated system and it's ready to move into full operational status.'"

In the RBC's case, operational acceptance means the Air Force can take full advantage of a multitude of enhancements provided by the new antennas. They not only offer a better tracking range, they provide an 85 percent increase in redundancy and allow the AFSCN to perform in a more automated fashion.

"What RBC antennas allow us to do is automate satellite contacts," said Lt. Col. Aaron Gibson, the 22 SOPS commander. "The AFSCN can now ingest our network tasking order schedule, build satellite contacts from that schedule, run the contacts and de-configure without a human touching a keyboard."

Bayless said the RBC antennas also should reduce, by up to 50 percent, the time tracking stations spend preparing for a satellite pass.

Story by Scott Prater, Schriever Sentinel

Astrium + Airbus Group—A Name Change, But No Game Change

A new year and a new name for a major company, and what, if any, changes in the company?

Taking off into the New Year, the EADS group has been rebranded as "Airbus Group". Uniting all its activities under a single and strong brand, Airbus Group also renames two of its three Divisions. Going forward, the Group is home to:

- Airbus is now focusing on commercial aircraft activities.
- Airbus Defence and Space, is integrating the Group's defence and space activities from Cassidian, Astrium and Airbus Military.
- Airbus Helicopters, is comprising all commercial and military helicopter activities.

In the course of this rebranding, the GEO-Information Division of Astrium Services becomes the program line "Geo-Intelligence", part of the "Communication, Intelligence & Security" business line of Airbus Defence and Space.

This new branding will neither impact the way that this part of the company operates, nor its legal structure, or its customer's points of contact into the organization. Customers can be assured that, while they will see a logo change, they will continue to receive the level of service they are used to.

Furthermore, the Airbus Group is launching procedures to change the legal form of its holding by 2015: Once renamed, Airbus Group N.V. shall turn into a European Company, Airbus Group SE (Societas Europaea) which will continue to be registered in the Netherlands.

Both the legal name change into Airbus Group N.V. and the conversion of the legal form into SE are subject to approval of the Annual General Meeting (AGM) of Shareholders: while adoption of the new name is expected at the AGM in May 2014, the legal conversion is targeted for approval in May 2015.

These steps complement the transformation process of the Group. In less than two years, the company has not only modernized its governance, broadened the shareholding structure, and united the Headquarters but also thoroughly overhauled its company strategy and launched the integration of the defense and space businesses.

Airbus Group is a global leader in aerospace, defence and related services. In 2012, the Group – comprising Airbus, Airbus Defence and Space, and Airbus Helicopters—generated revenues of 56.5 billion euro and employed a workforce of over 140,000.

Advantech Wireless accredited products and advanced technologies have provided leading-edge innovations for over 20 years. We provide diverse and extensive technologies and products for video and data transmission and proven flexibility for specialized solutions.

The Raptor series of transportable DVB-RCS hubs are turn-key systems which can be deployed in less than 1 hour, to enable a wide range of public and/or private network topologies with satellite interactive terminals.

The AMT 73L was the World's first deployed modem with certified compliance to the MIL-STD-188-165A standard, designed to fulfill two way satellite communication requirements in Defence Satellite Communications Systems (DSCS).

The 25W GaN X-Band BUC is perfectly suited for harsh environments such as man-pack terminal deployments. Constructed in a compact cooling enclosure for outdoor operation is the smallest fully integrated unit on the market today.

Advantech Wireless' S5920M Ruggedized VSAT Terminal is a complete DVB-RCS modem that can be used in very harsh environment as in military and desert operations. The RAR9160 Ruggedized Router is designed to provide best in class performance for critical applications under harsh environments.

Advantech Wireless KR Series products empower system integrators to address US and allied defense departments and government agencies with rapid, reliable, secure, global satellite & wireless communications networks abilities.

X-Band 25W GaN BUC
for man-pack terminals

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Raptor - DVB-RCS
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S5920M Ruggedized
DVB-RCS VSAT Terminal

KR Series - WBR-2000
Mobile Wireless WAN or LAN

Ruggedized Router
RAR9160

Solid State
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AMT 73L Modem
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POV:
CHANGING THE WAY THE DOD BUYS SATCOM

By Robert T. (Tip) Osterthaler, President + Chief Executive Officer, SES Government Solutions

Congressman Mike D. Rogers (R-AL) recently published an article entitled, "Changing the Military's Approach to Commercial Satellite Communications," and it was refreshing to see a leading member of the House Armed Services Committee seriously addressing an important if somewhat obscure issue.

I suspect there haven't been many votes either won or lost over the question of whether (or how) the Department of Defense reforms the way it buys commercial satellite capacity, but the stakes are surprisingly high and the Congressman and his staff deserve a lot of credit for taking the lead in a discussion that has been ongoing (but, unfortunately, going nowhere) for years.

In his article, Congressman Rogers points out that current DoD SATCOM procurement practices are both costly and risky, facts which no one in the industry would dispute. While I doubt it is their official acquisition strategy, today's reality is that the government buys commercial capacity when and where it needs it, accepting whatever performance it provides, paying whatever it costs, and accepting the risk of non-availability. To be fair, other than being much more expensive than it needs to be, this approach has worked satisfactorily during our decade of heavy engagement in Iraq and Afghanistan. Unfortunately though, that's not likely to be the case in the future.

Regarding cost, reform efforts to date have focused primarily on changing the way DoD leases satellite capacity. In the 2014 National Defense Authorization Act, Congress calls on the Pentagon to prepare a strategy for the expansion of satellite acquisition authorities that would effectively help to reduce risk and cost to the Department. Specifically, DoD is asked to examine the use of longer and larger quantity leases, and those changes will help bring lease costs into line with what large commercial customers pay.

To his credit, though, Congressman Rogers is looking beyond cost. In his piece, he observed that the current methodology "lacks strategic foresight, puts our troops at risk, and disadvantages our industrial base." Over the past year, he has led an effort to ensure our warfighters are not dependent for critical communications on satellites that are under the control of unreliable partners, such as China, and his efforts have yielded budget language that places strict limits on the practice. That legislation went a long way toward addressing the risk and industrial base questions, but the issue of "strategic foresight" remains.

In recognizing that the manner in which the government purchases satellite capacity today is short sighted, Congressman Rogers has taken a logical leap that others have missed: Commercial satellite capacity is essential infrastructure for our troops and will remain so in the future.

Photo of Tip Osterthaler at the Capital in Washington D.C., courtesy of SES GS. The photo is by Jason Dixson.

Congressman Rogers is greeted after stepping off the airplane during his recent CODEL he led to United Arab Emirates and Afghanistan. The visit included several meetings, security briefings, site visits and lunch with soldiers from Alabama's Third Congressional District.
Rogers serves as the Chairman of the House Armed Services Strategic Forces.
Photo courtesy of Mike Rogers' Congressional website.

Given that reality, we should not limit ourselves to buying it in the same way we buy janitorial services, using one-year contracts and behaving as if there were an unlimited number of potential providers. In fact, the most important satellite related language in the bill encourages the Defense Department to continue its efforts to implement alternative buying strategies that would better leverage the capabilities of commercial industry and ensure the future availability of adequate commercial bandwidth to meet DoD needs.

By encouraging the Pentagon to explore the use of completely new approaches and expressing his support for innovation in the acquisition of satellite communications, Congressman Rogers has opened the door to a variety of alternative approaches, such as the ongoing Space and Missile Systems Center Pathfinder program that seeks to acquire more reliable and affordable communications capabilities to support the US Africa Command.

Although previous, similar initiatives have been killed by defenders of the status quo inside and outside of government, the Chairman's intervention ensures that future attempts to innovate will at a minimum be given a fair hearing.

From an industry perspective, Chairman Rogers' leadership and initiatives such as Pathfinder are welcome because they enable us to look further into the future and justify investments in the capabilities the Department is likely to need from us years from now, something we have had great difficulty doing in the one-year-lease environment. This is particularly important if we are to allocate the capital necessary to build up capacity in the vast Asia Pacific region where there is currently little available spare bandwidth.

As the pace of operations slows in the Middle East and Southwest Asia and requirements grow in Africa and the Pacific, demand and supply patterns for satellite communications are changing, but what is not changing is the fact that commercial satellites provide much of the communications backbone needed by our Soldiers, Sailors, Airmen and Marines wherever they are stationed.

By taking the lead in improving the way the government and the satellite industry work together, Congressman Rogers is looking after the interests of both our warfighters and our taxpayers.

About SES GS

In SES Government Solutions, SES has combined three decades of Americom's USG experience with the global capabilities and assets of the SES satellite fleet. The result is a new organization, formed in April 2010, created solely to provide bandwidth and hosted payload opportunities to U.S. Government, Intelligence and Civilian agencies.

SES Government Solutions continues Americom's corporate record of serving the U.S. Government SATCOM market since 1973. As the only operating company within the SES family focused on USG, we back every Government mission with a long-standing record of technical achievement, operational excellence and service commitment.

From additional bandwidth to hosted payloads, SES Government Solutions brings world class experience, industry-leading reliability and unrivaled resourcefulness to your mission. No one delivers solutions as quickly or as cost effectively as SES Government Solutions.

With 55 satellites already in orbit covering 99% of the world's population, and a robust satellite schedule that includes 4 satellite launches between 2013 and 2015, SES Government Solutions ensures future capacity and an abundance of hosted payload opportunities in the years ahead.

The SES GS infosite is located at: ***http://www.ses-gs.com/***

About the author

Mr. Robert Tipton (Tip) Osterthaler joined SES in 2006 when he became the President and CEO of AMERICOM Government Services. Since then, the wholly-owned subsidiary of SES SA has grown and integrated with other government focused elements within SES to become SES Government Solutions (SES GS).

During his tenure at SES, the U.S. Government business has been transformed from a product oriented sales channel into a solutions-focused independent subsidiary responsible for all aspects of SES's US Government business, including planning for the next generation of satellites that will be needed by government users. Under his leadership, SES Government Solutions transitioned into a Proxy Corporation structure, allowing the company to broaden its business base to include a wider range of customers and technologies. In 2008, SES GS entered into a ground breaking contract with the US Air Force to fly the Commercially Hosted Infra Red Payload known as CHIRP, and in 2009, SES GS did its first ever acquisition, enabling the company to better serve the intelligence community.

From 1997 until 2006, Tip was a Senior Vice President at Science Applications International Corporation (SAIC) where his last assignment was Deputy General Manager of the Strategies, Simulation and Training Business Unit, a 2,300 person organization which provides government and commercial clients with advanced modeling, simulation and training solutions.

Prior to joining SAIC, Tip served in the U.S. Air Force for 28 years, retiring as a Brigadier General and Deputy Assistant Secretary of Defense for European and NATO Policy. Earlier positions included Vice Commander of the Air Intelligence Agency and numerous command and senior staff assignments. Mr. Osterthaler is a Command Pilot with over 3,200 hours of flying time in fighter aircraft including multiple models of the F-15 Eagle. Upon his retirement, he was presented the Defense Distinguished Service Medal, the nation's highest peacetime defense award.

Tip holds a BS in Economics from the U.S. Air Force Academy and an MBA from Texas A&M University. He is also a graduate of Harvard University's Senior Executives in National Security and National and International Security Management programs, the Royal College of Defense Studies in the United Kingdom, the Air War College, and the Marine Corps Command and Staff College.

AMPLIFIERS FOR TROPOSCATTER + COTM APPLICATIONS

By Mike Cascone + Gary McGovern,
Communications & Power Industries LLC (CPI)

Over the past several years, Communications & Power Industries LLC (CPI) has manufactured many products for use in Beyond Line of Sight (BLOS) and Communications on the Move (COTM) applications.

In this article, the amplifier requirements for which system integrators have asked and the innovative products that CPI has provided in response will be discussed.

Troposcatter / Beyond Line Of Sight (BLOS)

Troposcatter (also known as "Tropo" or BLOS) has become an increasingly popular mode of communication over relatively short distances due to certain advantages the technology has versus satellite links. Troposcatter links are secure, have no ongoing transponder cost and, with modern modem technology, can support high data rates. Troposcatter links typically vary from 50 miles to 200 miles in length.

Much work has been done in recent years in Ku-band at 15GHz, which is ideal for providing up to 40MBits at distances of 50 to 100 miles. While rain fade has occasionally been a negative factor in Ku-band satellite uplinks, a 1990 Dartmouth College study for the United States Air Force found that rain actually aids the signal in troposcatter communications by increasing the signal to noise ratio. The study was replicated by a commercial integrator at a variety of sites, setting off a stream of system development in this frequency band.

CPI has worked with leading U.S. prime integrators to demonstrate mobile systems using both 750W and 250W Ku-band SuperLinear® Traveling Wave Tube (TWT) amplifiers, which are demonstrably more efficient and lighter in weight than alternative types of amplifiers. These high power amplifiers (HPAs) have been tested and have performed successfully in severe environments, including desert, high altitude and high temperature. Transit case, rackmount and trailer mounted systems have been deployed in the United States and overseas. Systems in Asia and the Middle East also employ CPI amplifiers.

As with many satellite uplink applications, prime power to output power efficiency is crucial for troposcatter systems, as many of these systems are designed for mobile or remote deployment. The ratio of prime power to output power efficiency is stated as a percentage using the formula [Linear RF power (kilowatts) / Prime Power (kVA)].

For longer links, C-band is preferred by most operators. CPI has a GEN IV klystron power amplifier (KPA) that has demonstrated superior reliability and efficiency to legacy klystron systems, some of which are still in use. While previous systems consumed more than 10kW of prime power per amplifier, the multi-stage depressed collector (MSDC) technology used in the CPI GEN IV draws less than half this amount. This lower power consumption also lowers the temperature of the components, including the klystron, enabling more than 100,000 hours MTBF in the field. A separate independent study produced for the US Army showed that the GEN IV is the best alternative among TWTs, solid state power amplifiers (SSPAs) and KPAs for upgrading certain legacy tropo systems.

Even longer troposcatter links are possible using S-band systems with high power amplifiers. A 2GHz system is being evaluated using a 2.5kW GEN IV amplifier at high data rates. Multiple amplifiers can be combined to provide 5 or 10 kW for extreme link distances, which do come into play in some networks.

Solid State HPAs using Gallium Nitride (GaN) semiconductors in C-band with output powers of 500 to 1000 Watts and above are now in development at CPI. GaN provides superior efficiency due to the high-band gap properties of this material compared to older Gallium Arsenide (GaAs) devices.

The GaAs amplifiers, both corporate and spatially combined, have an efficiency of only about 7 percent when operating at linear output power, far less than mature MSDC TWT-based HPAs. The newer GaN devices show promise of efficiencies at linear power almost double that of GaAs devices, which will enable the next generation of solid state products to match the efficiencies of linearized TWTs up to about 300W. Above that, klystrons and TWTs will still hold an advantage in power consumption, size and weight. Furthermore, GaN devices will only be competitive in cost (as measured by $/W) up to perhaps 1000W, due to the high cost of these products.

As the cost of GaN comes down with time, this threshold will change. However, for the next number of years GaN will mostly displace other GaAs products and applications rather than tube-based amplifiers.

The importance of linearity in BLOS systems cannot be underestimated. Most modern communication links are highly modulated phase-shift-keyed waveforms. In legacy systems, QPSK approaches are now being upgraded to 8PSK, 16PSK, and even higher-order modulation schemes. At higher orders of modulation, the effect of phase errors becomes more and more critical. Any perturbation, whether phase noise, AM-PM or multiple transmitted signals, can induce bit errors. In some cases, the transmission can even lose lock and break down the link.

For the reasons indicated in the preceding paragraph, CPI has employed the unique SuperLinear® TWTAs—these optimize efficiency while maintaining excellent linearity. CPI also makes use of a pre-distortion linearizer, an advance which cancels out phase and amplitude shift in TWT, klystron and SSPA devices.

Communications On The Move (COTM)

By definition, COTM is typically referenced as a vehicle equipped with a satellite antenna that is able to establish communications with a satellite and maintain the link while the host vehicle is on the move. The need for broadband connectivity from moving vehicles has increased for military and commercial applications, whether marine, terrestrial or airborne. Attention to COTM systems is of the utmost importance in present and future communication platform development. CPI, as a provider of SSPA, TWTA and BUC solutions, offers a variety of field proven and preferred products for use in the COTM systems.

CPI maintains a close working relationship with industry system providers. These system providers strive to offer the most complete COTM system architecture possible while addressing issues facing all typical network designs and even some non-typical ones, as well. As an experienced designer and manufacturer of BUC and amplifier solutions, CPI is able to incorporate the latest technical advantages into the key RF components, thus enabling system designers to utilize these advantages in their final package.

Common industry practices have shown that current COTM systems will support MESH, STAR and SCPC links, however, there are challenges to this approach. Occasionally, a system will have to be "Global," as opposed to "Regional," meaning that beam switchover and IP routing re-convergence are required as the system moves from one beam to another.

In addition, the need for very small antennas is critical for COTM systems. There are other physical limitations and challenges posed by the need for security and advanced encryption that the latest modems are starting to address through forward error correction techniques.

CPI GEN IV KPA

CPI 40 + 80W Ku-band. GaN-based BUCs.

On the RF side, the challenges include thermal concerns, physical package size, efficiency and linear RF output power. CPI offers a variety of RF solutions to address the challenges facing COTM systems, including solid state amplifiers using GaN technology and TWTAs using SuperLinear® HPAs. In each case, the advanced technology in CPI products enable system designers to employ the most current and proven advantages.

CPI offers C-, X-, Ku- and Ka-band transmit and receive amplifiers, BUCs and LNAs/LNBs. The addition of transceiver systems (with an L-band front end) rounds out CPI's complete portfolio of RF products that are available for incorporation into commercial or military applications. These products, coupled with CPI's significant global support structure, make CPI a key partner for system design/integrators as they strive to provide the best total package solutions for all satcom requirements.

As COTM incorporates integrated networks for seamless land, sea and air communications, the need for deployable, ruggedized, reliable and secure solutions will continue to grow. Future networks undoubtedly will require global capability, more modulation schemes and the ability to be easily re-configured. The new market opportunities presented for amplifiers in COTM applications are exciting.

CPI believes these needs will be best addressed by system designs that are able to take full advantage of advances in technology that result in smaller, more efficient, flexible, cost effective solutions. With decades of experience in providing leading-edge communications products to global customers, CPI combines the ability to provide advanced technology products with an outstanding reputation of reliability and support, providing peace of mind to our growing customer base.

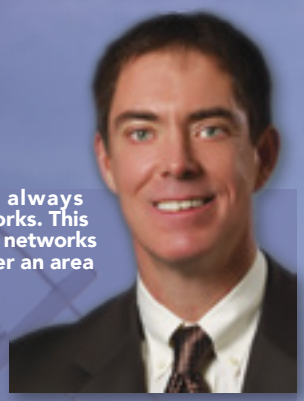
About the authors

Mike Cascone is the Director of Applications Engineering for CPI Satcom in Palo Alto, CA. CPI is the world leader in microwave tubes including klystrons, TWTs, and magnetrons.

Gary McGovern is a Director of Business Development at CPI Communications & Medical Products Division. He has been involved in the satellite industry since 1983. He co-founded Paradise Datacom (now part of Teledyne) and Locus Microwave (now part of CPI).

SECURITY IN A GLOBAL NETWORK

By Karl Fuchs, Senior Contributor



The need for security is always paramount in military networks. This is especially true for satellite networks where data is broadcast over an area the size of a continent.

The first line of defense of data in a satellite network is, of course, encryption. Virtually all military data transmitted over satellite is encrypted with a Type 1 High Assurance Internet Protocol Encryptor (HAIPE). Although this level of encryption is virtually impossible to crack in any reasonable timeframe, even with a great deal of resources at an adversary's disposal, a surprising amount of useful information still could be gleaned by simply monitoring transmissions and analyzing patterns or by intercepting seemingly innocuous packet header information.

For example, consider a simple IP-based time division multiple access (TDMA) network utilizing HAIPE encryption. Simply broadcasting the forward and return channels over satellite would give access to an extraordinary amount of information which when coupled with other intelligence could prove very detrimental. A HAIPE encryptor builds a secure tunnel with a routable IP header to the destination site. Therefore, a unique source and destination address is associated with each packet. In addition, the tunnel IP header has a Type of Service (ToS) field as all IP packets do.

When a packet is encrypted by a HAIPE, the ToS field of the red side packet is "promoted" to the ToS field of the tunnel IP header to ensure proper per hop behaviors across a network. When transmitted over satellite, an adversary has access to the entire tunnel packet header including source and destination address as well as ToS field of the tunnel IP packet. Beyond the IP packet, all TDMA-based systems employ a layer two protocol and control plane information. The layer two protocol information includes a layer 2 or MAC address for each remote router in the network while the control plane information contains a wealth of traffic engineering and acquisition activity data which could be exploited by an adversary.

Every piece of information available to an adversary opens the door to an attack. Access to the ToS field of an IP packet would allow an adversary to identify the transmission of high-priority or flash over ride data. Knowledge of layer two MAC addresses leaves a system much more vulnerable to spoofing, a case in which an adversary could obtain a satellite router and spoof the MAC address of an inactive remote, potentially infiltrating a network.

All of these vulnerabilities and more can be overcome by utilizing a robust Transmission Security (TRANSEC)-enabled system. At its most basic level, TRANSEC encrypts all of the layer two and control plane information including the MAC addresses using most often AES 256 bit encryption. X.509 digital certificates are often employed to counter any attempts at spoofing, and the most sophisticated systems even have mechanisms to obfuscate acquisition activity. TRANSEC has been used for some time now, and its implementation is quite simple assuming the TRANSEC system utilizes over the air key exchange. Manual key distribution can become quite cumbersome especially for large networks.

The relative simplicity of implementing TRANSEC changes dramatically in a global network. Acquisition is the most vulnerable time for a remote. During the acquisition process, no chain of trust has been established between a remote and the teleport. No X.509 certificates have been exchanged, and the key used for acquisition may have aged. These problems of remote acquisition are multiplied when a remote must operate on multiple beams of a global network and possibly on a Communications on the Move platform.

In order to securely acquire a remote, a special, long lived acquisition key must be utilized. This acquisition key is typically valid for 30 days and is responsible for encrypting all information exchanged during the acquisition process including the layer two acquisition burst and X.509 information. Furthermore, this key must be universal for all satellite coverage areas comprising a global network. Having a single, coordinated global key distribution mechanism is a critical component to building a seamless, global, TRANSEC network.

Quite often when discussing global networks, people consider the case of aircraft or maritime vessels in which there is a quick repoint of an antenna, a short acquisition process, and the remote router has network connectivity.

A more daunting challenge for security in a global network is the challenge of an iterant terminal. Quite often, iterant terminals are packed away for months at a time before being redeployed. As mentioned above, an acquisition key, as all keys, has a finite lifespan. Although this lifespan can be on the order of a month or two, quite often an iterant terminal will be packed away for a much longer time before being redeployed. It becomes necessary to have a mechanism by which a valid acquisition key can be securely disseminated, even if an encrypted communications path is not available.

Fortunately, a simple mechanism exists by which a network operator can encrypt the active acquisition key using the public asymmetric key of the iterant remote which is generated at the time the X.509 certificate is established. The active acquisition key can then be transmitted securely over a non-encrypted link or even read out over a satellite telephone. Since the acquisition key has been encrypted with the public key of a remote router, it cannot be used in any other remote.

The real trick to providing security in a global network is ease of implementation and ease of use. If systems security becomes too cumbersome and causes outages, people will skirt the system. Too much is at risk to allow that to happen.

About the author

Karl Fuchs is vice president of technology for iDirect Government Technologies (iGT). He joined iGT in 2004 as the director of sales engineering, just as the satellite-based IP communications company was expanding its very small aperture satellite (VSAT) market presence into the federal government and international Internet Protocol (IP) networking world. He now works as the vice president of technology. With more than 20 years of experience in technology and with the federal government, Fuchs leads iGT's team of federal systems engineers and serves as chief architect for new product integration.

Prior to joining iGT, Fuchs was director of systems engineering at Nortel Networks, where he oversaw the Verizon account team of systems engineers, leading the design of IP, frame relay, asynchronous transfer mode (ATM) and dense wavelength division multiplexing (DWDM) networks. Before joining Nortel, he designed IP and ATM networks for Sprint and the federal government.

Active in the satellite industry for more than 10 years, Fuchs has contributed editorial to numerous publications. In addition, he has been a featured speaker at leading industry events including the DoD SATCOM User Workshop, ISCe, IBC, Pacific Telecommunications Council and Emergency Management Talks.

Fuchs holds a Bachelor of Science degree in electrical engineering from George Mason University, Fairfax, Virginia, and an MBA from Averett University, Danville, Virginia.

NSR ANALYSIS #1
GOVERNMENT + MILITARY SATCOM... A WORK IN PROGRESS?

By Claude Rousseau, Research Director, NSR France

With the raft of bad news from recent earning calls stating lower government revenues in the satellite industry, one has to ask the question: Is a pessimistic view of the market fair when the changes coming will grow the market pie and offer more bits-per-hertz at a cheaper unit price.

The truth is that pessimistic views overshadow many opportunities for solutions developed over the past ten years that address military requirements of lower budgets while at the same time offering more bandwidth.

The inventor of electricity Thomas Edison once said, "Opportunity is missed by most people because it is dressed in overalls and looks like work."

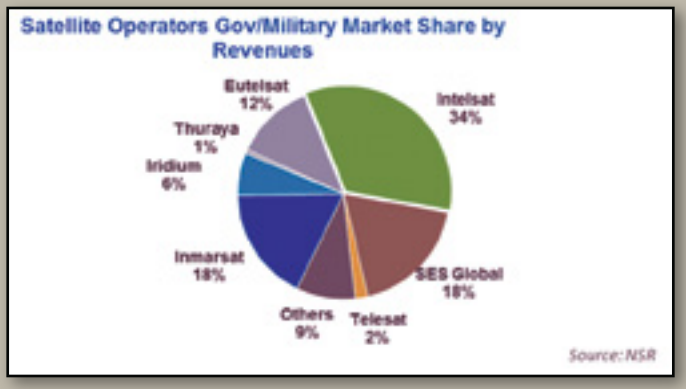
Well, these new opportunities for the government and military users are indeed a lot of work, with many still a work-in-progress. However, these will not only change the make-up of the off-the-shelf products available but will also jostle "who" is slated for the position at the top of this marketplace.

On top of everyone's agenda is meeting mandatory budget cuts, while at the same time addressing ballooning requirements for end-users, and to top it off, Communications On The Move (COTM).

With huge steps in capacity coming online via high-throughput satellites (HTS), there is some elbowing going on within the industry to meet the mandate of governments to 'do more with less,' in particular for high-potential, mobility applications.

As the graph below shows, when assessing satellite operators serving this market, the largest portion of the pie is captured by FSS operators who generated more than 75 percent of the revenues, while MSS operators garner the remainder. Intelsat, which expanded its off-network portfolio (MSS, X-band), has staved off competition and is far ahead in first place, taking in approximately one-third of total market revenues.

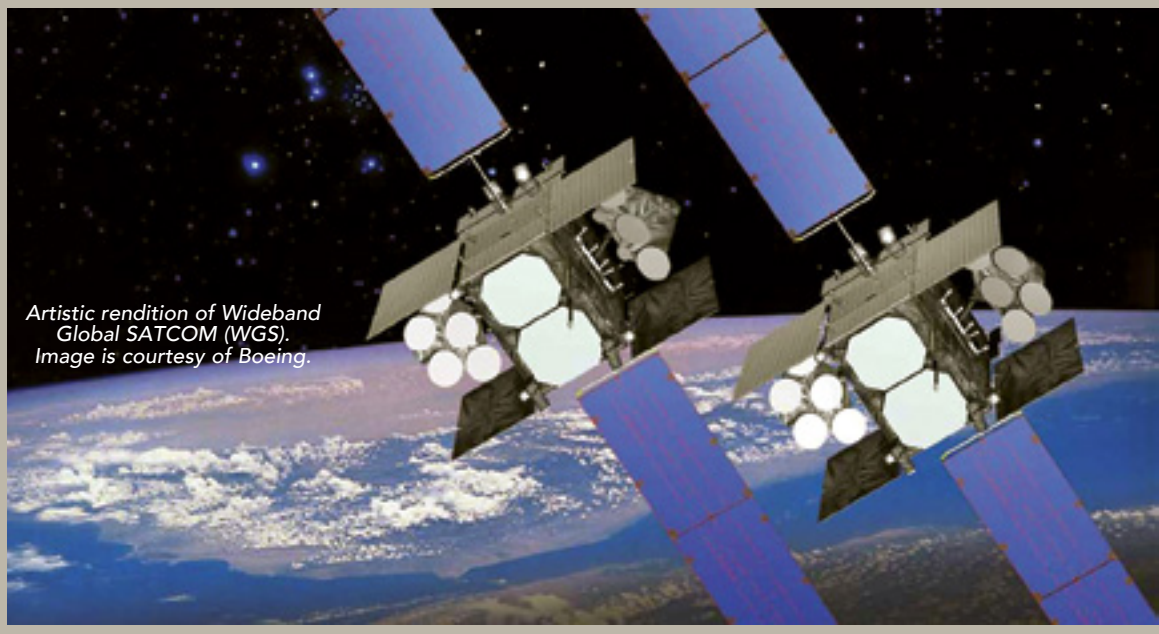
Interesting to note, however, is the two companies that are just behind in second place. SES, with a video-centric core, and Inmarsat, with a merchant marine base of users, will likely rub shoulders more often in this market as well as participate in steering changes to meet the new high-bandwidth, low-cost challenges of government users.



Furthermore, their market position will likely be determined by how well they can add more value to users with broadband mobility requirements.

When looking at this chart, one would say that today Inmarsat is a strong contender and has a lot of room to grow its government business. In particular, its FSS offering has been met with far less success than the company would have hoped for...

- The pull-out of troops in the Middle-East
- The US Navy decommissioning of its terminals on a couple of hundred ships



Artistic rendition of Wideband Global SATCOM (WGS). Image is courtesy of Boeing.

- The U.S. Coast Guard's choice of Ku-band VSATs for its Cutter Class vessels' primary means of communications, instead of Fleet Broadband

These are all misfortunes that the operator has had to grapple with over the past five years.

For SES, their position as a more diversified operator worldwide, and its investment in the high-throughput market via O3b Networks, has lessened the hit. Several new Ku-band transponders over oceans are also taking the company on the path to address the market for bandwidth and mobile solutions.

For Intelsat, keeping its number one share also means the firm must capitalize on its HTS EPIC satellites and deploy more capacity over places where ships and airborne platforms where UAVs fly, to lessen the recent drop in revenues due to transponder price cuts offered to the U.S. Government.

Having said this, it is easier to see why Inmarsat, which will be the first out of the gate with a global fleet of satellites offering high-throughput capacity to government users, is still targeting this market.

A good portion of its revenue is expected to come from the agreement in place with Boeing, whereby the satellite manufacturer's take-or-pay of 10 percent of the fleet's capacity, aims at getting military users onto the military Ka-band part of the Global Xpress payload.

Specifically, these services will have advantages for troops, ships and airborne platforms with an 'almost-like' WGS connectivity on a global basis that is becoming a strategic communications infrastructure for many countries around the globe. With this key advantage, Inmarsat is hoping to forge itself a future expansion in the government FSS business in a market in that is in dire need of cheaper bits.

The increased efforts to reduce the cost of communications links by satellite operators will bring more benefits to government and military users as well as create a more dynamic market where both FSS and MSS services will increasingly collide into one another.

The work-in-progress sign is still up on the doors of many satellite operators targeting the higher bandwidth and mobility government SATCOM markets—however, the opportunities are likely to be just beyond the doorway.

For further information regarding NSR, access their infosite:
http://www.nsr.com/

About the author

Mr. Rousseau has more than 20 years of experience in the space sector in various roles, including business and program management, consulting, research, administration and communications. Mr. Rousseau started his career in Ottawa, Canada as Special Assistant for space and science in the Office of the Minister of Industry, Science and Technology of Canada. He then joined the Canadian Space Agency in 1992 in Montreal, Canada where he was Assistant to the President, then successively Analyst for Industrial and Regional Development, Administrator for the RADARSAT program and Manager for Strategic Planning in the Long Term Space Plan Task Force.

In 1999, Mr. Rousseau became Manager, Professional Development Programs and Forum Activities at the International Space University (ISU) in Strasbourg, France where he was responsible for training and special events for various clients and created the University's Research Contract Service. Mr. Rousseau then co-founded Futuraspace, an international space consulting company specialized in space business and management located in California and France.

He serves as regional and applications expert on satellite communications for NSR and directs both multi-client research reports and consulting projects. He is a key element of NSR's presence in the European, Middle-East and Africa market. He develops research products in the ever changing mobile satellite services (MSS), government and military, oil and gas and Earth Observation markets. Mr. Rousseau currently lives in Strasbourg, France and holds a Bachelor of Science degree (B.Sc.) in Physics/ Astrophysics from the University of Calgary, Canada and a Master of Space Sciences (MSS) from the International Space University in Strasbourg, France. He is also fluent in French.

NSR ANALYSIS #2
THE AFGHANISTAN PULL-OUT'S EFFECTS ON SATCOM

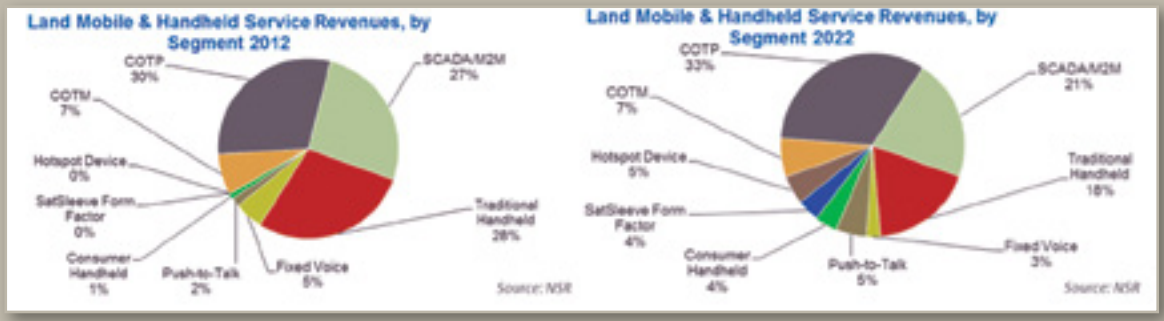
By Jose Del Rosario, Research Director, NSR Manila

One of the most highly anticipated events for 2014 is the full withdrawal of U.S. and allied troops from Afghanistan. The drawdown that began in 2011 has led to diminishing growth in the global land mobile satcom market given the lower number of troops, vehicles and other assets that needed to be supported by a variety of satellite-based solutions.

With the impending, or planned, full pull-out of U.S. and allied troops, the natural inclination is to regard key programs and solutions such as Blue Force Tracking (BFT), and Netted Communications to be adversely affected globally.

In the mix is a potential wild card to the demand outlook, which is the Bilateral Security Agreement (BSA) that permits foreign forces to stay in Afghanistan beyond 2014. It is a wild card as Afghan President Hamid Karzai may or may not sign the agreement. A signed security pact means that about 8,000 U.S. troops will remain until 2024, while an unsigned pact translates to a very light footprint of perhaps less than a thousand U.S. personnel by January 2015.

In its latest market study, Land Mobile & Handheld Satellite Markets, NSR forecasted growth in narrowband solutions supporting military operations in the Middle East/Africa region to exhibit flat to negative growth, reflective of trends over the past three years.



In terms of the overall land mobile market, however, NSR foresees a positive outlook, albeit at lower levels compared to the run-up to 2011, where growth in revenue terms displayed robust rates. In essence, the troop withdrawal has been factored in, given expectations over the past three years such that a scenario of a signed or unsigned BSA should have little to no effect on the overall market. Here's why:

- *The U.S. DoD has a new contract with Iridium based on unlimited use. This means that even if the number of U.S. troops were to remain at 8,000 based on a Karzai-signed security pact or all troops are completely pulled out should Karzai refuse to sign the agreement, the revenues generated should be at fairly equal levels for netted communications, handheld satphones as well as other applications the U.S. Military decides to run on the Iridium network as usage is not just contracted for Middle East/Africa but for the entire globe.*

- *For other services or programs such as the BFT, a signed pact means only slightly increased growth overall given that the bulk of BFT units will likely be re-deployed to other regions such as Asia in support of the pivot strategy as well as the U.S. to support military, homeland security, border patrols, drug interdiction and other civil missions.*

- *Lastly, the key market segment is Comms-on-the-Pause (COTP) and to a lesser extent, Comms-on-the-Move (COTM). In 2012, COTP accounted for 3 percent of in-service units yet accounted for 30 percent of service revenues. Usage of COTP (and COTM) is predominantly military in nature such that a low number of units supporting between 1,000 to 8,000 U.S. troops in Afghanistan post-2014 should still translate to a healthy market over the long term. Indeed, by 2022, NSR foresees COTP service revenues improving market share further by 3 percent compared to 2012 levels due to increased usage despite the lower number of troops and other key personnel that need to be supported. COTP and COTM combined are forecasted to account for 40 percent of service revenues by 2022. Usage of COTP and COTM are of course not relegated solely to Afghanistan and Iraq as new deployments and re-deployment similar to BFT and satphones should take place in other regions such as Asia and the U.S. However, given the continued volatility of the Middle East/Africa region, it is NSR's view that a large percentage of COTP and COTM equipment will continue to be deployed in this region over the long term.*

Afghanistan and Iraq have been key markets for the land mobile segment over the past decade. With U.S. troops returning home or staying at reduced levels, narrowband solutions are likely to remain flat or even diminish in revenue terms for the Middle East/Africa region but remain positive in the aggregate when other regions are included in the demand mix.

Broadband solutions, specifically COTP, should continue to be stable given that a vital component to the U.S. presence in Afghanistan, whether less than a thousand troops or 8,000 personnel post-2014, is to continue to provide small-scale support to local forces as well as mount Special Forces missions. The Special Forces component will be key, as missions will require high bandwidth solutions, specifically COTP and COTM services.

Information for this article was extracted from NSR's report: ***Land Mobile & Handheld Satellite Markets***—further details on this report are available at this NSR direct infopage link: ***http://www.nsr.com/research-reports/satellite-communications/land-mobile-handheld-satellite-markets/***

About the author

Mr. Del Rosario is a senior member of the consulting team where he focuses his research on quantitative modeling, data verification, and market forecasting for the commercial and government satellite communications sectors. He conducts ongoing research with specialization in policy analysis, economic indicators, regulatory initiatives and end user demand trends. In addition to authoring numerous syndicated reports in his areas of focus, Mr. Del Rosario has been involved in a wide range of strategic consulting projects. He has advised clients on market trends, implications, and strategies on such diverse topics as high throughput satellites (HTS), hosted payloads, wireless backhaul, SCADA/M2M/LDR and multi-mission satellite programs.

Prior to joining NSR, Mr. Del Rosario worked with Frost & Sullivan as Program Leader of the Mobile Communications Group, as Senior Analyst & Program Leader of the Satellite Communications Group, and most recently as Country Manager for the Philippines. Other experience includes being the Development, Outreach & Communications Specialist at the U.S. Agency for International Development (USAID) in the Philippines where he contributed to USAID/Philippines' various programs in energy, environment, health, education, economic development and governance. He was also the Public Affairs Officer of the European Commission's Delegation in the Philippines, co-managing the Commission's programs on economic cooperation and development assistance.

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Think global, party local, at SATELLITE 2014

ARE YOU READY TO BE THE NEW FACE OF SATELLITE?

By Robert Bell, Executive Director, Society Of Satellite Professionals

The French have a tradition that is, depending on your point of view, either charming or sexist. They personify the French state—in particular its ideals of "Liberté, Egalité, Fraternité"—in the form of a woman.

Known as Marianne, she was born in the Revolution, where Eugène Delacroix depicted her in his famous painting, Liberty Leading the People. She was thereafter re-imagined every decade or so: in the 1960s, such international beauties as Brigitte Bardot and Catherine Deneuve were her inspiration.

In July of last year, Inna Shevchenko became the new Marianne on French stamps. She was the highest-profile member of a Ukrainian feminist protest group, FEMEN, to whom France had granted political asylum.

At the Society of Satellite Professionals International (SSPI), we think that, if it is good enough for France (renowned for its space technologies), such is good enough for the Satellite Nation. At the 2014 Gala on March 11, SSPI launch a search for the Faces of Satellite.

Who Stands For The Industry?

To be honest, The Faces of Satellite started as a cute idea to be this year's theme for our annual fundraiser, which occurs on the opening night of SATELLITE 2014. However, the more we worked on the theme, the more it developed a serious side, starting with this question:

Who stands for the industry in our collective mind?

Are The Faces of Satellite the CEOs who appear on magazine covers and on the stage at SATELLITE? Is this Face the genius innovators of the past and present who make great leaps in technology and systems? Is the Face the new class of investors who have entered the business over the past decade and substantially changed how it operates?

You could make a good case for any or all of these identifiers. However, at SSPI, we think the Faces of Satellite are different. We think they are not necessarily the movers-and-shakers who appear in the headlines, though one or two of them might well be... they are not all destined to win awards or appear in "most influential" lists, though some may.

We believe the real Faces of Satellite are individuals, known and unknown, who are shaping the industry's present and future. They are people you know, people who truly make a difference.

They are engineers and programmers, salespeople and market researchers, senior executives and university professors. Their personalities, persistence, vision and sense of mission are contributing in small but extremely important ways to the industry's success. They are people the industry would not wish to be without.

We also believe the time has come for these professionals to have their moment in the spotlight. At Gala 2014 on March 11, we will unveil the first dozen Faces of Satellite in our program and on the big screens in the ballroom.

Who will they be? They will be vendors and customers, male and female, and they will come in all of the shades of humanity. They will be from Asia and Europe, Africa and the Middle East, North and Latin America—some you will know and some will be people you have not yet met—they are your industry.

The Gala is only the start for the Faces of Satellite. We will continue in the coming months to showcase the famous and the not-yet-famous individuals who make our industry what it is. You can take part by recommending a colleague for inclusion in the Faces of the future.

Fun—With A Serious Purpose

The Faces of Satellite is a bit of fun that also has a serious purpose. Like all technology businesses, our industry is engaged in what McKinsey has called a global war for talent. What we do is a lot harder than what Google and Facebook do, and our need for talent crosses a much broader range of skills.

When we celebrate those skills—when we recognize the countless achievements large and small that drive the industry forward—we are making our business more attractive to talented people.

The same is true of our Industry Innovators Awards, which SSPI will also present at the Gala to for-profit and nonprofit organizations, as well as the Stellar Awards for Government Service. Awards are fun—but they are serious business as well.

I hope you will celebrate with us at the Gala, the Satellite Nation's biggest networking event and SSPI's biggest fundraiser. To attend the Gala is now easier than ever as we are making available—for the first time—a reception-only ticket. For those with other dinner plans, this allows you to network with colleagues and entertain customers during the big Champagne Reception, where the entire industry gathers.

For SSPI, the Gala fundraising makes possible the many other educational and capacity-building programs offered to the industry, as well as providing our supporters with a great evening of business entertainment. However, whether or not you attend SATELLITE or the Gala, keep an eye out for the Faces of Satellite. One of them might just be your own!

About the author
Robert Bell serves as the Executive Director of the Society of Satellite Professionals International (SSPI), where he is responsible for the programs, finances and operations of the organization. He can be reached at ***rbell@sspi.org****.*

DISPATCHES

DoD + GSA—Addressing Acquisition Cybersecurity Reforms

The Department of Defense and U.S. General Services Administration (GSA) have jointly released a report entitled, "Improving Cybersecurity and Resilience through Acquisition," announcing six planned reforms to improve the cybersecurity and resilience of the Federal Acquisition System."

This report is an important step to improving the cybersecurity of our acquisition processes," said Undersecretary of Defense for Acquisition, Logistics and Technology, Frank Kendall. "Ensuring we have fully implemented the recommendations of this report will be instrumental in addressing the growing cyber risks we face."

"The ultimate goal of the recommendations is to strengthen the federal government's cybersecurity by improving management of the people, processes, and technology affected by the Federal Acquisition System. GSA and DoD will continue to engage stakeholders to develop a repeatable process to address cyber risks in the development, acquisition, sustainment, and disposal lifecycles for all federal procurements," said GSA Administrator, Dan Tangherlini.

The report provides a path forward to aligning federal cybersecurity risk management and acquisition processes. It provides strategic recommendations for addressing relevant issues, suggests how challenges might be resolved, and identifies important considerations for the implementation of the recommendations. The six recommended reforms are:

- Institute baseline cybersecurity requirements as a condition of contract award for appropriate acquisitions
- Include cybersecurity in acquisition training
- Develop common cybersecurity definitions for federal acquisitions
- Institute a federal acquisition cyber risk management strategy
- Include a requirement to purchase from original equipment manufacturers, their authorized resellers, or other trusted sources
- Increase government accountability for cyber risk management

The report is one component of the government-wide implementation of E.O. 13636 and Presidential Policy Directive (PPD) 21, and was prepared by a working group comprised of subject matter experts selected from across the Federal government. The report was submitted to the President in accordance with Section 8(e) of Executive Order (E.O.) 13636.

DoD and GSA are committed to implementing the recommendations through integration with the numerous ongoing related activities like supply chain threat assessments and anti-counterfeiting. The agencies will use a structured approach with continued dedication to stakeholder engagement, and develop a repeatable process to address cyber risks in the development, acquisition, sustainment, and disposal lifecycles for all Federal procurements.

The implementation will also harmonize the recommendations with existing risk management processes under Federal Information Security Management Act and OMB guidance.

A request for public comment on the draft implementation plan will be published in the Federal Register next month.

DISPATCHES

DARPA—The Agency's Programs Offer A New Future for Space

Arati Prabhakar, Defense Advanced Research Projects Agency director. DoD photo by Glenn Fawcett

Space is critical to understanding the planet and how the United States safeguards national security, but the costs and difficulties of reaching the domain have slowed U.S. effectiveness in space, the director of the Defense Advanced Research Projects Agency has said.

Speaking at SciTech 2014, a technical conference hosted by the American Institute of Aeronautics and Astronautics, Arati Prabhakar explained that now is an important time to think in fresh ways about how to break that paradigm.

In many ways the situation takes Prabhakar back to 1958, she said, when DARPA was established partly because of the technological surprise delivered in 1957 by Sputnik, the world's first artificial satellite, launched by the Soviet Union and marking the start of the space age.

"I think we're in the middle of a self-inflicted surprise in some sense in space today," the director said. "It's a very different kind of surprise, but it's one that is rendering us ineffective and putting us in a place [where] we simply cannot afford to be."

DARPA, the Defense Department's research and development enterprise, has a portfolio that includes hypersonic technology in rethinking air dominance for the future, new ways to control the electromagnetic spectrum, new cyber opportunities, big data analytics, brain function, outpacing the threat of infectious disease, and accelerating the development of synthetic biology.

Another part of DARPA's portfolio is rethinking national security space, Prabhakar said.

"Today we are extremely effective at waging a kind of precise lethal war," she added. "It's something that is a core element of our national security today, but it is a kind of warfighting capability that's simply not possible without the assets that we have on orbit."

Around the national security environment, the director said, space is becoming increasingly congested as more commercial activity takes place in orbit and as other nations stake their claims in space.

"There's also something going on inside the national security community in space that's actually quite troubling," Prabhakar said. "That has to do with how slow and costly it is for us today to do anything we need to do on orbit for national security purposes."

The director said the situation reminds her of living on a lake in Reston, Virginia, many years ago and watching ducks on the water in winter.

"I would look out at the lake, and... these ducks would cluster at twilight, and they'd sit in the lake, and they would stop moving, and the lake would start icing up around them. Eventually, they would just freeze in place on this lake," she said. "Tragically, that's what it feels like to me when I think about where we are in terms of our ability to react and do what we need to do quickly, cost effectively in space for national security purposes."

At DARPA, scientists are working on three projects—involving space launch, satellites and real-time domain awareness -- that the director said she thinks will create a very different future for space.

It can cost tens of millions of dollars to get even a very small satellite to orbit, and years to schedule the launch, she said, because only a few fixed sites around the world can launch such craft.

"Today at DARPA, we're investing in programs that we hope will change that model and allow for the ability to launch on 24-hour call-up from anywhere around the world," Prabhakar said.

With DARPA's Airborne Launch Assist Space Access program, called ALASA, the idea is for an aircraft to carry a small satellite and its host-booster inside the plane or externally. At the right altitude and direction, the aircraft would release the satellite and booster and both would continue climbing into space.

A key benefit of the system is that, within a day of being called up, a satellite launch mission could be conducted from a runway anywhere in the world. Another advantage is the flexibility of an aircraft to deliver a satellite into any orbit at any time, according to DARPA.

"Our ALASA program … aims to be able to get a [100-pound] satellite to [low-Earth orbit] for about $1 million. Our new experimental spaceplane program, XS-1, aims to develop a reusable first stage that enables a cost in the range of $5 million to get 3,000 pounds to 5,000 pounds to LEO," the director said.

These changes are dramatic, she added, because the price would be a revolution in capability and because of the flexibility and rapid call-up.

"These are important new dimensions and new ways of thinking about launch," Prabhakar said.

The second project involves satellites, she added.

"Today you assemble and create these very complex systems here on the ground. We launch them and when we get to orbit what we've got is what we've sent up, and it's a very inflexible capability in that regard," she explained.

DARPA's Phoenix program is working to create a future in which space robotics technologies can service satellites and even assemble them on orbit, and reuse components of old or nonworking satellites perhaps on orbit.

"As we develop those capabilities at [geostationary orbit, or GEO] we believe that we're going to start changing the fundamental dynamics and economics of what's going to be possible in terms of satellite capability," the director said.

The third project simply has to do with knowing what's going on in orbit, she added.

"Space is becoming a real-time domain, and it's no longer good enough to sort of know what's up there. We really need to start moving to a future of space traffic control, more like flight traffic control for the air domain," Prabhakar said.

DARPA has several programs that reach for this future, she said. One is the Space Surveillance Telescope, or SST, that can see very dim objects at geostationary orbit across a broad swath of the sky. DARPA has demonstrated this telescope capability in New Mexico and now is in the process of moving to Australia in cooperation with the Australian government.

"In addition to changing what we do, the director added, "I think how we work in space and how we work together to achieve these new capabilities is equally important. DARPA has a long history of working with a broad technical community, spanning universities, companies large and small and labs of all different sorts."

In the national security space environment, she said, "I think all of us in DoD have had a tendency to focus in a narrower fashion on the capabilities we think are important for our missions. And today we're at a juncture where it's critically important that we find new ways of working more broadly with the civilian and commercial space communities."

This is true, Prabhakar added, "first, because we have shared interests, and secondly because the challenges we face are so significant that we simply are not going to get there any other way."

Story by Cheryl Pellerin, American Forces Press Service

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Commander Amleto Gabellone, Head of Department, Systems Management, Navy CIS Rome Centre, **Italian MoD**

Lieutenant Colonel Vincent Lengkeek, Branch Chief ISTAR and Space, **Royal Netherlands Air Force**

Squadron Leader David Davenport, Officer Commanding, UK Space Operations Coordination Centre, **Royal Air Force**

Major Brad Green, Unmanned Aircraft Systems Officer, **United States Marine Corps**

Captain Alexander Clairin, CNGF, CIRISI Maisons-Laffitte, **French Ministry of Defence**

Dr Eva Bernhardsdotter, Space Program Manager, Air and Space Procurement Command, **FMV - Swedish Defence Materiel Administration**

Dr Martin Hellmann, Program Coordination Security Research, **DLR German Aerospace Centre**

Pascal Legai, Deputy Director, **EU Satellite Centre**

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DISPATCHES

USAF 3rd Space Operation Squadron— Optimizing Wideband Communication Constellations

Artistic rendition of WGS satellites.

Late in 2013, the 3rd Space Operations Squadron's mission—"Warfighters ensuring reliable wideband communications to national authorities and U.S. and Allied forces"—was proudly displayed as the unit repositioned its eighth satellite during a nine-month effort to optimize the military wideband communications constellation.

During the last six months, the squadron added the second and third Block II Wideband Global SATCOM vehicles to its fleet of communication satellites.

Since those vehicles have eight times the capacity of legacy Defense Satellite Communications System vehicles and modernized communications capabilities, Air Force, U.S. Army Strategic Command and Defense Information System Agency leaders directed the 3rd SOPS to study and provide optimization recommendations.

"We started this project nine months ago," said Capt. Matt Shull, the orbital analysis chief with the 3rd SOPS. "Planning for the current effort goes back as far as 2012, after the launch of WGS-4."

The wideband communications system of satellites consists of six advanced WGS vehicles and eight legacy DSCS vehicles. Together, they provide flexible, high-capacity communications for U.S. forces throughout the world, while enabling battle management and combat support information functions.

The optimization effort began after the Wideband Constellation Sustainment Assessment team proposed possible optimization plans to the squadron. The 3rd SOPS orbital analysis team then conducted feasibility studies for the proposals and determined multiple courses of action for each spacecraft.

"It was a daunting task," Shull said. "Some of these satellite moves involved large-scale relocations equal to 177,000 miles of movement in geostationary orbit. We had to create an optimization plan and collision avoidance plan for each vehicle, then determine where we could safely operate at the proposed location and how to safely move there."

Squadron engineers had to pay close attention to deconflicting telemetry, tracking and command links when shuffling multiple vehicles across one another. They also had to coordinate with Army Strategic Command's Wideband Consolidated Satellite Support Element to ensure communication users continued to have access to critical communication links.

Paul McMeekin, a system program analyst at the Joint Space Operations Center at Vandenberg Air Force Base, California, reviews data received on the Delta II site there. The purpose of the JSpOC is to provide a focal point for the operational employment of worldwide joint space forces, and enable the commander of Joint Functional Component Command Space to integrate space power into global military operations.
U.S. Air Force photo/Airman 1st Class Antoinette Lyons

"More than 400 satellites operate in the geostationary belt," Shull said. "We're sharing space, which means we must perform daily conjunction assessments and take occasional emergency actions to avoid collisions."

The 3rd SOPS orbital analysis team consists of active-duty officers, enlisted members, and specialized orbital analysis. The 3rd SOPS team deconflicted future satellite locations based on element-set plots obtained from the Joint Space Operations Center at Vandenberg Air Force Base, California.

Shull explained that moving the satellites, which reside in geostationary orbit more than 22,000 miles above the equator, involves using the vehicles' onboard propulsion systems to drift the satellites east and west.

"We're still in the process of optimizing and will be moving a few more vehicles," Shull said. "The optimization initiative is slated for completion in late February when the squadron will halt DSCS B13 for the final time."

This optimization initiative is unprecedented in the WGS era of wideband communications.

"Our operations tempo last year included two launches that required seven WGS operators to support launch and early orbit operations during an eight-month period," said Lt. Col. Chadwick, 3rd SOPS commander. "Combined with the optimization initiative to reposition these vehicles, the entire DSCS and WGS teams performed this complex ballet to ensure all vehicles were moved safely while being completely transparent to the hundreds of thousands of warfighters around the world."

Lt. Col. Chadwick called the initiative a truly monumental undertaking, in part because DSCS and WGS vehicles have unique propulsion systems.

"Each vehicle has its own personality," he said. "Without the expertise of the military and contractor expertise on the team, accomplishing this effort flawlessly would not have been possible."

The 14-satellite DSCS and WGS Wideband Constellation represents $3.9 billion in U.S. Government assets. Members of the 3rd SOPS orbital analysis team undergo an extensive and challenging training and certification process.

"As the commander, I put a tremendous amount of trust in the individuals selected to become orbital analysts," he said. "Because of their extensive training, I know they will perform to the best of their abilities to ensure the satellites I put in their care are protected and able to provide vital communications to warfighters around the world."

Story by By Scott Prater,
50th Space Wing Public Affairs

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THE HPA CORNER: HOSTED PAYLOADS ARE FROM MARS. MISSION PLATFORMS ARE FROM VENUS.

By Bob Bishop, Northrop Grumman Corporation

Well, not exactly, of course, but the metaphor from the 1990s book about relationship problems is within the universe of apt descriptions for separate development paths often taken by payload owners and satellite operators.

A primary point of divergence is the question of whether government and industry should agree on a set of standardized interfaces for hosted payloads.

Potential government hosted payload developers say the absence of standardized technical interfaces among various satellite manufacturers presents a serious challenge.

Satellite manufacturers, for their part, have been historically perceived as cautious toward the idea of common hosted payload interfaces. Mainly, they say, standardizing payload interfaces limits their flexibility and would establish an alternative to their own proprietary interfaces created at considerable cost.

How can they resolve these relationship problems?

ORS Shows The Way

The Defense Department's Operationally Responsive Space Office at Kirtland Air Force Base, New Mexico, leads U.S. military efforts to shorten satellite development time. Its goal: Provide small satellites that can be assembled quickly and launched rapidly. Its tactics: Develop a series of increasingly modular spacecraft built around an open system architecture using true plug-and-play technology.

Recently ORS took delivery of the first bus that implements a modular, rapidly reconfigurable architecture using open standards developed by an industry consortium in conjunction with the Air Force Research Laboratory and the ORS Office. Called the Modular Space Vehicle (MSV), the spacecraft was designed and built by Northrop Grumman.

The scalable, open architecture allows bus components and payload modules to plug into a central spacecraft network using standardized technology, much like the way new hardware can be plugged into computers via USB ports.

These give MSV unusual flexibility. It can accommodate payloads for a vast range of missions (radar imaging, missile warning, military communications and weather); and operate in several different orbits after being launched from a variety of launch vehicles.

Missing A Mission

The only element missing is a mission. MSV's intended mission was canceled before the spacecraft bus could be completed... leading us to ask Hosted Payload Alliance members:

Will the separate development of hosted payloads and the main mission platforms lead to better system modularity, standardized interfaces and a shorter integration cycle?

Artistic rendition of the MSV in orbit. Image is courtesy of Northrop Grumman.

"As hosted payloads become routine, they will necessarily fashion widespread spacecraft and launch vehicle interfaces and shorter integration cycles, which in turn will encourage more, new hosted payloads."—**Major General Jim Armor USAF (Ret.) and vice president, Strategy and Business Development at ATK Space Systems Division**

"The concept of a modular bus with an open architecture has great potential and we commend the ORS and Northrop Grumman efforts. It is yet another in an emerging broad range of cost-effective variations on the hosted payload concept. The advantage of a hosted payload on a commercial spacecraft means that the government mission pays only for a small cost share of a bus, launch and potential use of gateway and terrestrial network infrastructure. To obtain these advantages, the bus will have to suit the requirements of a typical telecom satellite.

Commercial telecom satellite manufacturers have become quite adept at integrating a variety of hosted payload missions onto their heritage bus platforms. At SSL we launch six or seven satellites a year and have for many years.

Throughout this time we have been evolving our spacecraft bus to suit the changing needs of the world's commercial satellite service providers. The 1300 satellite bus is also a modular platform with ample real estate and power capability for services such as direct-to-home television and broadband Internet as well as various hosted payload missions. The company has a track record of hosting a wide variety of sensor payloads at a marginal fraction of the overall satellite cost, while maintaining commercial production schedules under fixed price contracts.

Recently NASA has taken an innovative approach to an upcoming laser communications demonstration by working with SSL to create an interface that can be integrated onto any of our 1300 spacecraft in advance of selecting the particular host. This approach balances the advantage of a common interface architecture with the unique design requirements of today's telecom satellites."—**Eric Spittle, President, SSL Federal**

"We don't believe that all hosted payloads are equal. There are systems that are autonomous from the primary mission and the satellite, and in these cases we can provide SWAP (size, weight and power) and standard interfaces (akin to a USB port) that can easily be accommodated. Other hosted payloads require additional capabilities and are more integral to the design of the satellite. For these more "custom" payloads a standard interface would be applied. With the advent of "space wire" and movement to "cloud" approaches, the evolution of even more standard interfaces for hosted payloads are in the very near future, and in some cases now!"—**Jim Simpson, President, Boeing Satellite Systems International, Inc.**

"Separate development paths for hosted payloads and main mission platforms will allow less mature capabilities to be inserted at the appropriate time to ensure they meet the stringent timelines associated with most commercial missions. The preference is for hosted payloads to be included in the overall design of a given satellite at the beginning of a program but if that is not possible, hosted payloads need to be designed with enough flexibility to accommodate

multiple platforms. Standards already exist today and may vary a bit between satellite manufacturers but payloads can be easily accommodated. Even in today's satellite communications industry, all satellite manufacturers need to integrate various communications payloads from a number of communications payload providers—all with varying standards."—**Rich Pang, Senior Director, Hosted Payloads, SES Government Solutions**

"We see a slow evolution towards more commonality because organizations driving it—the Air Force Research Laboratory with the Modular Space Vehicle, and the Office of the Director of National Intelligence with the Space Universal Modular Architecture—are pushing towards common interfaces and more plug-and-play. The advantages of migrating to standards will be accrued to both hosted and hosting missions since fewer variables will mean less custom design, modeling, simulation and testing. That will save money and decrease cycle time while providing more flexibility in hosted mission integration. It also should improve reliability by reducing anomalies. We'll caution that a one-size-fits-all set of interfaces isn't likely because of differences in hosted missions and the extent to which hosted payloads will depend on host infrastructure, such as command and communications. And standards will not be static, of course—they will have to evolve as technology improves capabilities." **Tim Frei, Vice President, Communication Systems, Northrop Grumman Aerospace Systems**

For additional information regarding the Hosted Payload Alliance, please access ***http://www.hostedpayloadalliance.org/Home.htm***

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