SatCom For Net-Centric Warfare March 2016

MilsatMagazine

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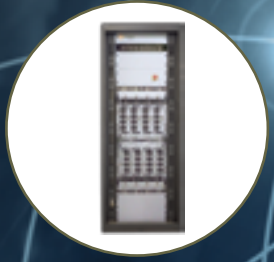

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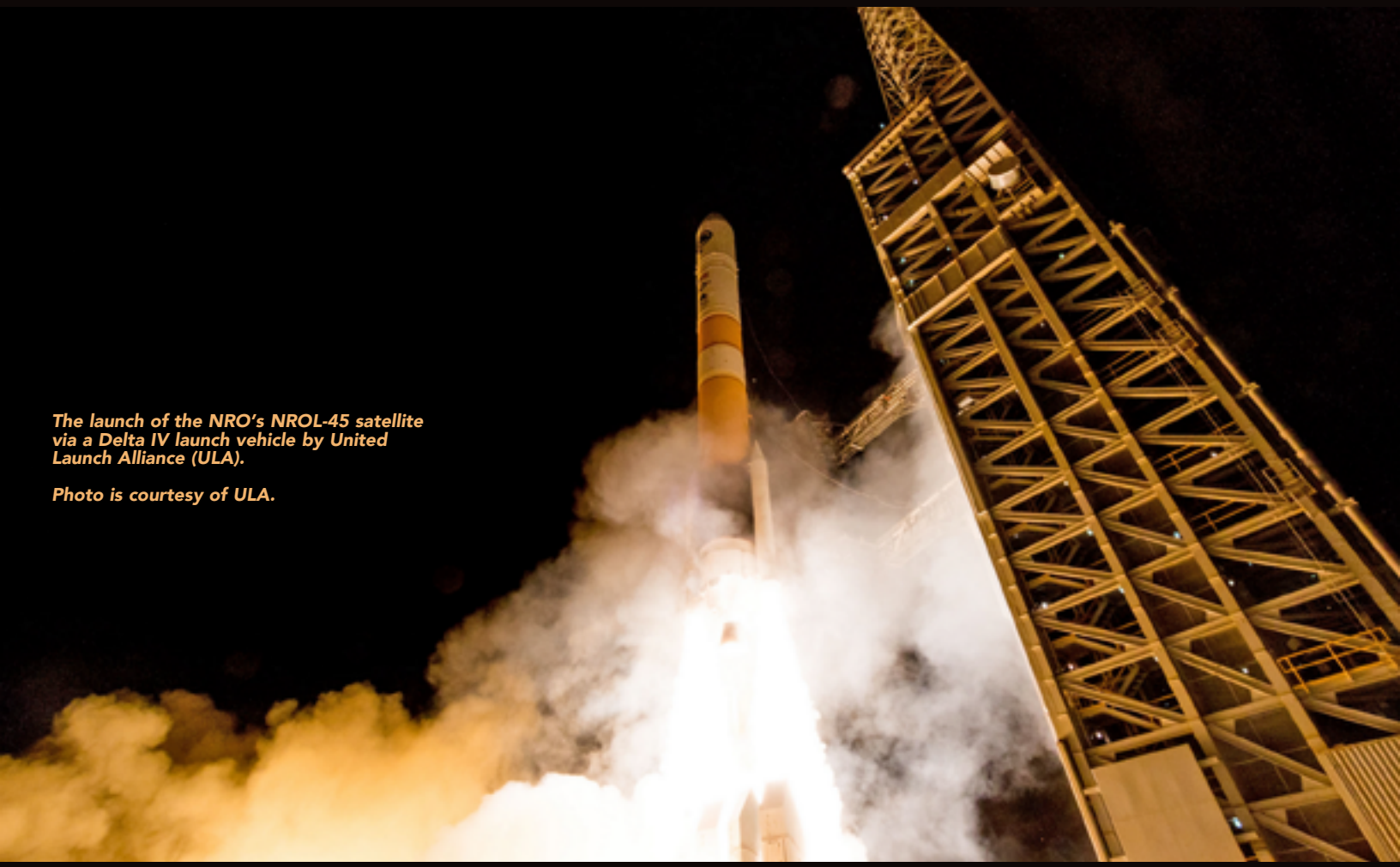

The launch of the NRO's NROL-45 satellite via a Delta IV launch vehicle by United Launch Alliance (ULA).

Photo is courtesy of ULA.

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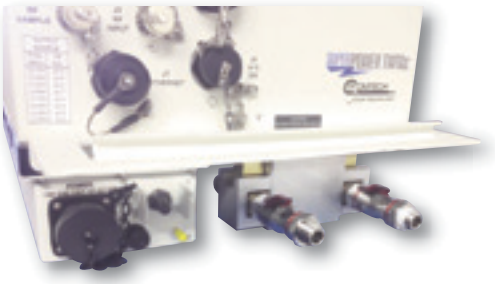

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DISPATCHES

Smile... Russia Successfully Launches Another...

On March 14, 2016, a Russian, civilian-operated, Earth Observation (EO) satellite, Resurs P3, blasted off at 1856 GMT (2:56 p.m. EDT) from the Baikonur Cosmodrome in Kazakhstan on a five-year mission, giving Russia a fleet of three advanced digital imaging spacecraft in orbit.

The launch was delayed due to an automatic abort that was triggered moments before ignition of the Soyuz rocket's engines that halted the countdown. Such launch scrubs late in the countdown are rare for the nearly six ton Soyuz workhorse.

The satellite's Soyuz booster steered north from Baikonur and dropped its four, first stage engines about two minutes after liftoff. The second stage core engine and a third stage propulsion system delivered the Resurs P3 satellite to a preliminary orbit about 9 minutes, 21 seconds into the flight, according to a statement by Roscosmos, the Russian space agency. Resurs P3 will collect black-and-white imagery with a resolution of 1 meter, or 3.3 feet, and analysts will resolve objects as small as 3 to 4 meters (10 to 13 feet) across in color pictures.

Russian government agencies responsible for agriculture, the environment, emergency situations, fisheries, meteorology and cartography will be consumers of data from Resurs P3, which will join two similar satellites—Resurs P1 and Resurs P2—launched in June 2013 and December 2014, respectively. A telephoto camera with a focal length of 4,000 millimeters will capture the highest-resolution images.

Data from the Resurs satellites will aid with disaster response, help authorities update maps, track pollution, track ice in maritime shipping lanes, and detect fields of illegal drugs, according to TsSKB Progress. The 5,730-kilogram (12,632-pound) Resurs P3 satellite hosts a suite of digital cameras.

One camera is tuned to image the Earth in 96 spectral bands, obtaining details on metrics such as crop yield, vegetation health, microbial activity in water, and assessing the impacts of invasive insects on agriculture.

The launch photo of Resurs P3 is courtesy of Roscosmos.

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The Mississippi Rumble

NASA and Aerojet Rocketdyne, a subsidiary of Aerojet Rocketdyne Holdings, Inc., test-fired the Space Launch System's first RS-25 flight engine, E2059, for 500 seconds at NASA's Stennis Space Center in Mississippi.

The Space Launch System (SLS) is America's next-generation heavy lift launch vehicle, and it will be capable of lifting three times more payload capability than any existing launch vehicle. Aerojet Rocketdyne is the prime contractor for the RS-25 core stage engines that will be used to propel SLS on its eight-minute climb into space.

Engine E2059 is slated to fly on the bottom of the core stage of SLS on its second flight, planned for 2021. Four other flight engines will undergo stage testing by late 2017 in preparation for the inaugural Exploration Mission-1 launch in 2018.

NASA engineers at Stennis Space Center tested RS-25 engine No. 2059 on the A-1 Test Stand and this was the first flight engine for NASA's new rocket, the Space Launch System (SLS), to be tested at Stennis. Numerous other test objectives were successfully conducted, including testing of a rebuilt high pressure fuel turbopump, calibration of facility and engine flowmeters, and testing in conditions replicating flight environments.

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Enhanced Tactical Comms For British Armed Forces

General Dynamics United Kingdom Limited has been awarded £135 million contract from the UK Ministry of Defence to provide enhanced Bowman tactical communications systems to the British Armed Forces.

The BCIP5.6 contract will allow for the Bowman tactical communications equipment currently used by the UK military to receive a series of enhancements and upgrades. These include the roll-out of approximately 12,000 new data terminals and an updated version of the Battle Management System.

The contract creates 50 new jobs as well as sustaining the jobs of 20 highly-skilled engineers at the General Dynamics UK's headquarters in Oakdale, South Wales, with further roles being secured in the company's wider supply chain.

Bowman's secure radio communications, declared in service in 2004, have been used in operations since 2005. The Bowman system has been developed and integrated by General Dynamics UK into more than

15,000 British Army vehicles, together with headquarters, ships and helicopters. The enhanced equipment will be delivered, beginning in 2018, and will support an increased operational tempo.

Defence Secretary Michael Fallon said, "*This is more evidence of what this Government's decision to grow our Defence budget can do for the UK. It will create highly skilled jobs in Wales and help our Armed Forces to keep Britain safe for years to come.*"

Brigadier Richard Spencer, Head of the MOD's Battlefield and Tactical Communications and Information System delivery team said, "This contract will replace the data terminals and update software across the Bowman system to ensure ease of use, more rapid and robust data services and improved interoperability. This new deal is good news for the Armed Forces and ensures that they will have access to the best possible tactical communications equipment for the foreseeable future."

Chief Operating Officer of General Dynamics UK, Steve Rowbotham, said, "*This contract ensures the British Armed Forces have access to the best tactical communications. We are delighted to continue our successful partnership, which has delivered world-class secure tactical communications to the British Armed Forces, and to build on this unique UK sovereign capability.*"

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Battlespace Intel Painted From A Windowless Room

In a windowless room, illuminated only by the light of computer screens, the Airmen of the 455th Expeditionary Operations Support Squadron intelligence flight at Bagram Air Field in Afghanistan, paints a picture of the battlespace clear as day.

With intelligence gathered from multiple platforms, from ground forces to satellites, the unit collects, analyzes, and formulates up-to-date reports for commanders to make critical decisions where lives are sometimes on the line.

"*Intelligence informs operational planning based on the commander's needs and the particular military objective, increasing chances for success,*" said Tech. Sgt. Jarom Saurey, 455th EOSS intelligence flight superintendent. "*Analysis reports draw on all available sources of information, including existing and newly collected material. These reports are used to inform and influence the planning staff and seek to predict the adversary's intent.*"

In order to meet this goal, Intel AFSCs use several scientific and mathematical processes, such as using geo-locational mensuration functions, historical trend analysis, and manipulating geospatial databases. While it may sound like a Ph.D. in rocket science is needed to decipher these techniques, the 455th EOSS intelligence flight Airmen, find parallels in a simpler explanation.

"*A good analogy of what Intel does is similar to the weather flight,*" said Maj. Joseph Shupert, 455th AEW senior intelligence officer. "*We are both analysts who collect and interpret data that we can't control, determine what it means to air operations, and present the combined data and assessment to aircrews and leaders to ensure mission execution.*"

From the squad leader protecting the base from the ground, to the F-16 Fighting Falcon pilots conducting strikes from the air, every mission in Afghanistan is reliant upon good, up-to-the-minute intel.

Story by 2nd Lt. Darren Domingo, 50th Space Wing, USAF

DISPATCHES

Manpacking Maneuvers By Harris For The US Army

Harris Corporation was one of three awardees of a multi-award IDIQ contract to supply HMS Manpack radios to the US Army.

The IDIQ contract consists of a five-year base and an additional five-year option and has a ceiling of $12.7 billion.

The Army expects full rate production to start in the fourth quarter of Harris' fiscal 2017 and will acquire approximately 65,000 HMS Manpack radios under the IDIQs.

The US Army selected the Harris AN/PRC-158 multichannel radio for both dismounted and mounted manpack configurations.

The Harris HMS Manpack radio features a two-channel architecture and integrated cross-banding. It includes SRW, SINCGARS and MUOS SATCOM waveforms while maintaining backward interoperability with legacy waveforms.

The HMS (Handheld, Manpack & Small Form-Fit) Manpack forms the core of the US Army's tactical communications architecture, providing an advanced communications infrastructure from the dismounted soldier to the Tactical Operations Center.

The selection follows the US government's decision to open the HMS Manpack competition to technically compliant, commercially developed radios, and further solidifies the US Army's commitment to bring future capabilities to the warfighter.

"*The HMS Manpack award is a major step forward for the US Army's tactical radio modernization program, and brings essential battlefield networking and communications capabilities to the warfighter,*" said Brendan O'Connell, president, Tactical Communications, Harris Communication Systems. "*The award also allows Harris to now compete at all echelons of the Army tactical communications architecture—from dismounted handheld radios through vehicular-based radio platforms.*"

harris.com/

SARLink Handheld Device With Immediate 406 MHz Emergency Access

ACR Electronics, Inc. has released SARLink, the first communication device that combines the global services of Iridium's Short Burst Data, and the Cospas-Sarsat 406 MHz emergency network into an ergonomically designed hand-held device.

The Iridium based features of the SARLink fulfill the requirements for Blue & Friendly Force Tracking, as well as two-way messaging for command and control. The 406 MHz locator beacon leverages the proven reliability of the Cospas-Sarsat network, which has successfully aided search and rescue personnel around the world in saving over 37,000 lives since the mid-1980's.

SARLink can be provisioned to operate on the DoD Gateway utilizing the Defense Information Systems Agency (DISA), Enhanced Mobile Satellite Services airtime contract, or the Iridium Commercial Gateway, supporting 10, 30 byte, and PECOS formats. The 406 MHz beacon can be configured to standard or national protocol. SARLink incorporates a second battery dedicated to 406 MHz operation, providing more than 24 hours of distress messaging.

Military personnel equipped with a SARLink will benefit from the following distinct operational capabilities:

- *Dedicated SOS Button—redundant emergency notification through the Cospas-Sarsat and Iridium networks with embedded Precise Location Information (PLI)*
- *Iridium Only Distress Alerting—option to engage the Iridium-only distress alert, user-defined notification to proprietary command centers and personnel*
- *Two-Way Data Communication—send and receive free-text and canned messages using the on-board QWERTY touch screen keyboard to* verify and validate distress messages as well as routine operational command and control

Communicate via text with:

- *Other mobile cellular and satellite devices*
- *Other SARLink devices + any email service*
- *Contact lists can be pre-defined and can incorporate canned messages that are scripted and loaded across agency devices*
- *Friendly Force Tracking—transmit PLI at selectable intervals from once per minute to once per day. Create, save, and send waypoints as well as manual check-ins*

Gerald Angeli, ACR Electronics President and General Manager, said, "Developing new products such as the SARLink to enhance the safety of military personnel brings further validation to the importance of what we do here at ACR."

acrartex.com/

**Sales of this product are limited to the US Military and Government entities.*

***This device has not been authorized for commercial sale and use as required by the rules of the FCC. This device is not, and may not be offered for sale or lease, or sold or leased, unless specific written authorization is obtained.*

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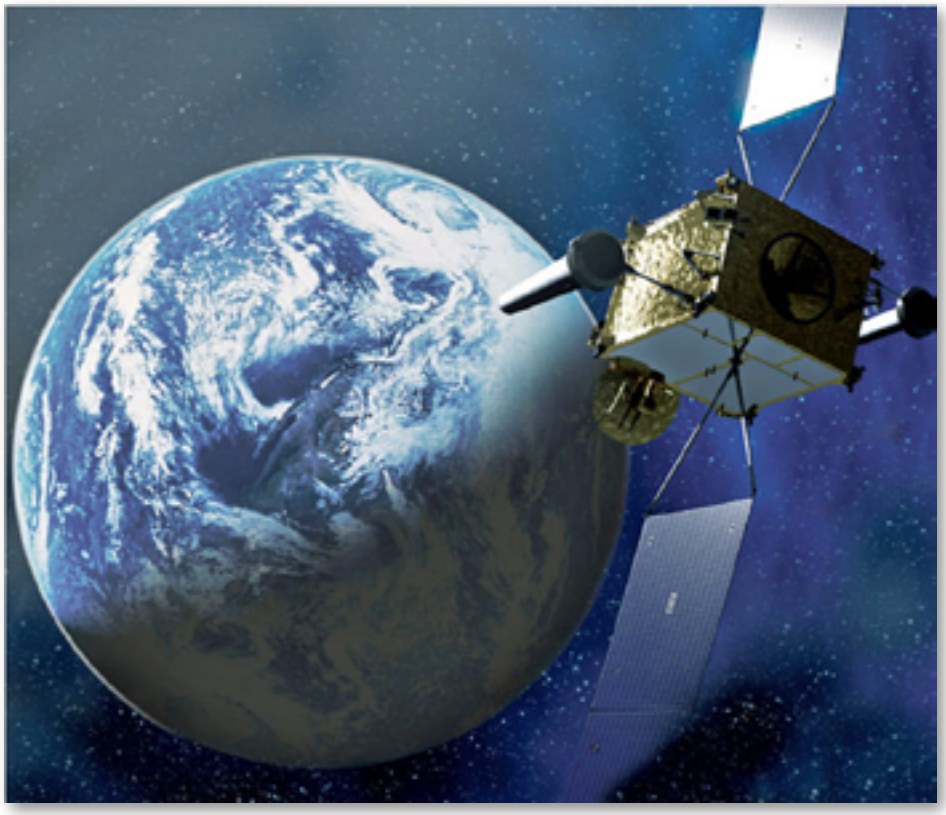

Airbus Defence and Space is working with local service providers to develop new partnerships to deliver highly resilient Skynet military satellite communication services to the Asia Pacific (APAC) region, following the successful completion of Skynet 5A satellite move from 6 degrees East to 95 degrees East to provide global X-band and UHF coverage in this region.

Airbus Defence and Space has signed an agreement with CopaSAT to become a new channel partner for Skynet services, primarily using the relocated Skynet 5A satellite.

CopaSAT will be offering Skynet services as part of a proven and assured portfolio to their US customers delivering innovative network services that combine the affordability, operational utility and scalability required to meet the complex scenarios experienced in global security and humanitarian operations.

Last year, Airbus Defence and Space worked with CopaSAT, and its terminal partner Tampa Microwave, to conduct a series of successful network tests using the Skynet 5A X-band satellite.

CopaSAT teams, using CopaSAT's teleport infrastructure and Tampa Microwave's remote manpack and fly-away terminals, as well as various other small terminals, conducted end-to-end testing to confirm operation of an entire network and the performance of Skynet 5A at the new orbital slot.

Airbus Defence and Space completed the move of the Skynet 5A to 95 degrees East over the Asia Pacific region in September 2015.

The relocation was initiated to extend the Skynet constellation's coverage and services from 178 West to 163 East, including the Indian Ocean and Western Pacific region.

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

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

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

Airbus Defence and Space also leases the X-band hosted payload on Telesat's Anik G1 satellite which covers the Americas and parts of the Pacific including Hawaii and Easter Island.

Obie Johnson, President of CopaSAT, said, "*We have worked with Airbus Defence and Space for five years primarily as a terminal partner, but we are now positioned to provide CopaNET to our US troops throughout the PACRIM, Asia, and west to Arabia.*"

Steve Mills, Head of Global Sales and Marketing for Skynet 5 at Airbus Defence and Space, said, "*This new partnership with CopaSAT will enable Skynet services to be delivered across new regions and to new customers. This capability provides allied governments with a significant new option for missions requiring assured communications, which can operate using light-weight, expeditionary terminals and is not susceptible to rain or snow fade.*"

airbusdefenceandspace.com/

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DISPATCHES

Cobham Shows Smallest Solution For Tactical UAVs

Cobham SATCOM has developed the smallest and lightest Inmarsat UAV satcom solution—the 1.45 kg AVIATOR UAV 200.

Redefining UAV SATCOM connectivity by integrating all components into one compact lightweight unit, the new system delivers Inmarsat Class 4 SwiftBroadband services in a low-SWAP package which is 76 percent lighter than existing comparable products on the market.

The AVIATOR UAV 200 has been introduced by Cobham to significantly enhance a Tactical Unmanned Aerial Vehicle's (TUAV) performance, range and payload capability by enabling operators to take advantage of the higher speed connectivity from today's satellite networks.

A cost-effective solution, the AVIATOR UAV 200 delivers greater operational flexibility for TUAVs in a number of applications, including military, border security enforcement, public safety, commercial use and scientific research.

Kim Gram, vice president of Cobham SATCOM's aeronautical business unit, said, "*We are very pleased to introduce this revolutionary new solution for tactical UAVs, as it will provide these widely-used aircraft with a number of benefits for the first time and open up important opportunities within different applications in the field.*

"*Until now, the size, weight and power requirements of Inmarsat satcom hardware were too restrictive for smaller UAVs which depend upon lightweight components to maximize range, endurance and operational use. AVIATOR UAV 200 matches the connectivity and performance of larger, class-leading satcom systems, but in a far smaller, lighter and less power-demanding package.*"

With improved SATCOM technology, UAV operators can benefit from improved aircraft control and situational awareness, with the ability to make real-time route adjustments while simultaneously tracking the airframe.

Operators also have a constant overview of on-board systems and structural integrity with real-time health monitoring. Better connectivity allows access to BLOS situational data and live streaming of imagery and video which expands the role of real-time scene surveillance UAVs.

Mounted within the airframe and measuring 24cm x 16cm x 6cm, the Cobham AVIATOR UAV 200 delivers up to 200 kbps data and full, real-time control of data channels.

Andy Start, President, Inmarsat Global Government, said, "*Today's announcement is a further example of Inmarsat's leadership in the UAV industry. We have seen a global demand from military and government customers looking to increase the operational effectiveness of their TUAV platforms. Enabling Satcom on these small airframes really is a game changer.*

"*Increasingly, we are finding that our government customers around the world need to do more with highly challenged budgets. This product allows beyond line of sight flight and payload control for a wide range of small UAV platforms where previously this has simply not been possible. Adding the ability to extend their operational range significantly and provide access to real time situational data and video, it is a truly compelling package.*"

cobham.com/satcom

SIA Leadership In Government Award Goes To Lt. Gen. John W. "Jay" Raymond

The Satellite Industry Association (SIA) presented their 2016 Leadership In Government Award at their 19th Annual Satellite Leadership Dinner held in Washington, DC.

SIA President Tom Stroup presented the Award to Lieutenant General John W. "Jay" Raymond, Deputy Chief of Staff for Operations, Headquarters, US Air Force, Washington, D.C.

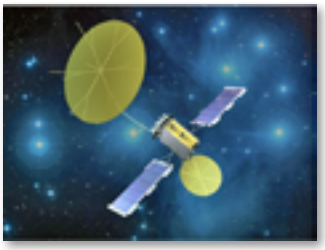
"*SIA is pleased to recognize Lt. Gen. Raymond for his advocacy, leadership and understanding of our industry's capabilities both now as Deputy Chief of Staff for Operations, Headquarters US Air Force here in Washington and during his previous assignment as Joint Functional Component Commander Space and 14th Air Force Commander,*" said Tom Stroup, President of SIA. "*His leadership was instrumental to improved coordination, communication, safety and security for the DoD and the commercial space community, notably within the Commercial Integration Cell of the JSpOC.*"

"*I am honored to receive this prestigious award, and greatly appreciate the strong partnership we enjoy with the commercial industry,*" said Lt. Gen. Raymond when accepting the award. "*We are an integrated multi-domain Air Force, and the commercial capabilities [the industry] provides are critical to our success.*"

SIA's Satellite Leadership in Government Award is traditionally presented to a current or former government official or member of Congress who has demonstrated long-term leadership and dedication to public service on issues affecting the satellite industry and has served as an example to others in government.

sia.org/

MUOS-5 Delivered By Lockheed Martin To Cape Canaveral AFS For May Launch



The US Navy and Lockheed Martin delivered the fifth Mobile User Objective System (MUOS) satellite to Cape Canaveral Air Force Station, Florida, on March 3, prior to its expected May launch.

The spacecraft will be the third MUOS satellite launched in a 16-month span, a cadence that demonstrates the production line concept put into place for the delivery of this five-satellite build.

MUOS-5 is the latest addition to a network of orbiting satellites and relay ground stations that is revolutionizing secure communications for mobile military forces. Users with operational MUOS terminals will be able to seamlessly connect beyond line-of-sight around the world and into the Global Information Grid. MUOS' new capabilities include simultaneous, crystal-clear voice, video and mission data, over a secure high-speed Internet Protocol-based system, similar to today's smart phones.

MUOS-5 will complete the Navy's baseline constellation and serve as an on-orbit spare for the system, ensuring the network is always available to support US and allied mobile forces.

Lockheed Martin manufactured MUOS-5 at its Sunnyvale, California facility. The satellite was loaded aboard a C-5 Galaxy aircraft at nearby Moffett Federal Air Field by the 60th Air Mobility Wing of Travis Air Force Base. Astrotech Space Operations, a Lockheed Martin wholly-owned subsidiary in Florida, will complete MUOS-5's pre-launch processing.

The satellite joins MUOS-1, MUOS-2, MUOS-3, and MUOS-4 already on orbit. All four required MUOS ground stations are complete. More than 55,000 currently fielded radio terminals can be upgraded to be MUOS-compatible, with many of them requiring just a software upgrade.

Once fully operational, the MUOS network will provide 16 times the capacity of the legacy ultra high frequency communications satellite system, which it will continue to support, and eventually replace.

lockheedmartin.com/muos

24/7 Overwatch In Afghanistan By USAF Jalalabad Predators

Editor's Note: The last names of certain Airmen are withheld in accordance with operational security requirements.

In a small, fenced-in compound on Jalalabad Airfield, an equally small unit of Air Force pilots and sensor operators are playing a large role in the Department of Defense's (DoD) intelligence, surveillance, and reconnaissance (ISR) mission.

Although the Air Force is progressing toward an all-MQ-9 fleet by fiscal year 2019 as the MQ-1s are phased out, the 62nd Expeditionary Reconnaissance Squadron Detachment 1's mission is very much alive in Afghanistan. The MQ-1B, an armed, multi-mission, medium-altitude, long-endurance remotely piloted aircraft is employed primarily as an intelligence-collection asset and secondarily against dynamic execution targets.

"*We have two combat air patrols in support of Operation Freedom's Sentinel*," said Capt. Steven, 62nd ERS Detachment 1 commander. "*We provide full-motion video ISR as well as close air support capabilities to troops on the ground and feedback back to our home station and headquarters.*"

The Predator carries the Multi-Spectral Targeting System, which integrates an infrared sensor, color/monochrome daylight TV camera, image-intensified TV camera, laser designator and laser illuminator.

The full-motion video (FMV) from each of the imaging sensors can be viewed as separate video streams or fused.

The aircraft can employ two laser-guided missiles, Air-to-Ground Missile-114 Hellfire, that possess highly accurate, low-collateral damage, and anti-armor, anti-personnel engagement capabilities.

In Afghanistan, the MQ-1B provides a unique capability to perform strike, coordination and reconnaissance against high-value, fleeting, and time-sensitive targets.

An MQ-1B Predator from the 62nd Expeditionary Reconnaissance Squadron Detachment 1 takes off on a combat air patrol from Jalalabad Airfield, Afghanistan, during February of 2016. The MQ-1B is an armed, multi-mission, medium-altitude, long-endurance remotely piloted aircraft is employed primarily as an intelligence-collection asset and secondarily against dynamic execution targets.

Photo courtesy of the US Air Force photo — Tech. Sgt. Robert Cloys.

"*Here at Jalalabad, we do the launch and recovery aspect of the MQ-1*," said Steven. "We don't fly any missions here. We launch a plane and then hand it over to a stateside mission control element crew who will fly the sortie and come back, and then we will land it."

The primary concept of operations, remote split operations, employs a launch-and-recovery ground control element for take-off and landing operations at the forward operating location, while the crew based in the United States executes command and control of the remainder of the mission via beyond-line-of-sight links.

Remote split operations result in a smaller number of personnel deployed to a forward location, consolidate control of the different flights in one location, and as such, simplify command and control functions as well as the logistical supply challenges for the weapons system.

That does not mean that the 62nd's mission isn't a critical one in Afghanistan.

"*Without us here at JBAD, the planes don't get airborne and the missions don't fly*," said Steven. "*The importance of that is, it keeps costs down for the Air Force. It allows them to deploy a few pilots to launch and recover 24-hour operations verses deploying dozens of pilots who have to fly the constant sorties.*"

The basic crew for the Predator is a rated pilot to control the aircraft and command the mission, and an enlisted aircrew member to operate sensors and weapons as well as a mission coordinator, when required.

The crew employs the aircraft from inside the ground control station via a line-of-sight data link or a satellite data link for beyond line-of-sight operations.

This basic configuration is often one not known or understood by those outside of the remotely piloted aircraft community.

"The misunderstood aspect of this is that people often use the word 'drone,'" said Steven. *"The Air Force doesn't like that term because it implies autonomy. Our planes are not autonomous in any way, shape or form. At all times a pilot and a sensor operator are in control of that aircraft. There is no point in time where there isn't a pilot in control."*

In fact, any kinetic strikes performed by MQ-1B Predators are more coordinated that many would expect.

"As an RPA pilot, I've been over the same target for a week, watching the same building, watching the same person, every day, building patterns of life. If I've been watching a target for 10 hours on just a one day alone, I know who's in the area, what's safe, what's not safe, where children are, where the school is, where the mosque is, which buildings to avoid, and I know which people are the bad guys with utmost certainty. Any pilot or sensor operator that takes control of the aircraft at any given time is intimately aware of the layout of the village or location."

Sensor operators at the 62nd ERS Detachment 1 play an equally important role in the mission at Jalalabad.

"The sensor operators here act more as a copilot than they do a sensor operator. In the launch and recovery portion there's no ISR to do," said Steven. *"They back us up when we do the engine run-ups. They scan temperatures, fluid levels and things like that. When we are airborne they are backing us up on making sure we are at appropriate air speeds for takeoffs and landings, checking altitudes, and boresighting lasers used for targeting."*

Stateside, the sensor operators are in control of the camera and help find and develop targets.

Pilots and sensor operators work in unison to put the aircraft and camera in the best position possible to get the best view for ISR and weapons delivery.

"Stateside we'll run the camera and track targets. Here, we're more of a copilot," said Senior Airman Adam, 62nd ERS Detachment 1, MQ-1B sensor operator. *"We're running checklists for the pilot, monitoring systems on the airplane and making sure everything is good to go, as well as calculating speeds and weights for the aircraft in flight."*

All in all, the 62nd ERS acts as the tip of the spear by monitoring and mitigating enemy activity without adding unnecessary human risk to US military personnel.

"Our mission is real," said Steven. *"We're flying full-sized aircraft with live ordinance on board, taking care of the mission and eliminating threats to the American people."*

Story by Tech. Sgt. Robert Cloys,
11th Wing Public Affairs,
455th Air Expeditionary Wing, USAF

Juniper Cobra: Comm check 1,2,3

A mass communication center was setup by three combat communications units in support of exercise Juniper Cobra 16, in Israel. This is the first time Airmen from the 1st Combat Communication Squadron (CBCS), 52nd CBCS and soldiers from the 44th Expeditionary Signals Battalion have worked together in a single exercise.

Photo is courtesy of the US Air Force—Staff Sgt. Stephanie Longoria.

In Israel, Airmen and Soldiers from three combat communications units worked together to maintain communication for more than 1,700 US Total Force service members and civilians who participated in exercise Juniper Cobra.

Juniper Cobra used ballistic missile defense computer simulations to train US and Israeli service members while reinforcing a strong military relationship.

For the first time, Airmen from the 1st Combat Communications Squadron (CBCS), 52nd CBCS and soldiers from the 44th Expeditionary Signals Battalion worked together to support US European Command.

"*In my 22 years working in a communications squadron, this is the first time three full comm units have ever worked together,*" said Col. Andrew D'Ippolito, United States Air Forces in Europe and Air Forces in Africa contingency and engagements division chief.

"*It's very very rare for multiple [communications] squadrons to work together,*" said Staff Sgt. Shirim Bishop, 1st CBCS tactical network operations supervisor temporarily deployed from Ramstein Air Base, Germany.

"*It normally only takes one unit, but with this large exercise they wanted to deploy multiple units to see how it works in the event that we would have to support a real-world situation.*"

For such a large scale computer-assisted exercise, maintaining communication is essential to the training.

"*Without communication the joint task force will have no command and control, and will not be able to accomplish the mission,*" said 1st Lt. Kyle Kiriyama, 44th ESB platoon leader from Grafenwohr, Germany. "*Communication is one of the most important pieces of this exercise.*"

"*The exercise would come to a halt if the communications lines were to go down,*" said Senior Airman Joseph Smith, 52nd CBCS communications specialist from Robins Air Force Base, Georgia.

Supporting the JC16 mission brought comradery among the three units along with some challenging learning opportunities.

"The initial setup was challenging but we got over the hurdles pretty easily," Smith said.

For Kiriyama, it was figuring out the roles and responsibilities for each unit, that he found the most challenging.

"We needed to figure out which unit is responsible for each building, area and what services were provided to customers," Kiriyama explained.

Learning each other's methods of troubleshooting an issue and the different ways of handling a situation as a team is one of the challenges the units have overcome during JC16.

"For a lot of soldiers this is our first joint exercise," Kiriyama said. "We've learned a lot about how the Air Force functions, how they deploy their communications assets and support customer's versus how we support our customers in the Army."

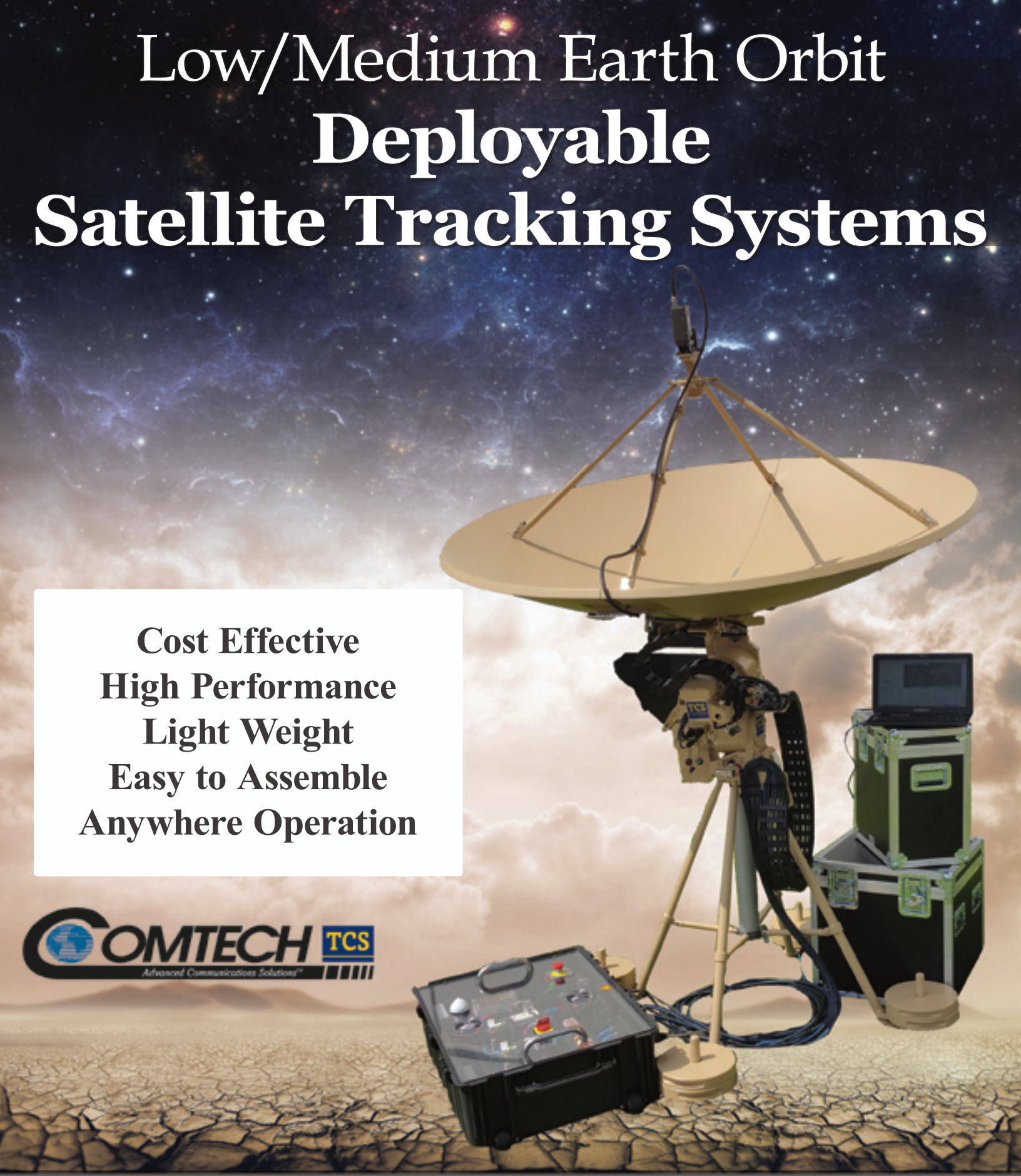
For Smith, working alongside the Israelis and learning new skills from his partner combat communications units was rewarding.

The team did an outstanding job working together and maintain communications throughout the exercise. I'm very proud of what they accomplished out here, D'Ippolito said.

"Our motto is 'First in, Last out,'" concluded Bishop. "We're usually the first unit in theater, and the last unit to leave. We setup before anyone else gets here, and we leave after everyone is gone. We provide the service that people need throughout the exercise."

Story by Staff Sgt. Stephanie Longoria,
48th Fighter Wing Public Affairs,
438th Air Expeditionary Wing, USAF,
US European Command

Low/Medium Earth Orbit
Deployable
Satellite Tracking Systems



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DISPATCHES

Moving On Up... Skot Butler To President Of Intelsat General Corp.

Intelsat S.A. has promoted Skot Butler to President of Intelsat General Corporation, a wholly owned subsidiary that provides satellite communications solutions to military, commercial and government customers—he will start his new role on April 4, 2016.

In his new role, Mr. Butler will oversee Intelsat General's strategic direction, operational plans and execution of the overall mission to provide a range of sustainable, cost-effective and secure communications solutions to government and commercial customers. He is succeeding Kay Sears, who is leaving Intelsat General after 10 years to pursue a new professional opportunity. Mr. Butler, who most recently served as Vice President of Satellite Networks and Space Services at Intelsat General, has held positions of increasing responsibility since joining the company in 2006. During his tenure, he led a number of initiatives that provided innovative, mission critical solutions to government and commercial customers worldwide.

Prior to joining Intelsat, Mr. Butler worked at DRS Spacelink as Director of Business Development, leading strategy and solutions for the company's satellite services business line. He began his career in the satellite industry in 2000 with Verestar Government services where he held sales and business development roles and served as an integral member of the team that launched the company's government services unit. Mr. Butler is a graduate of Old Dominion University and has a Master's Degree in Business Administration from the University of Maryland.

"*Since joining Intelsat, Skot has proven himself to be a strong, strategic and decisive leader,*" said Stephen Spengler, Chief Executive Officer, Intelsat. "*He has a deep understanding of the current and long-term needs of our government customers and takes great pride in the mission critical work we do on their behalf all around the world.*"

Mr. Spengler also thanked Ms. Sears for her numerous contributions during her tenure at Intelsat. "*With Kay's guidance, Intelsat General has established a proven track record of being a trusted and valued partner to our government customers. She has been instrumental in developing a strong team of professionals who are proud of the mission critical work they do on behalf of our government customers and together, they have established Intelsat General as the leading satellite service provider for the government sector. On behalf of all of us at Intelsat, I'd like to thank Kay for her contributions and wish her well in her next professional venture.*"

US Marines Test Interoperability Skills

To simulate services provided to requesting agencies, Company B with Marine Wing Communications Squadron 28 conducted a field exercise developing mission critical skills in support of potential requests from various agencies at Marine Corps Air Station Cherry Point.

During the exercise, Bravo Company provided their own Tactical Air Operations Center, Tactical Air Command Center and simulated unmanned aerial vehicle squadron requests, giving the Marines a broader understanding on what roles requesting agencies play during operations within a communications squadron.

MWCS-28 incorporates numerous systems ranging from single-channel radios to systems with an emphasis on interoperability and beyond line-of-sight communications, for a broad spectrum of information services. These services include video, multimedia, data, and imagery which enable the Aviation Combat Element to function with reliable communications architecture.

"*Everything that went into this training exercise was designed to be difficult, and we did a great job executing this,*" said Gunnery Sgt. John L. Fletcher, a data network systems chief with the squadron. "*There was a lot of cross training going on, and through that cross training, we gained a better knowledge on how we integrate with our own sections and how the different services work together. Everyone learned a lot, and it's been a great opportunity to find those key troubleshooting figures.*"

According to Fletcher, the exercise sharpened the minds of the Marines who are becoming more effective at reacting to troubleshooting common issues that happen on deployments, while also better serving the wing to ensure communications are up and aircraft are in the air.

"*A lot of the new Marines don't particularly know what the Marine Air Communications Squadron agencies do,*" said 1st Lt. Natasha Bentz, an air support control officer with Marine Air Support Squadron 1. "*Working as our own agencies showed the Marines the structure of the MACS and what their exact role is in each of those agencies.*"

"*The Marines are learning a lot from this training, to include simulating their jobs in the MACS agencies,*" said Bentz. "*Living in a tactical field environment while maintaining their roles in the training, teaches the Marines how to be well-rounded communicators.*"

Story by Pfc. Nicholas Baird,
Marine Corps Air Station Cherry Point,
II Marine Expeditionary Force

Second CENTCOM Contract Awarded To Intelsat General

Intelsat General Corporation, a wholly owned subsidiary of Intelsat S.A., has been awarded a second contract to provide satellite services to the US Central Command (CENTCOM).

The one-year contract calls for 288 MHz of Ku-band service to support US military operations in the CENTCOM Area of Responsibility (AOR), which extends from North Africa through the Middle East and into the Central Asian countries of Afghanistan and Pakistan.

The service, which began in February 2016, has four, one-year renewal option periods and one six-month renewal option period.

The new contract follows a similar award made last September to support the United States Air Forces Central Command (AFCENT) operations with 144 MHz of Ku-band services.

This contract was previously disclosed in a February 22, 2016, financial statement by Intelsat, S.A.

"*This capacity will provide the US military's deployed command and control nodes with robust reliable communications in remote locations,*" said Skot Butler, Vice President, Satellite Networks and Space Services, at Intelsat General. "*This will support vital C4ISR networks throughout the CENTCOM AOR.*"

intelsatgeneral.com/

DISPATCHES

New Remotes + Defense Line Cards From iDirect Government

iDirect Government (iDirectGov) has unveiled their next generation 9-Series portfolio of remotes and defense line cards that will bring greater spectral efficiencies and enhanced performance to the company's government customers.

Riding on the 9-Series remotes is the Evolution 3.4 software that brings the products to life.

Each of the remotes within the new series features different form factors and capabilities to accommodate customer specific needs.

The entire series of remotes is capable of nearly double the in-route Msps of its predecessor the 8-Series and with almost 10 times the packets per second capability.

Featuring extended frequency ranges, which allow users to access the Wideband Global Satellite (WGS) constellation, as well as High Throughput Satellites (HTS), the 9-Series supports the ability to receive multiprotocol encapsulation (MPE) broadcasts.

For secure traffic, the 9-Series will support both one-way and two-way TRANSEC and be certified at FIPS140-2 Level 3.

The series consists of the 950mp, 900 and 9350. The 950mp features a reduced footprint of 33 percent, uses 55 percent less power and is 28 percent lighter than its predecessor the e850mp—all of which is critical in the use of man-portable terminals.

The 900 and 9350 remotes include dual demodulators, which allow the remotes to support two separate data streams. Combinations of data traffic can include both two-way and one-way traffic, with one way traffic consisting of multiprotocol encapsulation (MPE) broadcasts or one-way TRANSEC.

The 9350 also boasts the first LCD screen on an iDirect remote, allowing the user to view remote's configuration and statistics.

The next-generation defense line cards—the DLC-T and DLC-—enable secure voice, data and video communication links and enable the 9-series remotes to operate on the new HTS.

The DLC-T supports one-way TRANSEC and is DVB S2X ready. The DLC-R has an on-board TRANSEC module and will support as many as 16 channels and as much as a four times increase in composite Msps and a two times increase in per channel TDMA and Adaptive SCPC returns. DLC-Rs are capable of supporting MCD Adaptive Spread.

"*The improved functionality of the 9-Series remotes and defense line cards will be a force multiplier for field operators who have long told us that they need a reduced footprint without having to sacrifice performance, agility and functionality*," said John Ratigan, president of iDirect Government. "*We innovated around speed and performance, bringing iDirect's fastest TDMA remotes into the marketplace. We're excited about what this means for the military missions ahead.*"

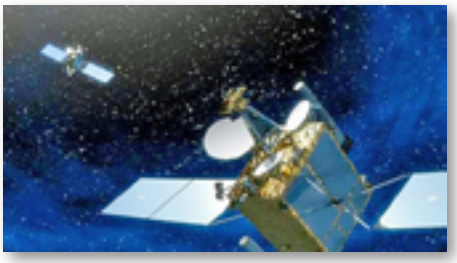
idirectgov.com

German MILSATCOM Systems + Airbus Defence & Space

Airbus Defence and Space has been awarded a 145 million euros contract by the procurement agency of German Armed Forces (BAAINBw) for the long term operation of the SATCOMBw secure satellite communications system.

Airbus Defence and Space has been operating the SATCOMBw system since 2006. This contract, which has been renewed for the next seven-and-a-half years, includes the on orbit operation of the military COMSATBw1 and COMSATBw 2 satellites as well as the operation of their teleport and associated networks in Weilheim, Germany, until 2022. Image courtesy of Airbus Defence & Space.

The two military communication satellites COMSATBw-1 and COMSATBw-2 provide German armed forces (Bundeswehr) in operation with military UHF and X-band plus additional capacity in C- and Ku-band over a coverage area that stretches from the Americas to Eastern Asia.



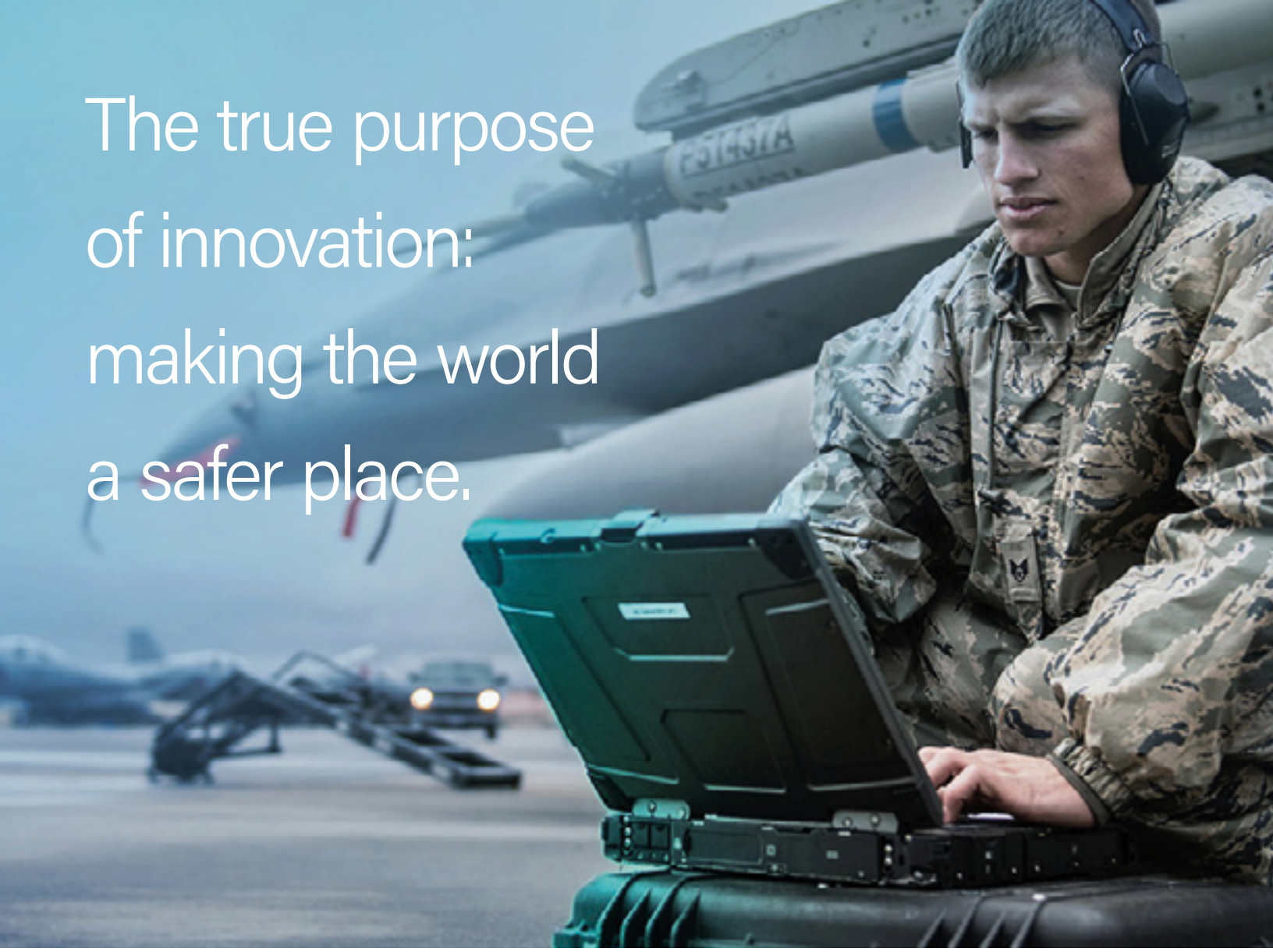
Artistic rendition of the German Armed Forces COMSATBw-2 satellite.

Image courtesy of Airbus Defence & Space.

In addition to the two satellites, the SATCOMBw program provides a secure ground communications network and control system. Command centers, vehicles, aircrafts and ships deployed around the world are linked directly into the base communications networks for voice, video, database access and IP (Internet Protocol) services.

Airbus Defence and Space has been responsible for the overall SATCOMBw system design, integration and delivery of a fully operational capability. The company has also delivered more than 500 ground terminals with range of antenna diameters from 1.2 to 4.6 meters included maritime terminals.

airbusdefenceandspace.com/



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DISPATCHES

Having A Ball With "Green" Propellant

The NASA Green Propellant Infusion Mission (GPIM) seeks to demonstrate and test the capabilities of a high-performance, non-toxic, "green" fuel on orbit—this the first time the nation will use a spacecraft to test green propellant technology.

The fuel and its accompanying technology offer many advantages for future satellites, including longer mission durations, additional maneuverability, increased payload space, and simplified launch processing.

The propellant for this mission is a Hydroxyl Ammonium Nitrate (HAN) fuel/oxidizer blend, or AF-M315E.

Developed by the Air Force Research Laboratory (AFRL), it offers nearly 50 percent higher performance for a given propellant tank volume compared to a conventional hydrazine system.

This new, green propellant is less harmful to the environment, increases fuel efficiency, and diminishes operational hazards.

The Ball Aerospace team will develop and fly the GPIM to demonstrate the new fuel and an integrated propulsion system that uses green propellant in space.

Once on orbit, the team will characterize the green fuel's performance using Ball Aerospace-developed software. Planned on orbit maneuvers include attitude control demonstrations, spacecraft pointing and hold, thruster performance characterization and mapping, inclination change and orbit lowering.

The GPIM payload will fly aboard the Ball Configurable Platform (BCP) 100 spacecraft bus.

The Ball Aerospace-built BCP 100 provides standard payload interfaces and streamlined procedures for short lead-time and affordable access to space.

The BCP 100 is ideally suited for scientific, technology development, and risk reduction payloads like the GPIM.

The GPIM will be developed over three years and is expected to launch in 2016.

Ball Aerospace is the prime contractor for GPIM. A principal investigator from Ball Aerospace will lead the demonstration of the alternative fuel for future space vehicles.

GPIM team co-investigators include the Aerojet Corporation, NASA Glenn Research Center, and the US AFRL at Edwards Air Force Base, with additional mission support from the US Air Force Space and Missile Systems Center at Kirtland Air Force Base and NASA's Kennedy Space Center.

In addition to the promise of higher performance for future satellites, the fuel's exceptional volumetric storage properties is also being examined for military uses such as missile launches and auxiliary power units that currently use hydrazine.

ballaerospace.com/

UAV Ops Gain Ku- Bandwidth

UltiSat, Inc., has announced that the Defense Information Systems Agency Defense Information Technology Contracting Organization (DISA-DITCO) awarded a COMSATCOM Transponded Capacity (CTC) task order for the company to provide United States Pacific Command (USPACOM) Ku- bandwidth capacity for Global Hawk (GH) Unmanned Air Vehicle operations and training.

UltiSat will support GH Ku-band Earth terminals and Tri-band Tactical Field Terminals (TTFT) located at Kadena Air Base (AB), Okinawa, Japan as well as a GH UAV based at Andersen Air Force Base (AFB), Guam.

This task order falls under the Future COMSATCOM Services Acquisition (FCSA) Schedule 70 contract vehicle. The total contract value including options is $4,128,240.00.

"*UltiSat provides a diversified portfolio of complex services and solutions to the government sector. Awards similar to this most recent CTC will allow us to manage and support end-to-end satellite communications solutions for our government customers in the demanding market of airborne ISR*," said Amy Gwinn, UltiSat's Senior Vice President of Government Solutions.

ultisat.com/

DISPATCHES

Automatic Beam Switching For UAS Demo'd On Intelsat Epic^{NG}

Intelsat General Corporation and L-3 Communication Systems-West (L-3 CS-West) announce the successful demonstration of new automatic beam switching technology that enables Unmanned Airborne Systems (UAS) fitted with L-3 CS-West satellite communications packages to operate on Intelsat's high-throughput satellite (HTS) platform, Intelsat Epic^{NG}.

This software upgrade was funded and developed through a partnership between Intelsat General and L-3 CS-West to ensure that the existing unmanned aircraft systems (UAS) platforms can take advantage of the 3x–4x throughput improvement that Intelsat Epic^{NG} enables. This demonstration was part of Intelsat's ongoing ecosystem work validating the compatibility of existing hardware with Intelsat's EpicNG high-throughput satellites. This over-the-satellite demonstration was

Artistic rendition of Intelsat's Horizons-1 satellite.

conducted on Intelsat's Horizons-1 satellite using three separate bandwidth segments and a navigation simulator representing a UAS flying through three separate high-throughput spot beams on a single Intelsat Epic^{NG}-class satellite. Using an L-3 CS-West hub and terminal modems for the end-to-end test, engineers measured the performance of full-motion video and IP data between the UAS and the hub controller as the system automatically switched both frequency and polarization while the aircraft flew through the three separate beams.

The new Intelsat Epic^{NG} satellites are designed to increase UAS data rate performance by 200 to 300 percent via their high-throughput spot beams and enable broadband performance to antennas with apertures smaller than 30 cm. This demonstration validated that the UAS could automatically switch between these beams without user intervention, thereby simplifying operations while fully leveraging this increased throughput.

Following this successful demonstration, Intelsat General and L-3 CS-West plan to conduct further tests with user platforms employing the recently launched Intelsat Epic^{NG} IS-29 satellite.

A demo video is available at ***http://intelsatgeneral.us8.list-manage1.com/***

DISPATCHES

Reducing Satellite Lease Costs With Channel Sharing

The Army's predominate friendly-force tracking tool known as Blue Force Tracker (BFT), used by nearly every ground and aviation vehicle across the fleet, could soon be part of a satellite channel sharing initiative.

Currently, BFT-1 and BFT-2 systems use unique satellite channels to send and receive Position Location Information (PLI) and Command and Control (C2) data which allows commanders to visualize assets within the operational sphere. While this is operationally effective, it comes with significant costs. Validation from single beam testing offers a forward-thinking solution.

The Army has conducted a channel sharing aviation mobility operational test at the Communications-Electronics Research, Development and Engineering Center (CERDEC) Intelligence and Information Warfare Directorate (I2WD) Flight Activity, located at Joint Base McGuire-Dix-Lakehurst, N.J., where system engineers operating both BFT-1 and BFT-2 from ground and aviation vehicles assessed the performance data of each system under shared channel settings.

"*The intent is that when combined, units won't be able to tell the difference*," said Jason Parks, system engineer, Project Manager Mission Command (PM MC). "*Same service, same data—lower cost.*"

The scope of the test examined the performance of transceivers in current operational conditions. BFT transceivers mounted on vehicles including a UH-60M (Blackhawk), an aircraft capable of producing the greatest rotor blockage, were used to evaluate data impact between platforms at different power ranges. Simulated data including PLI reports and C2 messages were successfully transmitted consistently between systems. Testing efforts to validate simultaneous operation of both systems onto a single beam represents an operational benefit that is seamless to the Soldier.

Along with validation from two separate assessments prior to the operational test conducted at the CERDEC facility, PM MC has evaluated channel sharing as technically and fiscally effective.

Operating Blue Force Tracker (BFT-1 and BFT-2) from ground and aviation vehicles, system engineers conducted a channel sharing aviation mobility operational test at the Communications-Electronics Research, Development and Engineering Center (CERDEC) Army aviation facility "hang 5" located at Joint Base McGuire-Dix-Lakehurst, New Jersey.

US Army photo by Devon Bistarkey.

"*Operating these two systems within the same satellite channel will provide PM MC the opportunity to significantly reduce commercial satellite lease costs*," said Lt. Col. Michael Olmstead, product manager, Joint Battle Command-Platform (JBC-P) part of PM MC. "*Additionally, success of this test shows how we continue to optimize the way we do things.*"

Operationally, both systems transmit data on respective satellite beams and ground stations. While BFT-2 comes as a system enhancement to BFT-1, which reduces network latency and processing time, the effort to combine the two currently disparate channels was the intent of an initial proof of concept set to look at reducing sustainment costs since both systems will be used operationally over the next ten years. Looking forward, the next version BFT 2.5 will incorporate the single channel technology and improve connectivity operations by increasing satellite opportunities to achieve full global coverage.

The BFT 2.5 modified installation is set to include an improved directional antenna design, processing boards with four-times the power and two full-duplex modems that can access additional waveforms.

"*The added capability of multiple waveforms to the BFT hardware will ensure BFT's relevance as the lower tier communication network for the warfighter*," said Andrew Stevens, SATCOM engineer.

Capability enhancements could allow for terrestrial connectivity with the use of the Soldier Radio Waveform (SRW), along with the addition of an enhanced antenna set to provide satellite based voice messaging. These improvements can increase anti-jamming capabilities and provide continued cost savings with redundancy in already purchased satellite bandwidth.

Story by Sgt. Devon Bistarkey,
444th Mobile Public Affairs Detachment,
Program Executive Office Command, Control, Communications-Tactical

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- *Advancing knowledge, science, and the creation of new technologies, which drive countless industries that deliver tremendous economic and social benefits.*

- *Revolutionizing US national security capabilities from the high ground of space giving the US armed forces a significant advantage in any conflict. This has contributed to US influence and soft power around the world, also aiding our allies and deterring adversaries.*

- *Inspiring generations of Americans to study science, technology, engineering, and math (STEM) and pursue high tech, high wage careers ensuring the US remains the most technically advanced nation. Many students who ultimately go into other fields are first inspired by space programs.*

- *Enabling and extending global communications capabilities to every point on Earth.*

- *Providing essential surveillance of landforms, the atmosphere, and oceans to produce data for agriculture, mining and drilling, urban and other planning, and for critical weather forecasts and global intelligence, saving countless lives and billions of dollars annually.*

KEY FACTS ABOUT THE UNITED STATES AND SPACE

The US is well-served by its three distinct yet interrelated and complementary space portfolios. These efforts are supported by networks of academia, industry, and national laboratories, which must be enabled by the federal government in order to ensure continued US leadership.

Civil Space includes the National Aeronautics and Space Administration (NASA), responsible for the exploration and development of space and advanced technologies for the expansion of knowledge and the benefit of life on Earth; the National Oceanic and Atmospheric Administration (NOAA), responsible for observing the Earth environment and understanding and forecasting planetary phenomena, like weather; the US Geological Survey (USGS), which operates the Landsat Earth-observing satellites; and the Federal Aviation Administration (FAA) Office of Commercial Space Transportation (AST), which regulates commercial space launch and re-entry to ensure public safety.

Commercial Space comprises those enterprises that own and/or operate space capabilities, including satellites and ground systems that provide products or services such as Earth imagery, satellite broadcasting, and a wide range of telecommunications. It also includes the launching of satellites, cargo, habitats, and soon people for commercial purposes. Examples of programs under development include NASA NextSTEP and asteroid mining. Customers range from individuals to corporations, researchers, academia, and government agencies.

National Security Space includes all military and intelligence community uses of space-based capabilities, such as threat detection, military weather forecasting, and reconnaissance activities. The US Air Force is the Defense Department's Executive Agent for Space, providing and acquiring critical capabilities and services to national leadership and all branches—from secure communications to precision navigation, timing, and targeting. The National Reconnaissance Office (NRO) provides a similar function for the intelligence community. Other agencies involved include the Defense Advanced Research Projects Agency (DARPA) and the National Geospatial-Intelligence Agency (NGA).

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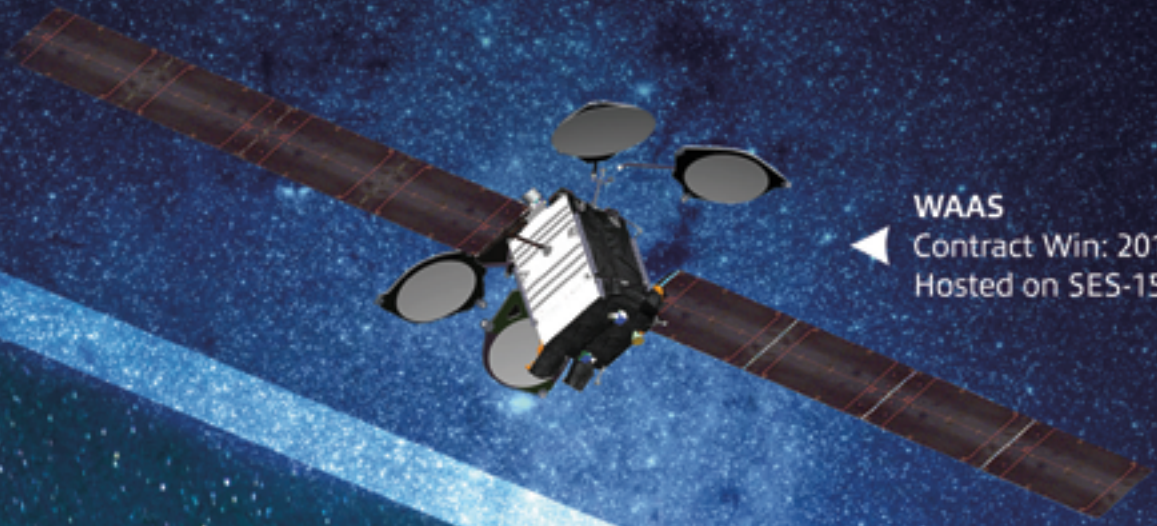

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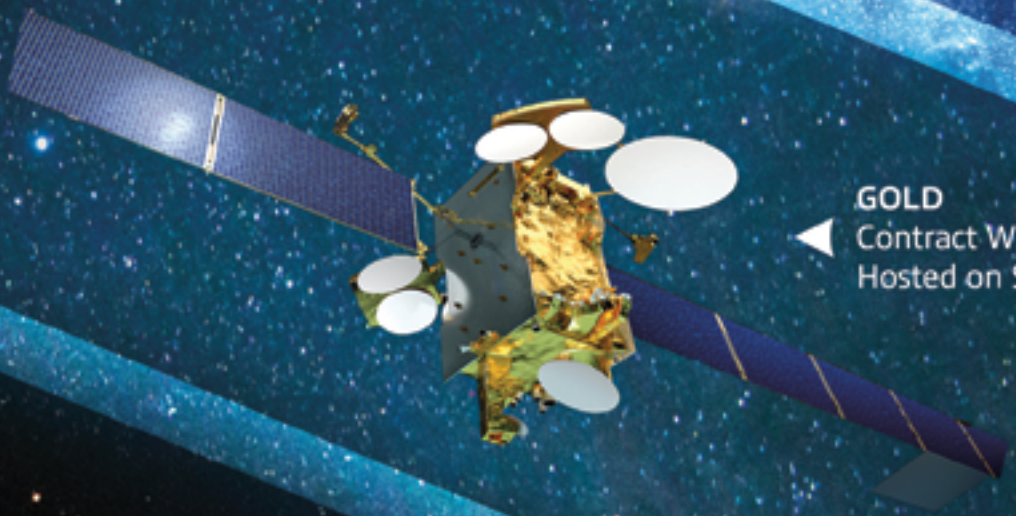

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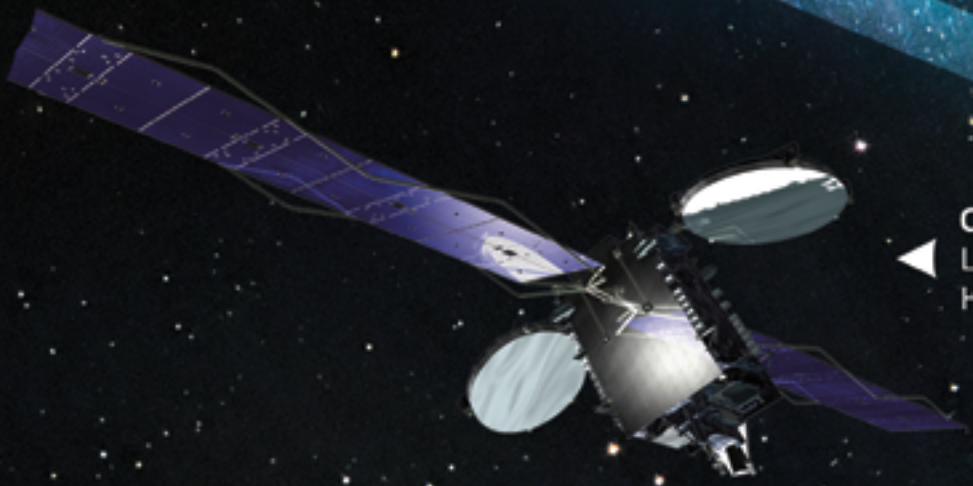

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US LEADERSHIP IN SPACE @ RISK

Despite the amazing benefits space has provided our nation, maintaining our space leadership is not guaranteed. Four key issues spanning Civil, Commercial, and National Security Space threaten US leadership and require immediate attention.

Budget Uncertainty

US Government research & development (R&D) as a percentage of our Gross Domestic Product (GDP) has fallen by 60 percent since 1964. Adjusted for inflation, NASA's purchasing power is below what it was in the early 1990s. By contrast, China's R&D investment is the fastest growing of all advanced countries as China seeks to counter US space advantages and pull away our traditional partners. US military space assets need modernization and recapitalization to keep up with peer and near-peer threats.

Despite its significant accomplishments, NASA's funding has fallen to historically low levels (adjusted for inflation)—below where it was during the mid-1990s—squeezing the agency's ability to develop new missions for human exploration, astronomy, planetary science, Earth science, solar science, technology development, and aeronautics research, which has led to cost and schedule inefficiencies for ongoing programs and missions.

FAA AST plays a critical role in providing timely review and approval of launch permits, licenses, and spaceport licenses for the commercial space industry and its budget will constrain its ability to fulfill these responsibilities. For this growing sector to continue on its current trajectory, it is critical that FAA AST have the authority to regulate and the resources it needs to work with the industry in a manner that will continue to promote growth and ensure public safety.

International Competition

Fourteen countries—including North Korea—operate their own launch vehicles and more than 100 nations have some type of space program. The two most prolific commercial launch vehicles are operated by Europe (Ariane) and Russia (Proton). At least four countries are presently investing billions of dollars in the development of new launch systems. The US is beginning to win back market share of commercial satellite launches for the first time in over a decade. Policies that promote open competition and innovation should be prioritized to maintain this positive trend, but mission assurance for national security launches remains paramount.

Currently, only China and Russia are capable of launching humans into space. The US now depends upon Russia to launch American astronauts to the International Space Station (ISS). Between 2012 and 2017, NASA will pay Russia over $2.1 billion to ferry astronauts to and from the ISS. Fully funding NASA's commercial crew program to restore US capability for independent access to the ISS and Low Earth Orbit (LEO) remains paramount.

The Space Operating Environment

Space is an increasingly congested, contested, and competitive domain in which space-based assets are threatened by orbital debris as well as cyber and kinetic attacks. Moreover, there is risk introduced by both unintentional and intentional interference (jamming) of radiofrequencies by both terrestrial and space-based systems. This puts human missions at risk and threatens the safety of all space platforms.

Workforce Trends

Although the US space workforce remains one of the largest in the world, the US civilian space workforce has declined more than 17 percent since 2006 due to reduced US space exports, reduced government space budgets, and increased foreign competition. As an example, of the world's 25 largest commercial satellite operators, only one is based in the US.

ACTION NEEDED TO CONTINUE US LEADERSHIP IN SPACE

Commit to predictable budgets, fund robust investments, promote innovative partnerships, and repeal the Budget Control Act of 2011. The federal government should authorize, appropriate, promote and manage US space programs for long-term viability and sustainability.

In recent years, our space programs have been hampered by a lack of long-term budgeting and planning, which impedes cost-effective management. Already, existing systems and programs have been delayed, curtailed, or placed on operational hiatus. Uncertainty caused by future potential sequestration of US space budgets will wreak havoc on government space programs, dissuade private sector investment, and place the space industrial base and workforce at risk. Historically, healthy government investments and partnerships encouraged increased industry R&D investments as well. Consequently, the US needs to continue to promote public-private partnerships in addition to strengthening investments in R&D. The resulting innovation and competitiveness will strengthen our industrial base and maximize the impact of taxpayer dollars.

Continue global space engagement. The ISS is the most visible example of the successful use of space programs to develop and sustain international collaborations and friendly, useful intergovernmental relationships. In many respects, the ISS is the most vibrant example of successful international public and private diplomacy, demonstrating the importance to the US of space programs for achieving national purposes.

The ISS is but one example. Today, our international partners continue to look to the US for leadership and direction. Additional examples such as the European-provided service module for NASA's Orion spacecraft, now in development, as well as European investments in the Dream Chaser ISS cargo vehicle and the continuing.

European interest in lunar exploration all represent further steps in international partnership for beyond LEO exploration. Likewise, the Department of Defense has a long history of successful military-to-military site visits, personnel exchanges, and various other trust-building engagements with friends, allies, and adversaries. US Strategic Command and US Air Force Space Command, in

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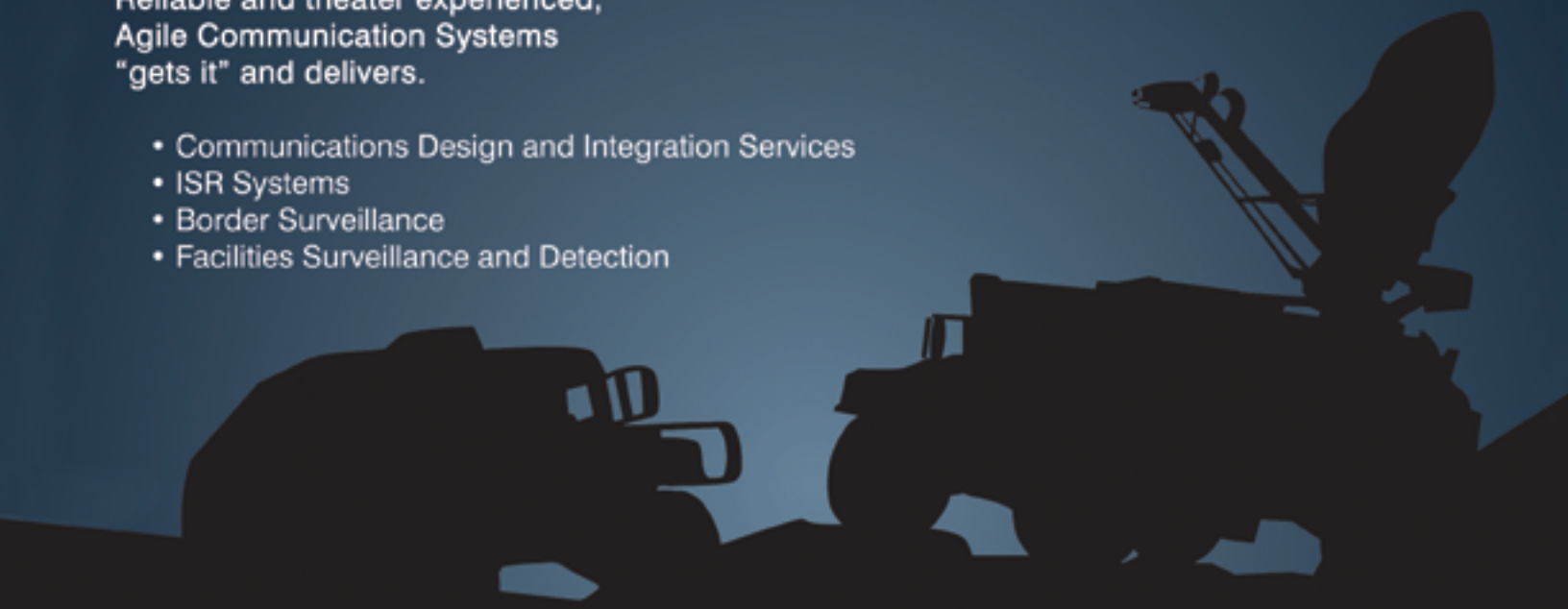

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particular, carry out important global engagement with space peers and competitors, which also contributes to overall US security.

Restore American access to space. The US must regain the ability to launch its own astronauts into space and bring an end to the practice of buying astronaut seats on the Russian Soyuz spacecraft. There are two complementary, viable pathways to achieving US independence in human space operations and both must be fully funded and vigorously pursued. Both systems expand safety, innovation, scientific research and technology development, and strengthen our industrial base:

The Space Launch System (SLS) and the Orion Multi-Purpose Crew Vehicle are NASA's next-generation human transportation systems to explore farther into the Solar System than ever before. These programs have enjoyed bipartisan and bicameral support and have made significant progress toward a renewed US capability to send astronauts beyond LEO for the first time in more than 40 years, opening the door to missions in cis-lunar space and eventually to Mars.

NASA's Commercial Crew and Cargo programs have also received bipartisan, bicameral support. Commercial Crew is the logical progression of the agency's Commercial Cargo program, enabling multiple commercial companies to operate cargo transportation to the ISS. Robust and competitive access to the ISS for cargo and the new crew vehicles that will once again launch Americans from American soil provides a new model for ISS access while strengthening the industrial base and helping to enable new commercial space services markets.

Encourage the continued use of fully competitive, innovative partnerships. The US Government needs to actively encourage the continued use of fully competitive and innovative partnerships to enable private industry to grow and create capabilities that will enhance and support government endeavors in a safe and affordable manner.

Maintain, strengthen, and grow the domestic industrial base. The US space industrial base has been the foundation of our nation's continued success in space. Declining budgets and reduced space initiatives have combined to create increased pressure on the industrial base with increasing difficulties for the smaller suppliers. In response, the US Government is exploring acquisition reform and efficiencies, and has begun to transition traditional responsibilities for well-established capabilities to the private sector. Innovative partnerships should continue to be utilized as a way to engage industry in the development and acquisition of groundbreaking and mature space capabilities as well as traditional and emerging space services. The US Government should also strive to protect American industry from international non-market economy competitors.

Commit to a robust national security space program that maintains US dominance of the high ground in space. The US Government should provide increased resources for national security space and launch programs, including the use of innovative partnerships that support, enable, protect, and connect our national leaders, our warfighters, and our allies. It should also ensure that these programs enable unmatched global capability to counter nation state and non-state threats and are able to operate effectively in an increasingly contested space environment.

Maintain and expand internationally harmonized spectrum access for space. Commercial, Civil, and Military space all require access to spectrum in order to deliver their services, operate safely, and meet their mission requirements. Given the significant infrastructure development and investment, it is critical to have predictable and stable regulatory access to spectrum.

Define and commit to new missions to expand the frontiers of science. Through American space leadership and international cooperation, we will continue to dramatically increase our understanding of our Solar System and the universe and gain a better understanding of the complex oceanic and atmospheric phenomena that impact life on Earth.

Promote STEM education and retention of US– educated workers. Scientists and engineers are essential to US innovation and growth. The federal government must continue to promote policies that enhance the pipeline of STEM-educated workers into the US economy and that permit the retention of highly skilled foreign-born workers who have been educated at US colleges and universities.

Further reduce barriers to international trade whenever possible. Increased international sales bolster the economy, assert US technological advancements, and reduce the need for the US Government to sustain the US space industrial base.

ENSURING US LEADERSHIP IN SPACE

Support for US space programs and industry means support for the US nation's economy, security, leadership, and high-quality American jobs and businesses.

This article is repurposed, with permission, from the Space Foundation's infosite and is courtesy of the contributing companies listed below.

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Plenum De-Ice Systems prevent snow and ice buildup that degrade your signals. Our unique hot air enclosure (Plenum) design mounts behind antennas — from 3.7 to 32 meters. Most reliable and economical system on the market. Uniform surface heating minimizes distortion losses — unlike electric pad or heat tape anti-ice systems. Electric, natural gas, or liquid propane heater options available.

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DISPATCHES

United Launch Alliance Gives The NRO A Lift

A United Launch Alliance (ULA) Delta IV rocket carrying a payload for the National Reconnaissance Office (NRO) lifted off from Space Launch Complex-6 on February 10 at 3:40 a.m. PST.

Designated NROL-45, this mission is in support of national defense. This is ULA's second launch in 2016 and the 105th successful launch since the company was formed in December 2006.

"Congratulations to the ULA team and our US Air Force and NRO partners on the launch of NROL-45," said Laura Maginnis, ULA vice president of Custom Services. "This is our second successful launch within five days for our US government customer, a testament to our outstanding teamwork and focus on 100 percent mission success, one launch at a time. ULA is proud to be entrusted with safely and reliably delivering our nation's most critical space assets to orbit."

This mission was launched aboard a Delta IV Medium+ (5,2) configuration Evolved Expendable Launch Vehicle (EELV) using a single ULA common booster core powered by an Aerojet Rocketdyne RS-68A main engine along with two Orbital ATK GEM-60 solid rocket motors.

The upper stage was powered by an Aerojet Rocketdyne RL10B-2 engine with the satellite encapsulated in a 5-meter-diameter composite payload fairing.

ULA's next launch is the Atlas V OA-6 Cygnus International Space Station resupply mission, flown for Orbital ATK under NASA's Commercial Resupply Services contract.

The launch is targeted for March 22 from Space Launch Complex-41 from Cape Canaveral Air Force Station, Florida.

The launch of NROL-45. Photo is courtesy of United Launch Alliance.

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

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

With more than a century of combined heritage, United Launch Alliance is the nation's most experienced and reliable launch service provider. ULA has successfully delivered more than 100 satellites to orbit that provide critical capabilities for troops in the field, aid meteorologists in tracking severe weather, enable personal device-based GPS navigation and unlock the mysteries of our solar system.

Although the NRO keeps most details of its satellites and their missions classified, analysis of the information that is publicly available and comparison with previous missions often allows inferences to be made as to the nature of the spacecraft being launched. The launch of NROL-45 was the tenth of 2016 worldwide and the third from the United States.

WHAT FIBER IN THE SKY MEANS TO THE WARFIGHTER TODAY

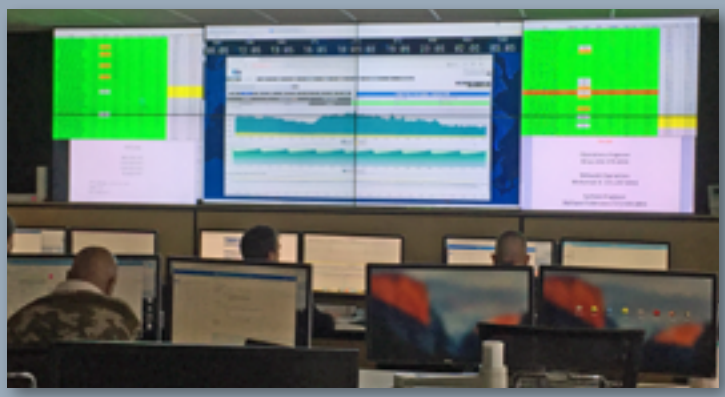
By Mike Blefko, Strategic Initiatives, SES Government Solutions

Back in 1995, *Newsweek* **published an article on "***Why the Internet will fail***."—I'd like to share an excerpt from that article with you:**

> "*Visionaries see a future of telecommuting workers, interactive libraries and multimedia classrooms. They speak of electronic town meetings and virtual communities. Commerce and business will shift from offices and malls to networks and modems. And the freedom of digital networks will make government more democratic. Baloney.*"
>
> "*…The truth is no online database will replace your daily newspaper, no CD-ROM can take the place of a competent teacher and no computer network will change the way government works.*"

History shows that this 1995 assessment was short-sighted. In fact, in just over 20 years, technological advances are so commonplace that we often take them for granted. We now seamlessly operate in an environment in which networks actively change the way government works. The current age, with information accessible anywhere at any time, brings with it some truly game-changing capabilities—once unthinkable—that are redefining government operations.

SES Government Solutions MediaPort in Bristow, Virginia, the location of ongoing O3b demos.



New O3b Network Operations Center in Bristow, Virginia.

We flourish in an environment the author thought would be "baloney"—an interconnected digital realm that enables government operations. With its ability to extend those networks to areas once thought untouchable, O3b represents another leap forward that few thought possible just a few years ago.

O3b is a Medium Earth Orbit (MEO) constellation in Ka-band that provides high throughput and low latency capability. Even in austere environments that make fiber-optic infrastructure physically or fiscally challenging, O3b capabilities represent connectivity options that are revolutionary.

Government users serve in some of the world's most hostile environments where fiber and other infrastructure is not available. However, these users still need high speed capabilities necessary to execute their mission. O3b's fiber-like, easily deployable system is available and ready to be used today. The following are some of the scenarios where O3b's high throughput and low latency can play a significant role in day-to-day operations.

SCENARIO #1: ARMY INFORMATION BACKHAUL FROM THE TACTICAL EDGE

As a direct provider of O3b capacity, SES Government Solutions (SES GS) reduces risk for the warfighter today. The O3b system can deliver that mission-critical information in real time. SES GS worked with industry partners to create a video dissemination platform that broadcasts multiple High Definition (HD), full-motion videos simultaneously through a "Youtube"-like interface. US Government attendees had a chance to exercise this platform during the SES GS/O3b US Government demonstration at MacDill Air Force Base in October of 2014. The demo featured six videos with no delay, pixelation or data lost.

Site of SES GS / O3b demo at MacDill Air Force Base in Tampa, Florida, during October 2014.

The Army's expeditionary mission relies heavily on field sensors producing large data files, HD video streams and information loaded to and from 'the cloud.' These videos could be coming from unmanned aerial systems, sensors or mobile devices used by Army soldiers.

During the MacDill demo the SES GS team conducted a complete 3.8 GB file transfer in about three and a half minutes over O3b's network. Meanwhile, the government's current VSAT (Very Small Aperture Terminal) solution projected an estimated download time of over eight hours for the same file.

The point was clear: an O3b-enabled solution provides decision-quality information to the warfighter much faster than traditional VSAT solutions.

SCENARIO #2: SECURE, CONNECTED AND HIGH-SPEED WIFI FOR THE NAVY

The second scenario addresses the need for high-speed Internet on Navy carriers, command ships and large deck ships. An O3b installation on these ships provides a dramatic increase in connectivity for each sailor.

Consider a scenario where a sailor is injured and needs to be transported back to land in order to implement a proper diagnosis and treatment. The ship's doctor could communicate with shore-based hospital efforts that could recommend life-saving procedures in real-time.

Using Ultra HD video conferencing riding on O3b, the sailor could simply under-go treatment on the spot, potentially saving the Navy thousands of dollars in air transportation costs and saving the sailor's life. This particular telemedicine scenario actually took place during O3b's satellite demonstration with the US Navy's 7th Fleet during a Limited Objective Experiment (LOE) last year.

For Navy on-board WiFi, the O3b solution can provide throughput to more than 6,000 devices per ship, with 300 times the capacity of a typical cruise ship. The result would be video teleconferencing, 24/7 video surveillance as well as morale boosting applications such as video games, streaming video and Skype all without any delay, pixelation or buffering. This technology is currently being implemented by Royal Caribbean's Quantum of the Seas cruise ship customers today.

SCENARIO #3: UNINTERRUPTED LIVE STREAMING FOR RESCUE MISSIONS

The final example is a hot spot scenario, like an embassy in a hostile environment where fiber has been cut by adversaries, or is unreliable, unavailable or just has not been installed. It could take months to restore severed fiber connections and perhaps years to install new fiber.

For any national security threat at an embassy, such as a hostage crisis, the US Government needs to identify and act on the threat as soon as possible. They also need to provide situational awareness for any effective planned relief effort and key decision makers overseas from the Pentagon to the White House.

An O3b solution would allow reliable, responsive access to mobile phones, tablets and security cameras to ensure a seamless, continuous live stream of information during a time-sensitive and life-threatening scenario. When identifying a target—be it through high resolution video, photo or map—you can assure that the decision will be accurate. By implementing and using O3b, the decision will be real time supported by crystal clear imagery products.

PROVEN TECHNOLOGY READY TO BE DEPLOYED TODAY

O3b capitalizes on modems, advanced satellites and efficient links to enable operations. The key however is the quick availability of this technology. An SES GS-engineered O3b solution can be up and running within 60 days. Upon receipt of all equipment, the 'box to bird' set up time for the two antenna O3b system can be as quick as 45 minutes. That equates to an HTS-enabled, fiber-like network anywhere in the world.

While some companies are talking about connecting the unconnected, SES and O3b are doing such today. In fact, O3b satellites are currently transmitting to over 40 customers worldwide.

SES GS has made the investment in purchasing, testing and demonstrating the O3b system and can provide outstanding throughput for time-sensitive missions. With O3b, SES GS once again breaks all barriers with heart-racing performance that will revolutionize modern warfare.

O3b satellite build being completed.

In 1995, conventional wisdom was short-sighted. Just ten years later, a giant leap was underway. Today we stand on the edge of the next generation of communications technology for the warfighter. SES GS is the catalyst to make this vision a reality today.

ses-gs.com/

Mike joined SES Government Solutions in the fall of 2015. His responsibilities include business development and sales in support of strategic initiatives for SES Government Solutions. His responsibility is to grow the O3b presence in the satellite marketplace.

Mike has held key positions at several leading companies in the Satellite community including GM and SATCOM Director at CVG (Kratos), Section Manager within the wireless group at Northrop Grumman TASC, and Business Development and Sales Manager at Micro-Ant. He has more than 28 years of engineering, design and sales experience in the RF, antenna, and satellite communications marketplace.

THE DOD DEPENDS ON THE EVOLUTION OF COMMERCIAL SATELLITE TECHNOLOGY

By Skot Butler, President, Intelsat General Corporation

Space technology and spacecraft innovation are hot topics of discussion among America's venture capital investors, Silicon Valley firms, and Department of Defense (DoD) planners.

Over the past couple of years, new space companies have sought hundreds of millions of dollars in financing for projects as diverse as taking high-resolution images of every spot on earth every day; circling the Earth with hundreds of broadband satellite hotspots; landing on asteroids to mine them for precious metals; and measuring the atmospheric deflection of GPS signals for weather forecasting.

Getting the latest hot technology into space, whether it is a higher resolution camera or a better propulsion system, is an exciting challenge. The DoD is beginning to take a larger role in seeking out commercial technology and innovation that could be used in space. The Pentagon is also working to change its acquisition approach to better take advantage of new technologies as they become available. This is especially important given the increasing threat landscape.

Last year, the Pentagon opened an office in Silicon Valley called the Defense Innovation Unit—Experimental to scout promising technologies. In a recent speech during a visit to Silicon Valley's high-tech hub, Defense Secretary Ashton Carter said the DoD was going to spend $22 billion on space projects in 2017. He also announced the formation of a DoD Innovation Advisory Board to be headed by Eric Schmidt, executive chairman of Alphabet, Google's parent company. Google has made a major investment in SpaceX, which plans to augment its launch business with a new satellite constellation in Low Earth Orbit (LEO).

The upcoming DoD study of the Analysis of Alternatives (AoA) for wideband communications gives the Pentagon another opportunity to look to commercial companies for the best ways to support the warfighter with the latest in space technology. By involving commercial companies in this study, the DoD will be able to see how advances in commercial satellites can help the United States maintain its superiority in space.

Intelsat has long been a leader in launching and operating continuously improved spacecraft, the latest example of which is our new Intelsat Epic^{NG} platform. Our first Epic^{NG} satellite, Intelsat 29e, reached orbit in January and a second Epic^{NG} will be launched later this year. A key feature of the Epic^{NG} spacecraft is the digital payload technology, first developed by The Boeing Company for use on the DoD's WGS satellites. This is the most advanced digital payload commercially available.

Artistic rendition of the Intelsat 29-e satellite on orbit.

Intelsat's next generation Epic^{NG} satellite fleet combines wide beams and spot beams with frequency reuse technology to meet the growing demand for broadband connectivity worldwide. Benefits include:

- ***Inherent Anti-jamming**—Intelsat Epic^{NG} beams are significantly smaller than wide beams covering a broad geographic area, thereby limiting the region from which a jammer can be effective. With the onboard digital switch, jammers can be detected and stopped at the satellite, thus preventing them from polluting the satellite's downlink. In addition, desired carriers can be re-tuned to avoid the jammer and the onboard digital payload re-configured so the desired carrier still arrives at its destination at the original downlink frequency.*

- ***Additional Layer of Protection—**IGC has participated in tests led by the US Air Force that validated the protected tactical waveform (PTW) modem performance over the Intelsat Epic^{NG} platform. PTW will provide cost effective, protected communications in multiple frequency bands. On the Intelsat Epic^{NG} satellites PTW will deliver broader protection, more resiliency, more throughput and more efficient utilization of satellite bandwidth*

- ***Smaller Ground Terminals**—The higher power due to the smaller, more focused spot beams of the Intelsat Epic^{NG} platform, will allow for much smaller and more affordable antennas on the ground. This lower cost has unleashed a wave of innovation in the market, with a prime example being much smaller antennas that are flat and automatically lock onto satellites. These are much cheaper and easier to operate than traditional dish antennas that require manual orientation. Intelsat has partnered with two flat-panel antenna developers, Kymeta and Phasor, to design and manufacture these types of terminals.*

The initial Intelsat Epic^{NG} satellites are a first step towards software-defined satellites, which will deliver immense benefits for customers. The move to fully reconfigurable—on orbit—satellite payloads offers the revolutionary possibility that satellite design and launch can be standardized and streamlined. When the beam coverages can be done via software, market drivers shift dramatically.

This will result in increased flexibility and substantial cost savings. Satellites are typically designed and built for a specific orbital location and beam coverage. Each such satellite is, by definition, custom-built with dedicated, one-time, hardware design and engineering costs. Software-defined satellites, on the other hand, can all be built the same and configured on orbit. Manufacturing costs are significantly lower. In addition, spares can be built and put in space for quick deployment and configuration as needed.

Other features we expect to see in later HTS spacecraft include:

- *Flexible Power Allocation—For each high power amplifier on the satellite, Intelsat will be able to direct portions of the amplifier's power to different beams, as needed. For each high power amplifier on an HTS satellite, the digital payload can change the output to different beams based on the amount of signal traffic. At the same time, lower-volume beams would not have dedicated yet underutilized, amplifiers.*

- *Beam Forming—On orbit, operators on the ground will be able to define and implement customized satellite coverage beams to provide more capacity to a specific area as operational needs or conditions change. This will be particularly important in military operations where an area that is calm one day might become a battleground the next.*

Another major technology development involves Intelsat's partnership with OneWeb, which is developing a constellation of up to 720 satellites in Low Earth Orbit (LEO) using the Ku-band. OneWeb satellites would provide global connections to ground antennas that would serve as local hotspots for 3G and 4G cellular service. The constellation is scheduled to be operational by 2019.

OneWeb LEO satellites will be interoperable with the Intelsat GEO constellation and will enable us to extend our broadband mobility offerings to the polar regions, an important service for our government and commercial customers. These LEO satellites will also complement our highly efficient GEO broadcast capabilities with LEO high elevation angles for select situations where GEO signals may be blocked, such as urban landscapes or mountainous terrain. Terminals are being developed that will be able to switch between our Epic^{NG} satellites and the OneWeb network, depending on type of use and coverage needed.

Once operational, the OneWeb service will open up a number of new applications for our military customers. For example, when troops deploy today to an area without a terrestrial network connection, they have to set up network servers in the combat area and create their own small network and connect back to a command center via satellite.

With the OneWeb terminal to set up a hotspot connection, troops will be able to use their iPhones, laptops and other portable devices to connect to the military network or call loved ones back home at 4G LTE speeds.

Our fleet and capabilities are evolving with the kinds of features and functionality that the US military needs to maintain American superiority in space. By including commercial companies in the AoA process for wideband communications, the DoD will be able to better define how the satellite ecosystem can best serve war fighter needs.

The Pentagon can also take advantage of the speed with which commercial companies can get new technologies into space. Through the AoA process, government planners will better understand how to improve communications resiliency by spreading SATCOM across a range of commercial spacecraft in LEO and GEO offering pole-to-pole coverage.

www.intelsatgeneral.com

Mr. Butler brings to the position two decades of experience in the commercial satellite communications and telecom industries. He joined IGC in 2006 as Director of Hosted Payload Business Development and was most recently Director of Solutions Development. Preceding IGC, Mr. Butler held sales, business development and strategy roles at satellite services companies DRS, Spacelink and Verestar.

Mr. Butler holds an MBA from the Smith School of Business, University of Maryland, College Park. He stays active in the industry, serving as the President of the Mid-Atlantic Chapter of SSPI in 2012. He has also represented IGC on the Commercial Space Engagement Forum (CSEF), the Satellite Industry Association Comsatcom Operations Working Group and other assignments.

COMMAND CENTER: PETER HADINGER, PRESIDENT US GOVERNMENT BUSINESS UNIT, INMARSAT, INC.

Peter Hadinger is responsible for all US government sales and programs for Inmarsat. He has overseen the government-side of the launch of Global Xpress, the first ever-commercial Ka-band network that spans the world; creating a system that has also ushered in an era of expanded, MILSATCOM-compatible global mobile satellite communication capabilities and services.

Mr. Hadinger is recognized as a leading authority on critical industry topics such as MILSATCOM, intelligence, surveillance and reconnaissance (ISR), air-space integration, cyber and signal processing. He also holds multiple patents in advanced communications.

Mr. Hadinger's diverse regulatory and policy background includes leadership roles in the World Trade Organization's Telecom Services Agreement, the FCC World Radio Conference Advisory Committee, the President's National Security Telecommunications Advisory Committee and a fellowship in the US Senate.

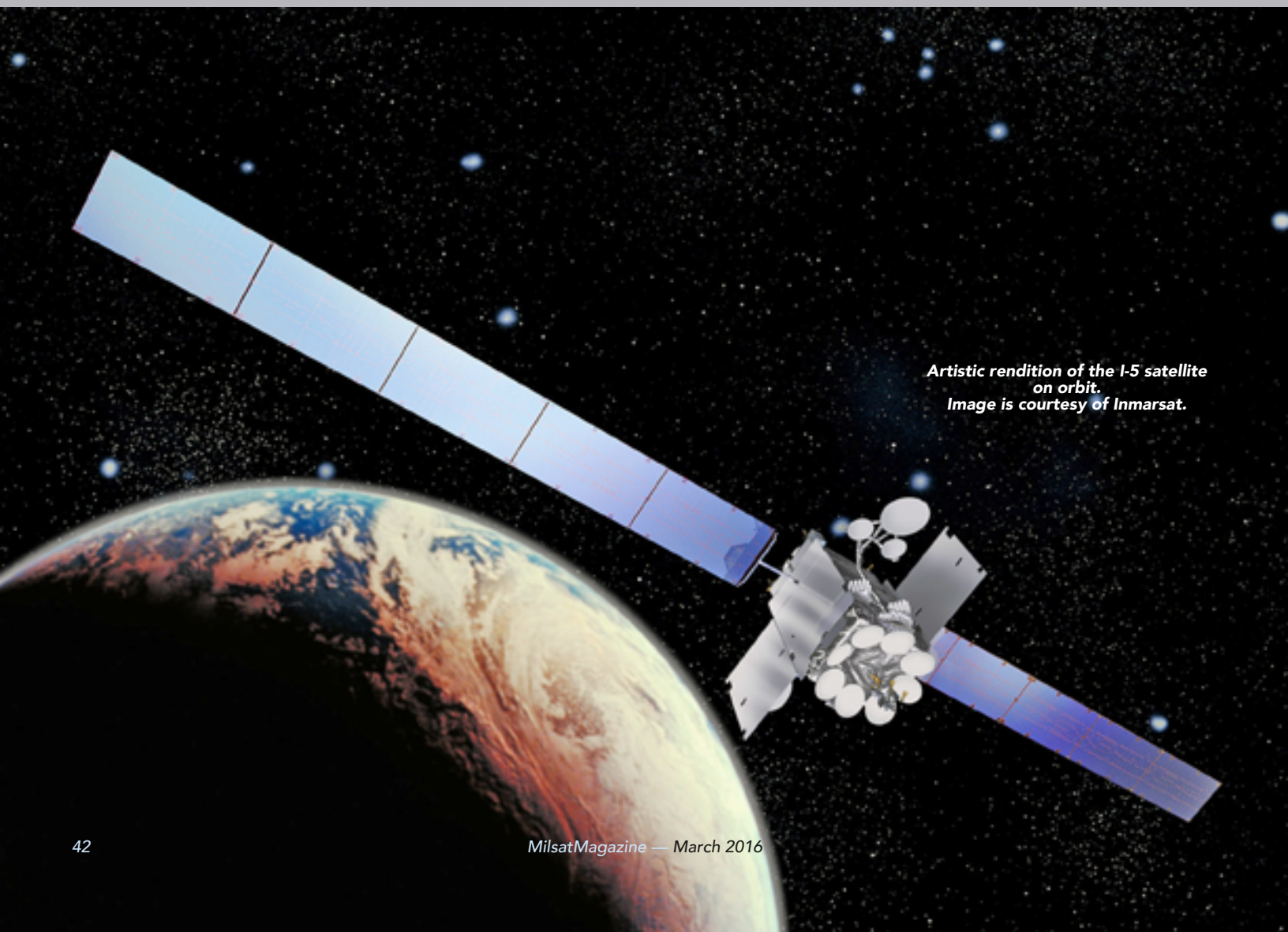
Prior to arriving at Inmarsat, Mr. Hadinger spent 30 years as a leader in technology development, engineering and government spacecraft programs at Northrop Grumman. He received his Bachelor of Science in Electrical and Electronic Engineering from California State Polytechnic University, and an MBA with an emphasis in finance and strategic planning from George Mason University. He serves on engineering advisory boards at Virginia Tech and loves to judge elementary and high school science fairs.

MILSATMAGAZINE (MSM)

Good day, Mr. Hadinger. Would you please tell readers about how you initially became interested and involved in the satellite communications world?

PETER HADINGER

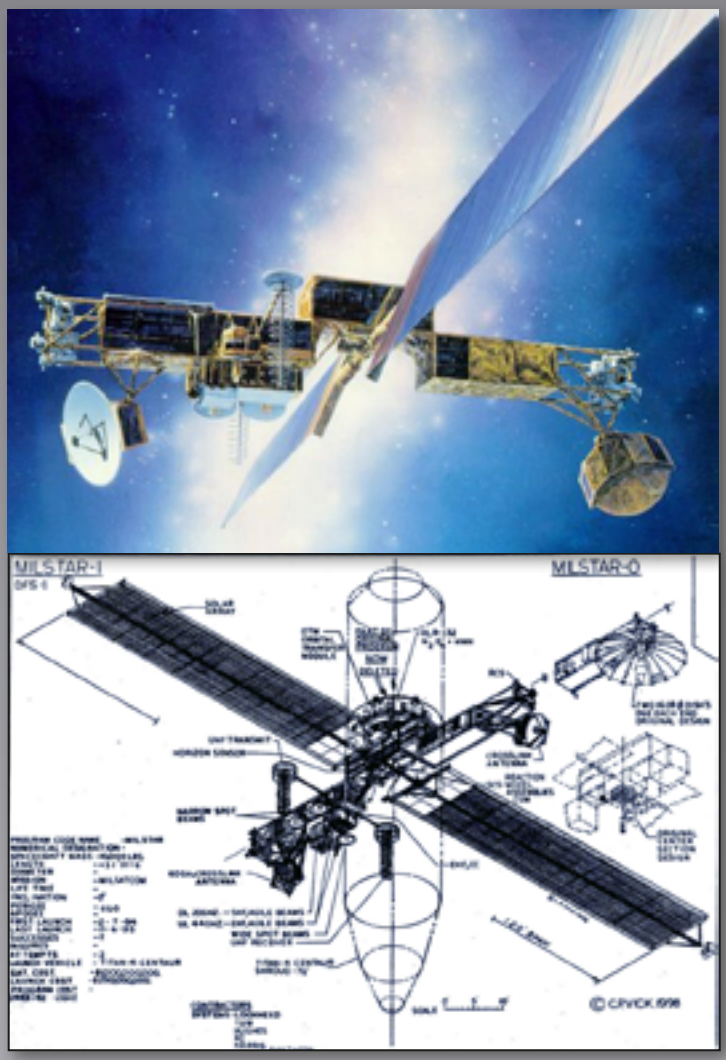
I entered the industry straight out of college. This was the early 1980s, and the world was a different place. There were substantial, existential threats on the horizon. The US government was investing heavily in satellites designed to operate within a wide range of adverse, even hostile environments. At the time, I had completed a senior project on digital demodulation for missile telemetry, which was considered a rather advanced concept back then.



Artistic rendition of the I-5 satellite on orbit. Image is courtesy of Inmarsat.

Based on this, I was selected for a job interview at a company that was then called TRW, which was at the forefront of building amazing satellites for the government. There was a long line of applicants waiting that day, and I was one of the last ones to interview. I ended up talking with a TRW manager who had a ponytail —he was clearly of the "flower power" generation. But it was immediately apparent that he was a technical whiz, and his specialty was digital demodulation! He understood exactly what I had done.

We had a fantastic interview and I got the job at a place that I previously could only dream of working for—I was immediately assigned to help design a satellite, Milstar 1, which came with a magnitude of difficulty greater than any satellite previously built. It was thrilling to join the project team and take on these challenges.



Artistic rendition and a diagram of Milstar-1.

From there, I went on to design many other systems for the government throughout my career. But to enjoy such an experience so early—to work with the people who wrote the textbooks I studied in college—made for a very heady time. I worked with brainy people who solved extremely hard problems. That's a great way to start a career.

MSM

What, primarily, brought you into the world of MILSATCOM, with the attendant focus on military/agency/government communications solutions?

PETER HADINGER

Obviously, Milstar was like jumping into the deep-end of the MILSATCOM pool. There had been no satellite program as big and complicated as that one. It was quite fulfilling to join a team that pulled off such a revolutionary accomplishment.

Milstar's primary purpose was to give the President absolute control of nuclear forces at all times, regardless of jamming or other interferences. That's a tall order. Milstar 1 had to be nuclear hardened, so we had to test every part of it through all sorts of environments. It was sobering to consider the situations we were planning for, because it was designed for "the worst possible day." There were many complex satellite programs after that one but Milstar was a great way to learn how to stretch the limits of technology, along with the value of systems engineering to handle the complexity.

MSM

What drew you to Inmarsat as the company where you wanted to further extend your career?

PETER HADINGER

TRW was acquired by Northrop Grumman in 2002, and I spent a total of 30 years with the combined companies. I had opportunities to do incredible things. In the late 2000s, it became clear that the government's willingness and resources to invest in massive new "programs of record" was winding down.

I'm a front-end designer. I create things. However, the government need was shifting toward sustaining, maintaining and building "more of the same." By then, I had worked with Inmarsat on a number of projects and its company leaders reached out to me. They told me about Global Xpress, and asked for my help in crafting the initiative so it would specifically address the government's needs. They were looking for someone who was very experienced with government SATCOM to lend that sort of flavor for the new system.

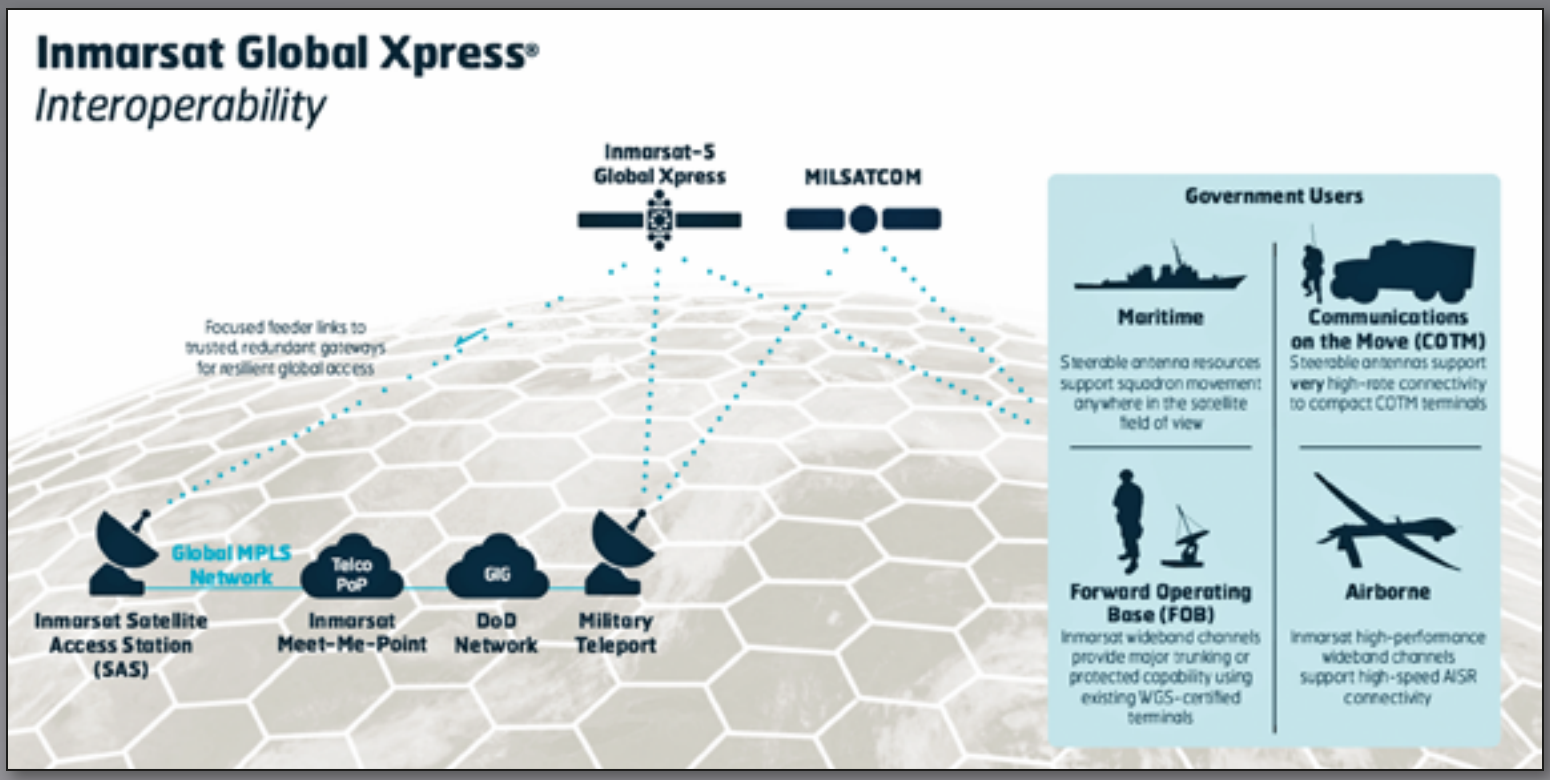
It was a perfect marriage of opportunity and timing. I came in on the ground floor of Global Xpress and helped tailor the system and subsequent systems to reflect the needs of governments. Not just the US government, but governments worldwide. Throughout it all, we strived to come up with advanced capabilities that our customers always wanted, and could seamlessly function with what they already had.

MSM

Inmarsat has been an advocate for an integrated architecture for MILSATCOM for the government. Please describe your vision for this and how this will improve military operations and effectiveness.

PETER HADINGER

Both commercial and military satellite communications are widely used today and technically should be interchangeable in most applications. But the capacity is procured through different pathways—one a service, the other a satellite.



It's difficult to go back and figure out where in the pathway the "make/buy" decision was made between government SATCOM and commercial SATCOM, and it is almost impossible to reconstruct a true cost comparison.

This is driven by a few factors: Users don't pay all of the costs of government SATCOM. They pay for the terminals, but not the communications bandwidth. However, on the commercial side, they pay for both—but usually from different budgets. Government SATCOM is designed to be a great technical match for traditional program-of-record platforms and deployment constructs, but a user's bandwidth allocation is usually subject to external decision-making and prioritization

While commercial SATCOM bandwidth arrives at additional cost, it also comes with unique benefits—including global coverage, greater flexibility in the choice of terminals and managed services to meet rapidly changing needs, as well as the knowledge that users have contractual control over the communications path.

With so many factors influencing the best choice of service for a particular application, ultimately, there is no simple basis to arrive at a purchase decision. It would be far better if federal leaders could step back and determine where they want to evolve the use of government and commercial resources side-by-side, from a long-range perspective. Both are essential to the mission. If federal leaders resolve ahead of time the best long-term roles for commercial and military SATCOM, both of the systems can evolve to deliver maximum utility and value for service men and women.

Today, we never know what role the government wants the industry to fulfill next. Sometimes we're called upon to augment capacity. Other times, they ask us to augment coverage. We're happy to do these things, but I'd ask that the government establish, communicate and stick to a long-term vision for the role of commercial, and then let the market take over to quickly deliver high value. One model might be that commercial is asked to serve fixed locations where bandwidth will be needed for an extended stretch. Buying long-term connectivity (not spectrum) on a competitive basis, the government will get the best prices and terms for capacity. Knowing this, commercial providers can effectively apply the government's long-term vision into their planning.

Meanwhile, the variable surge requirements popping up in special operations and random situations can fall over to military systems, which—freed from much of the long-term requirements—would have reserve capacity to handle surges with the agility and operational security required by those missions.

Unfortunately, the current model is the exact opposite. In an attempt to minimize short-term costs, MILSATCOM is loaded to capacity with very pedestrian, fixed requirements. Then, when problems in the world arise on short notice, they go to the commercial market for surge capacity or coverage.

At Inmarsat, we're already jumping ahead to the day when commercial is truly seen as augmentation of MILSATCOM. We're enhancing wideband MILSATCOM capabilities with Global Xpress. We're extending what we do with L-band to augment narrowband MILSATCOM. We're making our systems compatible with the military, to ease the transition for the agency customer who needs to go back and forth between commercial and government SATCOM. Our strategy has worked well. Everyone benefits from clearly defined roles, so we can plan investments into future systems.

MSM

Beyond the space segment, what changes and opportunities do you envision would improve operational flexibility and robustness on the terminal and ground segment elements of SATCOM?

PETER HADINGER

More than anything, we must have government terminals that operate in both military and commercial Ka-band. It's easy to do in Ka-band because it's the only part of the spectrum where military and commercial channels are side-by-side. With the change, you'll expand the frequency range, coverage, interoperability, and give users the option to deploy MILSATCOM and COMSATCOM interchangeably based upon mission needs.

It's simple and almost cost-free to do this in the beginning when engineering a terminal, as opposed to trying to correct later. That's why we recommend that procurement policy require all future government SATCOM include both military and Ka-band. It won't obligate users to buy COMSATCOM. But it gives them the option of doing so, without making changes to their equipment.

MSM

This has been a big year for Inmarsat. As of this writing, Inmarsat recently launched its third satellite in the transformational Global Xpress constellation in 2015—can you provide a high-level overview of Global Xpress and the value this technology brings to customers?

PETER HADINGER

The completion of the initial Global Xpress constellation (which is formed of three Ka-band, high-speed satellites) and our recent announcement confirming that global Commercial Service Introduction (CSI) was achieved during December 2015.

These innovations represent a watershed moment for the broadband satellite industry. For the first time, it is possible to go anywhere on the globe and access high-speed wideband communications via satellite from small, mobile, easy-to-use terminals. Inmarsat always focuses on global coverage.

It began as an essential requirement for our unique "safety of life" capabilities and now supports our servicing of customers like governments who not only have remote requirements, but requirements that can't be predicted. Global Xpress establishes "anytime/anywhere" connectivity for them.

Our strategy for Global Xpress was to go broad before going deep—exactly the opposite of regional operators. We realize many people will turn to Ka-band as their top choice for future wideband communications. However, we understand that it will take a while for demand to build, especially in government, where procurement cycles are extensive. Still, we know the demand will come. Therefore, the first step was to go global. On top of that, we built spot beams of high capacity to focus on areas of intense consumption.

Our understanding of traffic-demand statistics is unique in the industry and the product of decades of experience as a mobile satellite operator. We can predict traffic patterns by the day, week, month and year, and what the profiles look like during emergencies. We applied this insight to our design of Global Xpress.

The Global Xpress has another major difference between Inmarsat and many regional operators: instead of just leasing circuits, we also offer a fully-managed network, with incredible ease of use for customers who simply want global connectivity, without the time and cost of creating their own private networks.

We're not finished yet, either. We're far along with Inmarsat-5 F4 in construction at Boeing and are preparing to launch in late 2016. Originally procured as a launch spare, Inmarsat-5 F4 now begins the next wave of satellites, including Inmarsat-6, which augments the Global Xpress fleet to provide additional network capacity.

MSM

Beyond Global Xpress, Inmarsat continues to innovate in its more traditional L-band services. Would you share some of the company's latest innovations? What's next for Inmarsat?

PETER HADINGER

Our L-band has set a standard for "anytime/anywhere," highly portable broadband.

The speed of our BGAN, FleetBroadband and SwiftBroadband services has steadily improved from mid-hundreds of kilobits per second to what's approaching a megabit per second in very small terminals that are a fraction of the size and cost of VSAT. In addition, we're investing heavily in machine-to-machine communications, with new modules for small, inexpensive Internet of Things (IoT) devices. We'll continue to provide global handheld capabilities, but we're also adding features specific to the government such as Inmarsat's L-band Tactical Satellite (L-TAC) service and high-bandwidth, airborne ISR services.

Our L-TAC product allows UHF MILSATCOM as well as VHF public safety radio units to gain access to additional spectrum and boost mobility by simply replacing the antenna with a tiny L-band "up converter" and antenna, enabling the radio to operate across the Inmarsat L-band frequencies. This is completely transparent to the end users, who may not know that their radios are no longer transmitting through MILSATCOM UHF but are "roaming" on Inmarsat's frequencies.

But what they do know is that suddenly their same secure tactical radios can connect worldwide to dozens of clear channels that have always been in short supply in UHF. What's more, they can move from larger UHF antennas to smaller ones, which can be more easily placed on a vehicle, a helicopter or the backpacks of soldiers on the move. It's a transformative capability for high op-tempo agencies requiring fast-reaction deployment throughout the world with high mobility, portability and security.

For rapid-deployment L-band airborne ISR users, we've created wideband channels with throughputs of up to 10 megabits per second from extremely small terminals that can be mounted on light aircraft and UAVs.

Today, high-demand users benefit from Inmarsat satellites that can deliver multi-megabit links from antennas the size of a coffee can. This is the smallest size and weight of any airborne ISR package, and has superior performance. It's a revolutionary advancement, and we'll continue to invest in it for the next generation.

We are already planning for the future, and committed to continue providing reliable L-band capabilities. We recently announced our $600 million investment in construction of our new Inmarsat-6 satellites, which will be built by Airbus Defense & Space. The first satellite is scheduled to be launched in 2020 with the second satellite scheduled to be completed and available for launch in 2022. The sixth-generation fleet will feature a dual-payload with each supporting both L-band and Ka-band services. Inmarsat-6 continues our commitment to developing the most reliable and secure satellites and ground networks for our end-users.

MSM

What are Inmarsat's key differentiators that resonate with government/ military customers?

PETER HADINGER

From the very beginning, our overriding ethos has been about global safety of life. This underpins our emphasis on global coverage, mobility and reliability. Our commitment has never changed, and it's aligned precisely with what governments do themselves in MILSATCOM.

Regardless of band, we've always designed for these three things. Just like MILSATCOM, Inmarsat starts with a minimum of four satellites—three for global coverage and one as a spare—with fully redundant ground stations and resilient networks, for anytime/anywhere accessibility with high reliability and capability. That is what's needed to support government missions, which are often called to respond in times of crisis, supporting safety of life in far-flung places.

In addition, we uniquely design systems which are interoperable with MILSATCOM, with terminals and equipment that government users are familiar with and can use interchangeably with their own MILSATCOM systems. Our satellites look and act like military SATCOM. We design them with additional security features so they're aligned with unique government demands.

With Global Xpress, governments can now safely commit to the future—installing new Ka-band terminals knowing that they will get seamless global operability on aircraft and ships in a way that is already set up for MILSATCOM. These are all in place today—it's not viewgraph hype, it's Inmarsat's commitment to the mission.

Whether we're talking about soldiers in combat, humanitarian assistance teams heading to disasters, or rescuers searching for stranded sailors and pilots, we realize that government leaders and users share the same ethos as we have believed in for all of these years. We're all mission focused. Our dedication strongly resonates with agency customers. It's engendered a special kind of trust with them, and that makes us unique.

MSM

There are serious issues today regarding perceptions that deal with a lack of homeland security as well as border control—how can Inmarsat bring its expertise to play in these areas?

PETER HADINGER

Governments worldwide are adopting Inmarsat border-control communications, whether on Unmanned Aerial Vehicles patrolling remote border territories, or small sensing and monitoring hosts. We supply border-crossing stations with communications to check IDs and biometrics. We also help implement systems that support interior responses to a crisis, whether man made or natural disasters.

Governments recognize that they can't depend upon terrestrial infrastructure during these situations, because those infrastructures are frequently compromised during a disaster. They need something that supports reliable communications on-demand. I think you'll see a lot of Inmarsat in next-generation public safety programs such as FirstNet.

MSM

What challenges do you and Inmarsat face in ensuring your programs and technologies are presented and acted upon with alacrity by government and military acquisition agencies? How do you prepare for such critical discussions?

PETER HADINGER

The fastest response is the one that's ready in advance. We look to help customers prepare ahead of time with systems that are globally available and easily portable, so they can go to where the problem is, without much, if any, pre-investment. We bring them flexible and reliable communications with equipment that is easy to use and works with what they already have. Because of our planning and alignment with the government, customers can act with alacrity even when the procurement process does not.

MSM

What is SATCOM as a Service and what value does it bring to customers?

PETER HADINGER

SATCOM as a Service isn't a new concept for Inmarsat. We've offered it for decades. What's new, however, is bringing SATCOM as a Service to broadband/wideband communications, which has been dominated by old-fashioned leased satellite services. Using leased services means setting fixed systems up, one-by-one, every time a new network is required. To do that, government contractors have to set up their own hubs in ground stations throughout the world, wire together their own network and create their own systems. With Global Xpress, SATCOM as a Service —which has been our hallmark—now provides wideband/fixed satellite services globally without the time and expense of building and maintaining a private network.

As a result, users avoid the cumbersome experiences encountered with a patchwork of different fixed satellite services. From a user's perspective, SATCOM as a Service establishes a mobile wideband experience that's no different from moving around the globe with a cellphone, without stopping to worry about where the cell phone towers are, who installed them and who wired everything together.

SATCOM as a Service liberates users from the time and cost spent to customized solutions for each and every need, empowering them to go anywhere in the world with one-touch access. They never have to make a new investment whenever they set up a new SATCOM network—no end user actually wants to manage these networks, after all.

What users really want is access to information no matter where they are. How it happens is immaterial to them. Inmarsat makes this seamless and invisible to them by taking care of all of the backend processes—as well as legal and technical aspects—to supply reliable communications, which are delivered to users simply, portably and cost effectively.

MSM

What are some of the more critical MILSATCOM technology challenges facing today's service men and women? Are these specialists being trained appropriately to fully utilize the science they are responsible for implementing?

PETER HADINGER

At Inmarsat, we do not believe that the service men and women should have to get down into the weeds of the technologies, because global networks today are so complex. We all know how to connect to Wi-Fi but very few really know how it works. Similarly, we do all the hidden prep work in the design of terminals, satellite channel optimization, network reliability, cyber security, etc.

We take all of this and standardize it. Users can count on our systems as critical, high-level building blocks from which they can then easily create the networks specified by their missions. They don't have to deal with the science. They're freed up for unique, mission-related functions, confident that the global, mobile communications core is firmly set in place.

MSM

How can we, as an industry, truly support STEM training for students to ensure there are enough qualified and trained candidates for the extremely complex and crucial projects that lay ahead for the MILSATCOM industry?

PETER HADINGER

This is a great question. I love talking with students, and I still volunteer to judge local science fairs whenever I can. There are some great minds in the pipeline! I still remember how exciting it was to stretch the classroom concepts I'd been taught in a real high-tech environment. Helping to solve national-level "hard problems" brought out inventive qualities in me that I didn't realize I had.

Today's students are brighter and have more knowledge at their disposal than we ever had—it's just as important now to bring out the best within our young people by challenging them with today's hard problems that support the military community.

Through a number of Inmarsat's programs, we give aspiring future technology leaders an outstanding learning base, along with top personnel with tremendous backgrounds to mentor them. We initiate outreach to schools to sponsor projects. Even if these students don't end up working for us, we embrace the opportunity to expose them to everything our industry has to offer. It's exciting for them, and we hope it inspires them to go well beyond what we have today.

MSM

Given your decades of experience, when you look back upon your career, what project or projects truly bring a sense of accomplishment to you?

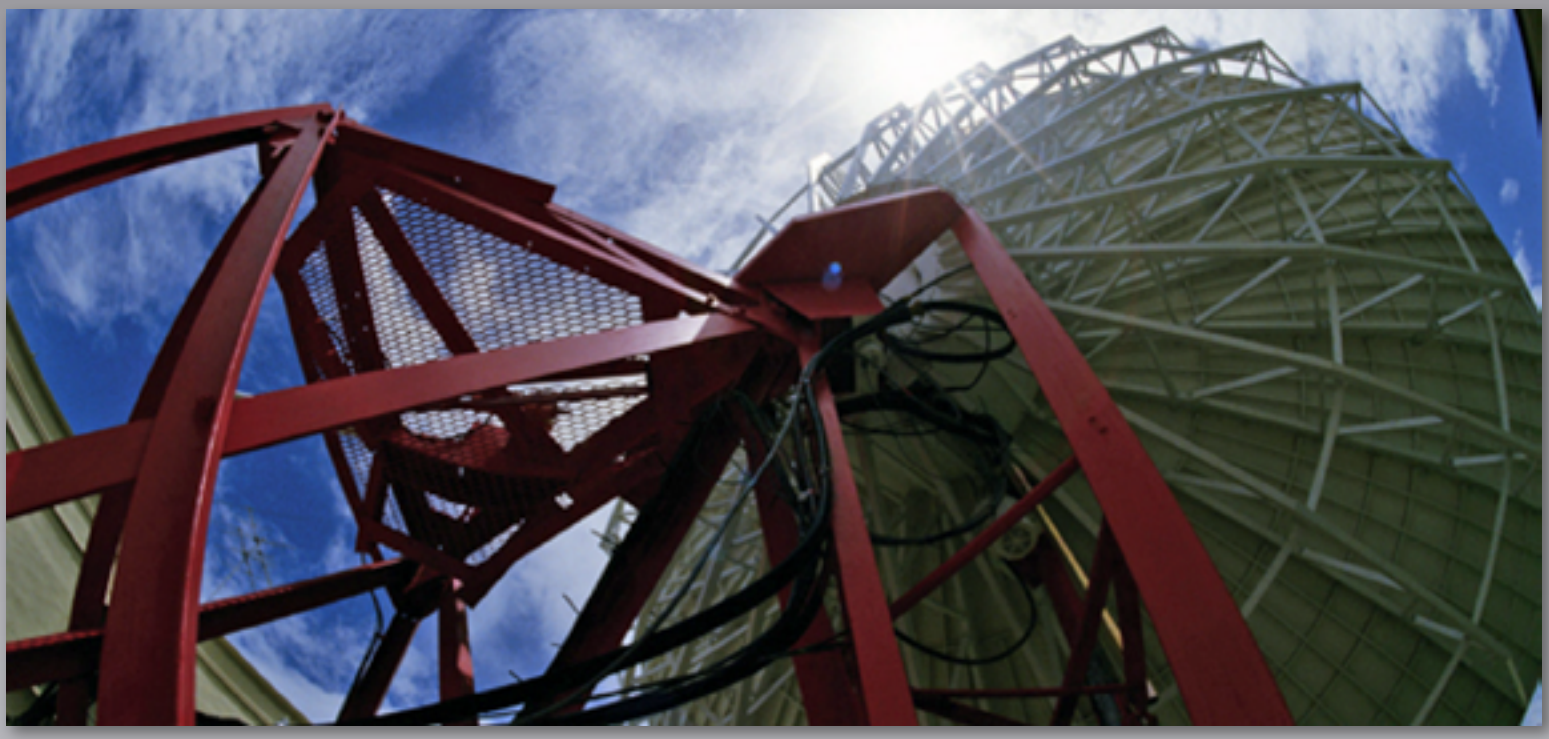
PETER HADINGER

You always remember a first love—and for me that was Milstar. It was an immense, technological challenge, and it fueled my passion for SATCOM. Milstar established a profound, technological base of knowledge within me, and it launched a career that has always been dedicated to the satellite field.

The second is just as easy to pick—helping to bring about Global Xpress with its unique challenge of developing new, global capabilities that align with government attributes. This time, I had a bit less technical role. Instead, I needed to integrate decades of government SATCOM experience within the industry's top mobile satellite team to set a vision and pathway for what commercial-based MILSATCOM capabilities will look like for the next couple of decades.

To have the privilege of working on two global projects – one that greatly honed the technical side of me, and the other, which gave me an opportunity to realize a high-level vision – is quite gratifying. It is a complete picture, if you will.

inmarsat.com/government



AN SSL PERSPECTIVE: DRAGONFLY INNOVATION UNDERWAY

By Matteo Genna, Chief Technology Officer, SSL

SSL is a leading provider of commercial satellites and innovative space-based systems—the company is also the only US manufacturer with the ability to incorporate robotics technologies proven on the Space Shuttle, the International Space Station, and the Mars lander and Mars rovers, into its world leading satellite platform.

As a result of these missions, the company has been funded by DARPA and NASA to develop a capability for satellites and spacecraft to self-assemble on orbit. The program, called Dragonfly, will begin with the design of a satellite with a built in robotic arm that can deploy and reconfigure large radio frequency antenna reflectors while on orbit. SSL has a patent pending for this technology.

One of the greatest limitations for communications satellites is the volume of the launch vehicle fairing, which is the nose cone of the rocket where a satellite is safely housed for the taxing trip to orbit. Satellites are designed to maximize the space within the fairing, with equipment such as solar arrays and large antenna reflectors folded up against the main structure for launch. However, there are size constraints that limit the capabilities and performance of a spacecraft. Dragonfly will enable larger and more powerful satellites that otherwise could not launch within the fairings of today's launch vehicles and will ultimately lower the cost for high performance missions.

In order to maximize the payload equipment on any given launch, large reflectors can be stacked and stowed in a highly efficient configuration within the fairing.

Once on orbit, the satellite's built-in robotic arm can travel, much like an inchworm, across the spacecraft to pick up and attach reflectors into their operating positions. The concept, which will be demonstrated on the ground in 2017, will have both commercial and government applications.

For many geostationary (GEO) satellite applications, larger reflectors mean better performance, and this is particularly important for high throughput satellites (HTS). Larger reflectors on the satellite enable more radio frequency (RF) power to be concentrated into each beam, and also allow for smaller receiver devices on the ground in either fixed or mobile locations.

As the demand for the transport of digital information grows, with the expectation that high quality video and huge amounts of cellular data should be available from anywhere in the world at any time, the role of HTS will continue to expand. Satellites with larger and more strategically placed antenna reflectors will offer higher capacity to help meet this demand.

Dragonfly robotics can help place large antenna reflectors, such as the ones pictured here, on a satellite after it is on orbit. Image courtesy of SSL.

Large SSL 1300 satellites, such as the one pictured here is being tested in the Compact Antenna Test Range, could benefit from Dragonfly technology.

Image courtesy of SSL.

The Dragonfly program is expected to demonstrate that satellites and other spacecraft with built in, mass-efficient robotics capability can actually lower cost and mass for the highest performing systems. Ultimately on-board robotics are expected to be used not just for initial assembly but to move and replace reflectors and reconfigure and refresh payload equipment. This would allow satellite operators to change and adjust satellite antennas years into the mission life for flexibility and to accommodate technology advances and changing requirements.

By selecting Dragonfly for one of its nine "Tipping Point" collaborations with industry, NASA's Space Technology Mission Directorate has identified it as having potential to become a critical future space capability. The goal of the NASA program is to mature technologies beyond their "tipping point" to help private industry to develop and qualify them for market, stimulating the commercial space industry while at the same time delivering technologies and capabilities needed for future NASA missions and government missions.

A technology is considered at the tipping point if an investment in a demonstration of its capabilities would result in a significant advancement of the technology's maturation, high likelihood of infusion into a commercial space application, and significant improvement in the ability to successfully bring the technology to market.

The Tipping Point initiative is a two year, multi-million dollar effort which calls for NASA to work with the commercial space industry to advance the goals for robotic and human exploration of the solar system through the development of critical space technologies, such as on-orbit robotic assembly of satellites and spacecraft.

The commercialization of technologies that may also be of value for both civil and DoD missions helps build the supply chain and enables rapid generational advances to help reduce the cost of government missions. The Dragonfly system, which might ultimately enable significant manufacturing in deep space, offers great opportunity for commercial satellite operators in the near term. It also has the potential to serve as a stepping stone to future advances in space including on-orbit habitats, supply depots, and travel to distant planets.

sslmda.com/

An SSL 1300 satellite during the build process. Photo courtesy of SSL.

DISPATCHES

Terminals For Spain's MILSATCOM Systems From Indra

Indra has secured a master agreement with the Spanish Ministry of Defense as a primary maintenance provider for terminals used in Spain's military satellite communications system (SECOMSAT).

The agreement establishes the terms under which users of the SECOMSAT system may request maintenance services worth up to a maximum of 42.8 million euros over the next three years, with the option to extend the deal by a further three years.

The framework agreement is divided into three lots, with each corresponding to a different system making up the communications network.

Indra was selected as the sole successful bidder for two of these (lots 1 and 2), while it was selected for the third in a joint venture with Telefonica.

SECOMSAT network systems are used by Ministry of Defense bodies, all three armies and Spain's military emergencies unit (UME).

The maintenance services that Indra is set to provide include support tasks of all descriptions, ranging from preventative

maintenance and equipment repairs, through to the provision of engineering services to ensure development of the terminals and to incorporate any technological advances as required.

The company will also adapt systems to specific environmental conditions encountered in missions conducted by users and to the operating requirements that these demand, which means adding new functions and building on existing features.

The core objective of such tasks is to ensure the greatest possible systems availability and to keep the same operational.

The strategic environment in which the Armed Forces operate demands rapid reaction capabilities, meaning systems that can be relied on to transfer information quickly and securely.

This renders satellite communications an essential asset when participating in international missions and to support optimal coordination in any environment.

Indra has been the main contractor for the Spanish SECOMSAT program since 1994 and was responsible for deployment of this advanced communications network.

Indra also played an important role in deployment of the SISCOMIS military satellite communications network in Brazil and has supplied a significant number of terminals of various types to the country.

In recent years, Indra has designed and developed satellite equipment and terminals to cater to all kinds of requirements, simultaneously building up a highly technical and extensive industrial structure. Ships, submarines, vehicles and ground forces operated by countries including Spain, Portugal, France, Germany, India and Brazil all use solutions and technology provided by the company.

Indra has adapted its satellite communications systems to cater to the civilian market too, having deployed its technology for industries as diverse as transport, telephony and media.

indracompany.com/en/defense

Comcept SATCOM System To Connect French Naval Vessels

The French Defence Procurement Agency (DGA) has awarded Airbus Defence and Space and Actia Telecom a contract to equip 17 French Navy vessels with the capability to connect up to the Comcept broadband communication system.

Comcept is an 'all IP' (Internet Protocol) technology broadband satellite communication network whose initial operational capability was brought into service in the French Armed Forces in 2015. This system aims to respond to the increase in data exchanges between military equipment and information systems, adding on to the Syracuse satellite system via new satellite transmission capacities in the Ka-band, especially those of the Franco-Italian military satellite Athena-Fidus, or via capacities in the Ku- and C-bands.

The first 17 vessels are going to be equipped with new navalized SATCOM terminals. The contract also plans to install teleports in mainland France and in the territories overseas to ensure connection to the Ministry of Defence's terrestrial networks.

The installation of Comcept on board vessels will allow all satellite broadband needs to be catered for within a global, unified system shared first by the Army and the Air Force, and now by the Navy. The French Armed Forces had the opportunity to try out the Comcept system in 2015 during its initial implementation. It is planned to ramp up the deployment of user ground stations over 2016.

The core of the Comcept network comprises two redundant mission centers to manage the network and teleports that ensure the transfer of data between the satellite and the terrestrial networks of the Ministry of Defence. The armed forces are equipped with fixed and deployable stations of different sizes (ranging from 70 cm and transportable in a case up to 2.4 m in a shelter) designed by Actia Telecom and Airbus Defence and Space. More than 200 stations have already been delivered.

airbusdefenceandspace.com/

DISPATCHES

A New Look + New Execs Joining Silent Falcon™ Team

Silent Falcon™ UAS Technologies will roll out a new logo over the coming months—this new logo is the first significant change in Silent Falcon's look since the company began in 2010 and an updated website is also on tap for 2Q.

"We have made tremendous advances in the Silent Falcon™ Unmanned Aircraft System and significantly upgraded its capabilities. We felt it was important to upgrade our external look as well. Our new look and web site reflects our commitment to continuous improvement and staying at the forefront of unmanned aircraft systems technology," said John Brown, Silent Falcon™ UAS Technologies President & CEO.

The new Falcon icon and Silent Falcon™ logo typeface communicate speed, design, and elegance. The logo was developed by 3 Advertising located in Albuquerque, New Mexico. During 2015, advancements were made to the Silent Falcon™ UAS to make the craft the best small, solar electric UAS on the market in terms of endurance, payload adaptability, ease of use, and cost.

Additionally, two new executives have joined the firm.

Inbo Lee comes to Silent Falcon™ as Chief Strategy Officer, reporting to the CEO, John W. Brown. He will be responsible for managing the relationship with the firm's new Korean affiliate, SFK UAS, Co. LTD, as well as our sales and distribution activities throughout Asia, and beyond. As a fluent Mandarin and Korean speaker, and experienced international executive, he has significant personal relationships in Korea and throughout Asia.

Kären Mastenbrook joined Silent Falcon as Director Marketing, also reporting to the CEO. Ms. Mastenbrook is a marketing professional with over 20 years' experience marketing diverse product lines and services.

WHEN DISASTER STRIKES...

By Tony Bardo, Assistant Vice President, Government Solutions, Hughes, + Senior Contributor

Events such as Hurricane Katrina and SuperStorm Sandy demonstrated the importance of improving the emergency communications infrastructure at every level of government.

Being adequately prepared to ensure uninterrupted communications both during and in the aftermath of an emergency—whether of natural or intentional causes—is essential for government organizations to meet mission requirements and serve their constituents.

Keeping mission-critical applications up and running when disaster strikes is vital to ensure agencies have fast and secure access to information, and can respond in an effective and coordinated manner. It is crucial to have a highly-reliable and path-diverse network architecture in place should terrestrial landlines become inoperable from a flood, hurricane, tornado or any other disaster.

As SuperStorm Sandy and Hurricane Katrina demonstrated, terrestrial communications infrastructure is susceptible to damage from the very incident that caused the emergency, leaving public safety officials and emergency responders unable to efficiently communicate when needed most. This is where satellite broadband comes into play.

THE SATELLITE BROADBAND SOLUTION

Network Availability Is Critical During Crises

According to Research and Markets' Global Satellite Broadband Communication in Public Safety 2014-2018 report, the growth of the global satellite broadband communications in public safety market is forecasted to exceed 8.5 percent CAGR during 2013-2018. This growth is driven primarily by government's need to establish efficient emergency communication systems to handle emergency response coordination when disaster strikes.

Additionally, Research and Markets identified that the US government is increasingly turning to satellite broadband to carry out functions such as receiving regular status updates, government notifications and advisory services; provisioning of deployable communication vehicles; and establishing temporary communication channels with agency headquarters during the response period.

A primary issue critical to communications during a crisis is diverse and redundant connectivity from agency headquarters to branch offices. Many agencies believe redundancy can be created by having two terrestrial-based communication networks through separate carriers.

However, diversity of carriers is not enough, because the communication lines often run through the same conduits or are close enough to remain vulnerable in a disaster. Agencies need to look for continuity solutions that incorporate true alternate path technologies.

Satellite broadband connectivity is the answer. As satellite broadband technology is not dependent on land-based communication lines, satellite solutions offer government agencies a true alternate path-diverse networking option—ensuring that agencies will have the connectivity to maintain critical operations even when the primary terrestrial network fails.

With satellite broadband-based communications networks, first responders, senior emergency response teams, public safety officials and other key stakeholders can be assured that their network will stay up and running and they will be able to communicate and share information during and after the crisis.

Redundant Satellite In Action

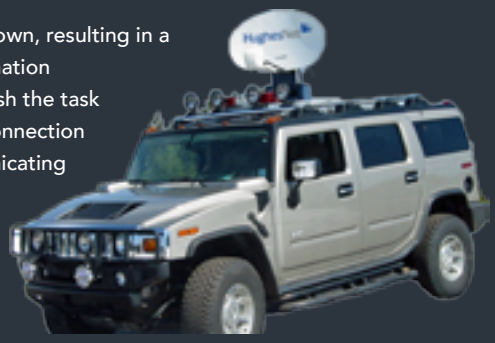
SuperStorm Sandy knocked out approximately 25 percent of all cellphone communications across 10 states. An estimated 800,000 New Yorkers lost power during the storm, and the city's telecommunications network experienced downed landlines and disconnected cell towers.

Adding to the situation, a key hub for a major telecom provider located in lower Manhattan flooded, so it was unable to provide Internet or voice communications to its customers. In fact, thousands of people remained without service even six months after the storm. But in the aftermath of Sandy, vital response communications were rapidly restored in some areas by using satellite technology powered by Hughes.

Hughes satellite networks played a major role in ensuring continuity of operations, keeping emergency responders, businesses and people connected when terrestrial services were disrupted or unavailable. First responders and public safety managers experienced first-hand the critical need to communicate during a crisis and manage field resources during the response. Government leaders, in turn, relied on Hughes highly reliable and resilient satellite communications to coordinate effectively among national, regional and local agencies.

A second advantage of satellite broadband technology during disasters is its ubiquity—or ability to reach virtually everywhere, even where land-based connectivity is limited or unavailable. That means any government agency can readily expand its broadband wide-area network to include remote locations not served by terrestrial fiber, DSL or cable. Additionally, mobile satellite systems provide first responders and emergency communications personnel with reliable, high-speed connectivity to handhelds and laptop portable units.

Shortly after Hurricane Katrina hit, the Maryland Urban Search and Rescue team was deployed to New Orleans—to offer aid by providing immediate medical and search and recovery assistance for displaced citizens. However, upon deployment, the team learned that the majority of terrestrial lines were down, resulting in a lack of real-time information to effectively accomplish the task at hand. An Internet connection being vital for communicating with their command center and with outside information, such as news and weather forecasts, they turned to Hughes satellite broadband for connectivity.



This critical lifeline enabled them to also provide important "comfort activities" to other search and rescue teams, such as accessing email to contact loved ones and communicating with their centers back in their home towns. Without satellite broadband, none of these activities would have been possible.

SATELLITE BROADBAND: A RESILIENT, PATH-DIVERSE, EMERGENCY CONNECTIVITY SOLUTION

In the final analysis, it goes without saying that any disaster may bring tragedy, but being better prepared means mitigating it, including helping to save lives. Citizens need their government to be able to operate during disasters.

Incorporating satellite-based capabilities into an agency's network design is essential to ensure that when disaster strikes—the agency is most prepared to coordinate and respond. Terrestrial-only access networks, whether fixed or mobile, even if backed-up by other terrestrial technologies, are vulnerable to disruption or failure by the very incident that caused the emergency— leaving public safety officials and emergency responders unable to communicate when it is needed most.

Satellite-based networks offer agencies the only true alternate communications path to terrestrial technologies— for both last-mile access to fixed and mobile terminals, and as a robust backhaul of traffic to and from cellular wireless base stations. No agency's mission can be fulfilled otherwise; and the constituents it serves deserve nothing less.

Anthony "Tony" Bardo has more than 30 years' experience with strategic communication technologies that serve the complex needs of government. Since joining Hughes in January 2006, Bardo has served as assistant vice president of Government Solutions, where he is focused on providing Hughes managed network broadband solutions and applications to Federal, State, and Local governments. Bardo also served as Chair of the Networks and Telecommunications Shared Interest Group (SIG) for the Industry Advisory Council, an advisory body to the American Council for Technology (ACT).

Before joining Hughes, Bardo was with Qwest Government Services for nearly five years where he was senior director of US Government Civilian Agencies sales and marketing, senior director of marketing, and senior director of business development. Prior to Qwest, Bardo spent 14 years with the government markets group at MCI where he held the position of executive director for civilian agencies. During his tenure, his teams managed programs for the Federal Aviation Administration's national air traffic control network, the Social Security Administration's toll-free network, the US Postal Service Managed Service Network, and the US General Services Administration's FTS2001.

Mr. Bardo is a 1974 graduate of Virginia Tech where he majored in economics with a minor in public communications.

A SPECTRA PERSPECTIVE: A VOICE OF AUTHORITY IS BEING HEARD

By Simon Davies, CEO of Spectra Group (UK) Ltd.

Military operations now can depend heavily on effective satellite communications with personnel based in remote and challenging environments, and where this is the only feasible way to communicate.

As tensions rise in many regions and international terrorism continues to cause a major headache for the world's leaders, military personnel have to know that their communication links cannot be compromised.

With the nature of conflict changing and often unpredictable, we can expect to see the emergence of even more high tempo, short duration deployments, where innovative products such as SlingShot® and SHADE™ developed by Spectra Group (UK) will come to the fore even more.

With a number of its personnel possessing a military background, Spectra Group (UK), which was founded in 2002, has first-hand knowledge of the true value in having communications functioning efficiently—and, adversely, the potentially disastrous effects if they don't possess efficient comms.

As concerns grow about the increased threat of global terrorism, in particular, Spectra is experiencing a surge in inquiries about the firm's expertise in the design and delivery of voice and data services to security, defence, aid and emergency and commercial organizations in areas that have little or no communications infrastructure—predominantly in remote environments or areas that have been destroyed by natural disaster or conflict.

The company's ground-breaking SlingShot® product—a small, external adapter for military radios—is a straightforward and cost effective way to achieve tactical, secure, Beyond Line of Sight (BLoS) command and control Communications-On-The-Move (COTM), using UHF and VHF radios.

The adapter currently uses the Inmarsat L-TAC™ service and this, in combination with its SHADE™ product (Spectra Hostile Area Deployment Environment) has resulted in record airtime revenues. This was reflected in recently being recognized as a 2015 Top Ten Global Government Partner by Inmarsat, the leading commercial global satellite network company.

SHADE™ is a rapidly deployable communications hub delivering secure voice and data services across any available bearer and is ideal for small and medium-sized teams needing 24/7 availability, plug and play set-up and remote management. It offers secure and straight-forward connectivity for VoIP, to the world wide web, ISDN, PSTN, or dedicated private networks.

A range of SHADE™ nodes gives the system flexibility and scalability and no matter how hostile the environment if there is access to a bearer of some kind, be it leased line, ADSL, 3G or 4G, SHADE™ can utilize any of them to create a secure global network of voice and data services in minutes. With no available terrestrial bearer, VSAT or BGAN can be utilized, depending on bandwidth requirements and how fast and often you need to move.

With omni-directional antenna and Manpack, Vehicle, Maritime and Aviation capability, SlingShot® allows users to be always in contact. Unlike other solutions, SlingShot® delivers robust communications on the move, pause and halt. It allows low-latency voice and data regional communications, with the additional option of connecting to an out-of-theatre rear-base command node.

By using Inmarsat's world leading satellite communications network, SlingShot® gives the unique capability to access single-hop L-L band relay from an existing global constellation of geostationary satellites, meaning that the signal is uniquely switched on the satellite and straight back to the receiver.

I believe our expertise is providing voice and data services in areas where either none exist or where high intensity conflicts, natural disasters, terrorist attacks or pandemics have destroyed existing networks. As we are mainly staffed by ex-serving members of the Armed Forces we know only too well the crucial importance of having these services available and have first-hand experience of the damaging effects when communication services fail.

This approach and service offering has evolved to cater for the requirements of the modern war fighter. The nature of conflict has changed and so has the information needs of everyone from the commander right through to the frontline soldier. With this in mind Spectra has invested in providing the capability at the tactical level so data can be sent and received in a timely and appropriate manner.

Spectra had been aware for many years that UHF TacSat was a limited resource only available to a select number of high priority radio users. Furthermore, it attracts a premium price and it is restricted in its ability to offer reliable and high quality communications on the move (COTM).

Because of this, the company worked with Inmarsat to pioneer a complementary service offering to provide a global solution for those armed forces that couldn't get access to UHF TacSat. Interest grew rapidly in Spectra's capabilities around the world, as defence users quickly realized the benefits of a product that provided BLoS global connectivity using tactical radios.

Spectra prides itself on a detailed understanding of the challenges faced by military communicators. This is our key differentiator,. We have experienced first-hand the challenges of maintaining secure voice and data communications in hostile environments.

This drives us to ensure our solutions are always fit for purpose. All our systems have been designed for ease of use and reliability and reducing the burden in the modern battlefield. Our end users consistently feed back to us their experiences of the ease of setting-up SlingShot® and SHADE™ in austere environments and the consistent quality of service once connected.

Security is always the first thing we think of, by making sure the data people send is secure, and we do that with closed networks, ensuring the service is reliable, as we live in an unstable world and our customers have to operate is an agile way, moving from location to location.

As the equipment we provide is small, lightweight and removable, it lends itself to those types of operation. All of our equipment can be located on land, in headquarters or on the man, vehicle, boat or aircraft. We are covering all those platforms.

For reasons of client confidentiality, Spectra cannot comment publicly about specific instances of the deployment of its products in war zones and hostile environments. However, we can disclose that the company has worked successfully with Oxfam in the Haiti Earthquake disaster, providing voice and data communications when all terrestrial networks were down.

The key driver for why people use us is our agility. We are able to act and respond in a timely fashion. That's what differentiates us from so many of the main players in our industry.

When our customers are battling the forces of nature, and sometimes other forces, having robust and reliable communications is a very tangible requirement. Spectra takes the responsibility of providing what can be life-and-death communications very seriously and is fully committed to ensuring that technically, and functionally, we exceed our customers' expectations.

spectra-group.co.uk

Simon Davies is the Managing Director of Spectra Group (UK) Ltd., a leading provider of Voice and Data services into remote and hostile areas world-wide for Defence, Governmental and Non-Governmental sectors.

Simon joined the Army as an Apprentice, direct from school, into the Royal Signals and served in the UK, Germany, Belize and deployed to many Operational theatres during his 24 years' service, rising to the rank of Warrant Officer Class 2 in the appointment of Yeoman of Signals.

Upon leaving the Army in 2004, Simon established Spectra, which has achieved steady growth over the past eight years through these difficult economic times and is fast becoming a leading service provider of reliable, robust, deployable communications. Spectra's services are deployed world-wide in some of the world's harshest environments supporting the UK Military, European Union, Stabilization Unit, to name but a few.

THE HPA CORNER: HOSTED PAYLOADS FOR WEATHER MONITORING

By Todd Gossett, Senior Director, Hosted Payloads, SES Government Solutions

In recent years, both the National Oceanic and Atmospheric Administration (NOAA) and the US Department of Defense (DoD) have experienced acquisition issues with weather satellites which have resulted in schedule delays, cost overruns and the cancellation of already- or nearly-built satellites and sensors.

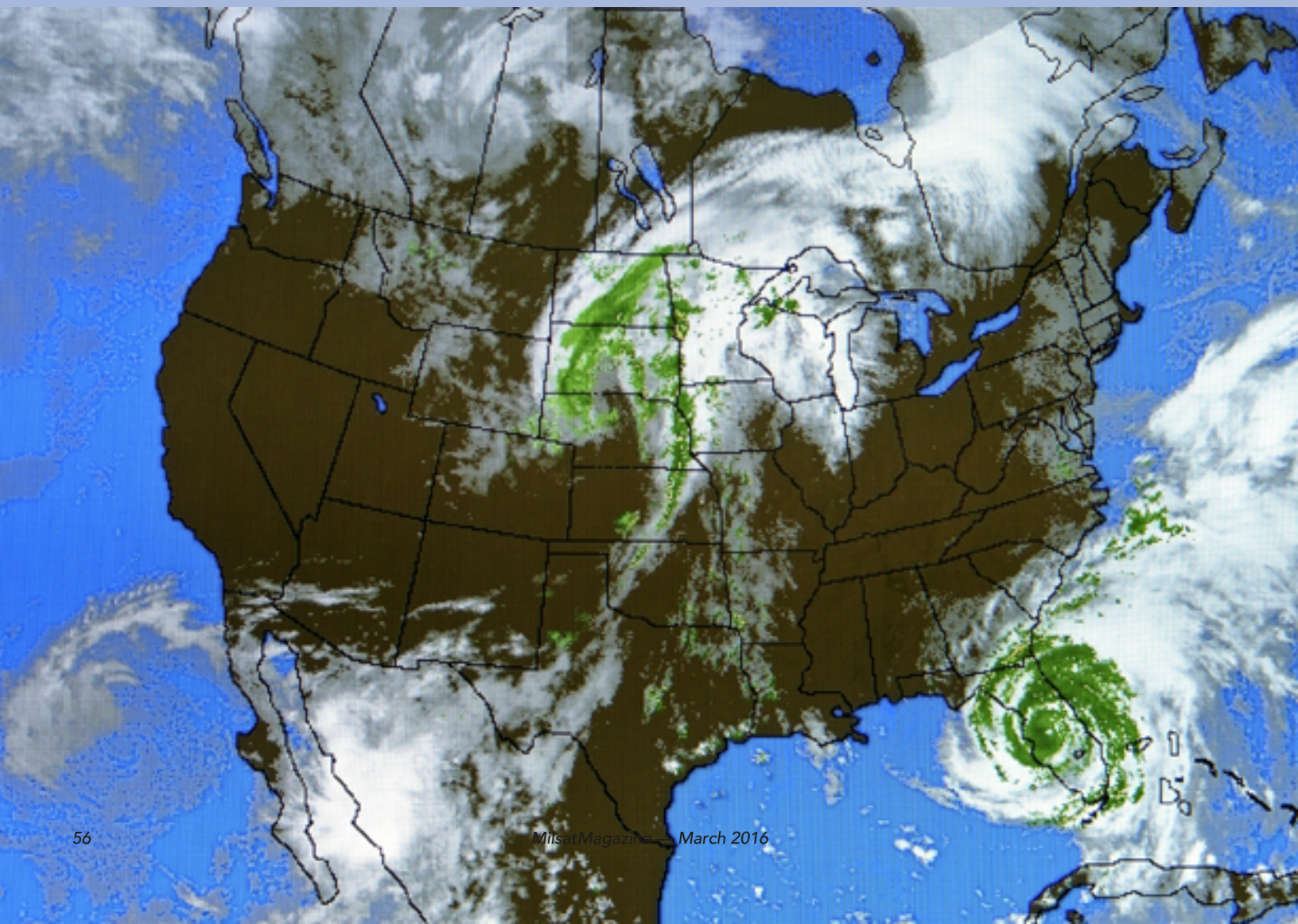
EUMETSAT has experienced very similar problems. Congress has prohibited any current or future reliance on Russia or China for space-based weather data, further exacerbating the DoD's ability to satisfy upcoming weather-coverage gaps.

Where problems with traditional programs of record and security concerns have limited the US government's options, the use of commercial satellites to host weather sensors as hosted payloads offers a timely and cost effective way to fill these critical capability gaps going forward.

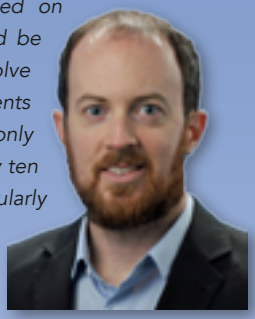
This column's question for HPA Members is…

From your perspective, as members of the Hosted Payload Alliance, can hosted payloads do a better job of saving taxpayer dollars and providing more innovative solutions than weather-monitoring solutions out there today? If so, how? What are the pros and cons?

"Hosted payloads present an opportunity for more cost-efficient weather sensor deployment with the added benefit of disaggregating sensors to lower mission risk and increase resiliency. Sharing the costs of the satellite platform and launch with other payloads leaves more room in the budget for the weather sensors that improve existing capabilities, establish new ones and fill gaps. Coupled with a commercial launch pace, this means more weather payloads with better technology deployed faster at a more attractive cost.



*"Host satellite resource allocations can be codified in the hosting agreements to ensure the hosted payload has what it needs to achieve its mission. The challenge is to ensure the needs and requirements of the customers are met by balancing various payloads and satellites and aggregating the data."—**Eric Webster**, Vice President and General Manager, Environmental Solutions, Space & Intelligence Systems, **Harris Corporation***



"If weather payloads were hosted on commercial satellites, there would be much more opportunity to evolve new meteorological instruments on a regular basis. Instead of only launching new systems once every ten years, like we currently do, regularly adding to a constellation of sensors on various commercial satellites would dramatically improve the efficiency and consistency of payload development. This would also reduce cost and improve performance while providing resilience from acquisition, appropriation, technology development, launch and operations risks as well as data gaps.

*"The rigorous calibration, validation and verification process required of operational meteorological payloads can still be maintained when government-developed payloads are hosted on commercial satellites. As an example, to conserve budget, on a satellite launched in 2005, the government of Japan successfully combined a sophisticated Visible and IR imager with a geostationary communications satellite and flew the multi-mission program, MTSAT, for its full design life."—**Jonathan Sheffield**, Principal Systems Engineer, **SSL***

hostedpayloadalliance.org/

*The Hosted Payload Alliance (**hostedpayloadalliance.org**) is a satellite industry alliance formed to increase awareness of the benefits of hosted government payloads on commercial satellites.*

The US National Space Policy published in 2010 calls for an increasing role for commercial space to meet government requirements and explicitly directs the use of non-traditional options for the acquisition of space goods and services, and cites hosted payloads as one of these non-traditional options. The policy notes that public-private partnerships with the commercial space industry can offer timely, cost-effective options to fill government requirements.

PRODUCT FOCUS: IDIRECT GOVERNMENT'S NEXGEN MODEMS

By Trisha Kinman, Director, Product Management, iDirect Government

The Department of Defense (DoD) and government agencies have long relied on technology advancements in military satellite communications (MILSATCOM) to operate smarter and more effectively.

Today's military requires satellite communications equipment that is smaller, lighter, less power consuming and easier to setup—all while delivering higher bandwidth than ever before. To those ends, VSAT has long played the role of ensuring military and government customers are able to communicate in a highly secure and efficient manner no matter where the mission may be. Today, that mission covers land, air and sea

Recent technological advances allow SATCOM modem manufacturers and terminal integrators to reduce the size, weight and power (SWaP) of modems and SATCOM equipment to levels previously believed to be unattainable. SWaP ranks as one of the military's most frequently requested improvements to MILSATCOM equipment in supporting their critical operations with anytime, anywhere communications.

Defense and government agencies rely on secure, satellite-based voice, video and data applications to ensure mission success—be it force-protection, logistics, situational awareness, disaster recovery or emergency response.

The next generation of defense remotes and line cards have arrived and iDirect Government's newest family of remotes, the 9-Series, and next gen line cards deliver extraordinary speed and software capability to teleports and VSAT terminals around the world. The new remotes and line cards are compatible with Ka-, Ku-, C- and X-band commercial satellites, the Wideband Global Satellite system (WGS), and the next generation of high throughput satellites (HTS).

Soldiers can now deploy a wireless broadband network on a moving vehicle for superior communications on the move (COTM) experience. Additionally, ships, military aircraft and unmanned aerial vehicles can leverage the new remotes for increased data speed and performance. The new 9-Series remotes are optimized for field operations in that they are quickly deployable, robust and bring significant SWaP improvements. In addition, they are capable of supporting unprecedented throughput levels and increased security standards.

The iDirect 9-Series 950mp features a reduced size, weight and power (SWaP) footprint. The new 9-Series product line operates on the Evolution 3.4 platform and includes the 950mp (man-portable) and 900 and 9350 dual demod modems.

The newest defense remotes include:

- ***950mp Board Level Remote**. Designed for integration into highly compact man-portable solutions, this modem is 30 percent smaller than iDirectGov's previous man-portable board, the e850mp. It features embedded FIPS 140-2 Level 3 encryption and is designed to operate within all Ku, C, Ka and X bands including WGS frequency ranges, providing flexibility in secure network deployments.*
- ***900/9350 Series Satellite Remotes**. Available in board-level and rack-mount options, these remotes provide unprecedented performance, dual demodulators, support for multiprotocol encapsulation (MPE) traffic and greater efficiency – enabling service providers to implement the most efficient technology on their network architectures.*
- ***980 Airborne Board Level Remote**. The 980 is designed for integration into airborne solutions on military aircraft. The 980 features improved performance, dual demodulators for seamless beam-switching, spread spectrum returns and skew angle compensation support for aeronautical operations, enabling the use of ultra-small and phased-array antennas on military aircraft.*
- ***9800 AE and 9800 AR Integrated Airborne Satellite Modems**. The 9800 AR/AE incorporates the 980 module in a fully integrated package. Available in two form factors: ARINC 600 Enclosure (AE) and 1 RU Rack Mount (AR), the 9800 AR/AE meet the stringent certifications required for installation on aircrafts and support a broad range of military aeronautical missions.*

SECURE FOR CRITICAL MISSIONS

When it comes to fulfilling security requirements, it is important to work with a platform that meets the highest military security standards. The 9-Series remotes and line cards are supported on iDirect's Evolution platform and meet an increased level of transmission security (TRANSEC) and FIPs standards. Utilizing an on-board TRANSEC Module, the 9-Series remotes and line cards will be certified to FIPS 140-2 Level 3.

The Evolution platform also supports one- and two-way TRANSEC. One-way TRANSEC is a new capability for iDirecGov that secures communications on receive-only terminals.

The new iDirectGov remotes enhance military communications, improve performance and deliver increased scalability and extensibility, leaving the military better equipped and prepared for the next mission. As MILSATCOM demands continue to evolve, iDirect Government is helping to equip satellite service providers with the right level of performance, efficiency and security to handle any situation at any time.

www.idirectgov.com/

Trisha Kinman serves as Director Product Management for iDirect Government; ***tkinman@idirectgov.com***.

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LOCKHEED MARTIN IS SHRINKING THE TELESCOPE

Since Galileo first started gazing at the stars atop a mountain in Italy, to modern-day astronomers who can see billions of miles into space, the general design of a telescope has pretty much remained the same.

In fact, even if you're looking at the stars using only the light-sensitive cells in your eyes, the image-forming process works the same way. Both methods collect light from an object and then reflect that light to form an image. Just like observatories and science classrooms use telescopes to gaze up, satellites use telescopes, too. That's how we get map images and weather forecasts, and you may recognize the most famous of these eyes in space, the incredible Hubble Space Telescope.

From space, the need for higher-resolution imaging to resolve far away objects requires bigger and bigger telescopes to the point where the size, weight and power of the telescope can completely dominate a system. Plus, it's also really expensive to put big, heavy objects in space.

"*We can only scale the size and weight of telescopes so much before it becomes impractical to launch them into orbit and beyond*," said Danielle Wuchenich, senior research scientist at Lockheed Martin's Advanced Technology Center in Palo Alto, California. "*Besides, the way our eye works is not the only way to process images from the world around us.*"

In order to shed pounds on future telescopes, scientists at Lockheed Martin are taking a new look at how to process imagery by using a technique called interferometry. Interferometry takes in what you're seeing, photons, using a thin array of tiny lenses that replaces the large, bulky mirrors or lenses in traditional telescopes. Large-scale interferometer arrays, located in observatories around the world, are used to collect data over large periods of time to form ultra-high-resolution images of objects in space.

SPIDER flips that concept, staring instead from space, and trading person-sized telescopes and complex combining optics for hundreds or thousands of tiny lenses that feed silicon-chip photonic integrated circuits (PICs) to combine the light in pairs to form interference fringes.

The amplitude and phase of the fringes are measured and used to construct a digital image. This provides an increase in resolution while maintaining a thin disk. It's a revolutionary concept analogous to the idea that helped replace your bulky old television with a thin display that can hang on your living room wall.

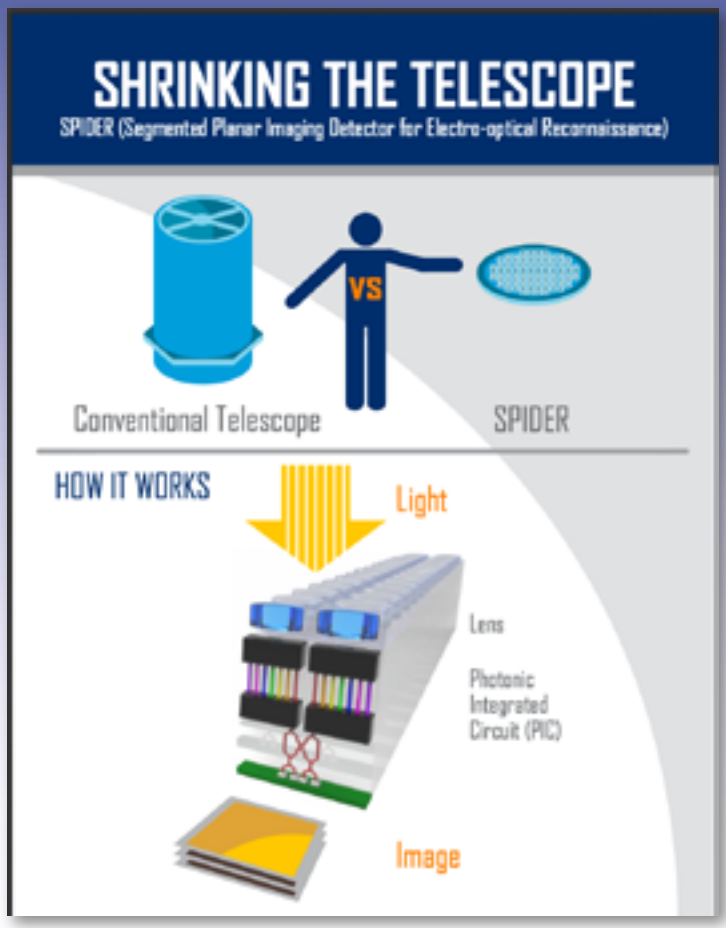
This is also how Lockheed Martin's imaging technology, called Segmented Planar Imaging Detector for Electro-optical Reconnaissance (or SPIDER), could reduce the size, weight and power needs for telescopes by 10 to 100 times. This concept could make a big difference for commercial and government satellites alike.

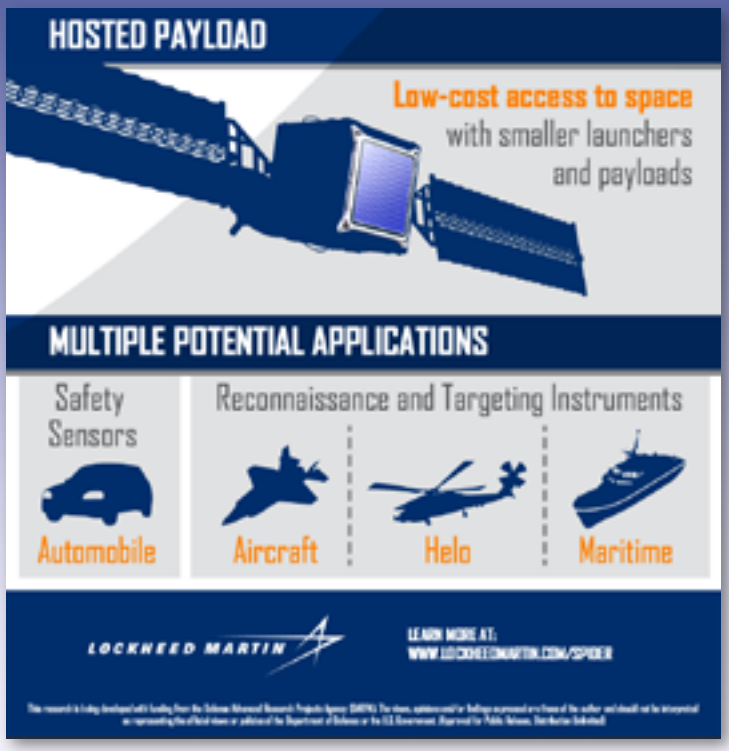
"*What's new is the ability to build interferometer arrays that have the same number of channels as a digital camera*," said Alan Duncan, senior fellow at Lockheed Martin. "*They can take a snapshot, process it and there's your image. It's basically treating interferometer arrays like a point-and-shoot camera.*"

SPIDER's photonic integrated circuits do not require complex, precision alignment of large lenses and mirrors. That means less risk on orbit. And its many eyes can be rearranged into various configurations, which could offer flexible placement options on its host. Telescopes have always been cylindrical, but SPIDER could begin a new era of different thin-disk shapes staring in the sky, from squares to hexagons and even conformal concepts.

Duncan's team, which includes Wuchenich, is developing this capability in the heart of Silicon Valley at the Advanced Technology Center. This is also the home of the Optical Payload Center of Excellence, which brings together the collective expertise of Lockheed Martin's space observation professionals. Alan and other scientists form the research base of the center so that one day, developmental technologies like SPIDER could be an option on production spacecraft.

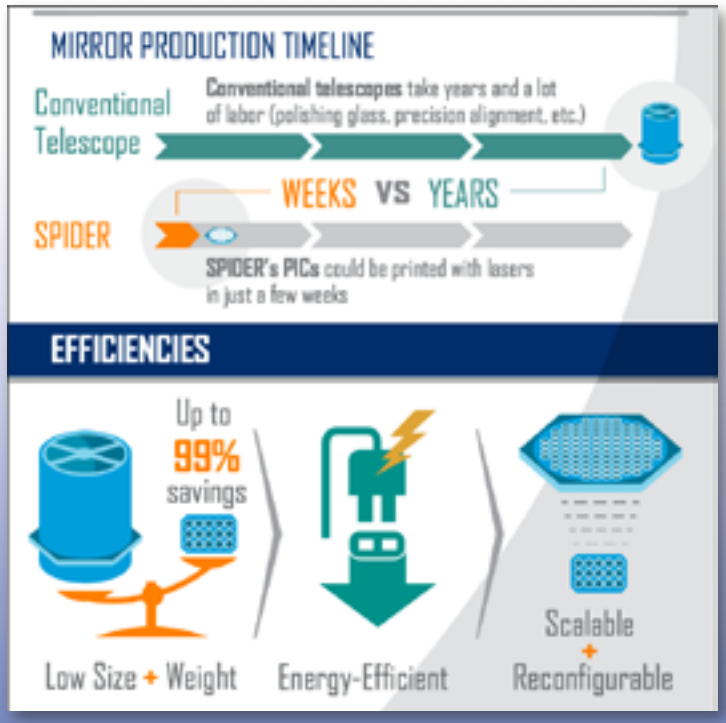
SPIDER Eyes... Power In Numbers





THE FUTURE LOOKS BRIGHT (AND LIGHT)

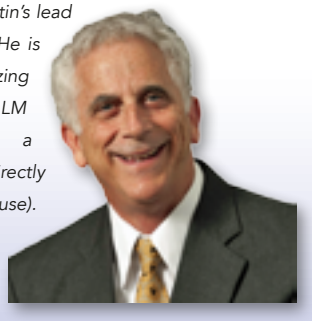
Developed with funding from the Defense Advanced Research Projects Agency (DARPA), the SPIDER design today is still in its early stages. It uses just several lenses and their associated PICs developed by Lockheed Martin's research partners at University of California, Davis. Despite the technology's advances, Duncan predicts SPIDER's capabilities could still be five to ten years away from being fully matured.



However, the team envisions a future where a telescope could be scaled up to serve in a similar capacity as telescopes that are currently photographing the planet, and at a fraction of the cost. In fact, SPIDER could even be able to operate on a spacecraft as a hosted payload, where it could simply be mounted to the side of a vehicle with minimal size, weight and power impact.

"*SPIDER has the potential to enable exciting discoveries by putting high-resolution imaging systems within outer planet system orbits such as Saturn and Jupiter*," said Duncan. "*The ability to reduce size, weight and power could significantly change the game. With 10 to 100 times the resolution of a comparable-weight traditional telescope, imagine what you could discover.*"

The Lead Engineer

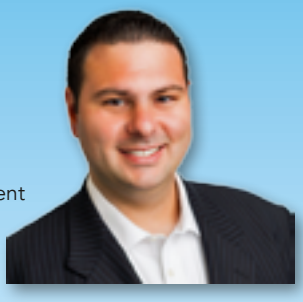


Dr. Alan Duncan is Lockheed Martin's lead scientist on the SPIDER project. He is currently a Senior Fellow specializing in Electro-Optical Systems at LM Advanced Technology Center, a senior staff position reporting directly to the vice president (Dr. Scott Fouse).

Dr. Duncan has 30 years of experience developing space based imaging systems and holds several patents for innovative imaging concepts. Recently, he completed a 5-year appointment as the LM instrument program manager for the NASA SIM (Space Interferometer Mission) program and a two year appointment as the LM program manager for the NRO SMT (Segmented Mirror Telescope) program.

Dr. Duncan has overall responsibility for the technical oversight of EO systems projects at the LM Advanced Technology Center. Dr. Duncan received his PhD in Physics from the University of Colorado.

GOVSAT INSIGHTS: THE ROLE OF COMSATCOM IN OPERATIONS

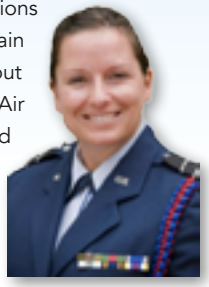


By Ryan Schradin, Executive Editor, GovSat Report (Sponsored by SES Government Solutions)

During the most recent SATCOM conference, Lt. Gen. John "Jay" Raymond addressed attendees as a keynote speaker and shared his vision and desire to realize a more collaborative and complimentary relationship between the military and commercial satellite communications providers.

These sentiments were reflected by Retired Major General Jay Santee in the panel discussion immediately following General Raymond's address. During his introductory remarks, General Santee shared his vision of a combined infrastructure that utilized military satellites working seamlessly together with available COMSATCOM capabilities to deliver the communications and connectivity needed to accomplish missions.

This raised some interesting questions about how the relationship between these parties can be improved, how the COMSATCOM sector could work to address military concerns and the Air Force's plans for embracing some exciting new COMSATCOM innovations that are rapidly entering the marketplace. To obtain the answers to these questions, GovSat reached out to Captain AnnMarie Annicelli of the United States Air Force's public affairs department. Here is what she and the United States Air Force had to say:



RYAN SCHRADIN

During Lt. Gen. John "Jay" Raymond's keynote presentation at this year's SATCON event, he stated that commercial SATCOM was essential for military operations and communications today. What is COMSATCOM's current role when it comes to empowering military communications operations in theater, and how will that change or evolve in the future?

CAPTAIN ANNICELLI

COMSATCOM enables our armed forces to project power globally, supports the operation of Naval forces underway, Army, Navy, and Air Force mobile units, and allows field commanders to command and control our military forces around the world. In addition to supporting our military forces COMSATCOM helps us establish a disaggregated satellite communications architecture which provides a more resilient communications system.

We see our relationship with commercial satellite service providers continuing to evolve to provide greater resiliency, transmission protection, increase flexibility, and affordability, all of which our pathfinders efforts are designed to help achieve.

RYAN SCHRADIN

What stands in the way of increased COMSATCOM use within the federal government and military? What changes are necessary in the acquisition and purchasing processes to open the door for increased COMSATCOM use in the military?

CAPTAIN ANNICELLI

The preservation of our space capabilities, which includes both mission assurance and assured access are very high priorities for the Department. Space has become a contested environment and our dependence on space-based assets requires that our future space architectures possess sufficient protection measures to ensure mission accomplishment.

Commercial systems provide a cost effective solution to deliver satellite communications because they are designed for efficiency and reduced costs. While COMSATCOM offers some protection measures, it may offer insufficient protection and flexibility that our future SATCOM systems require to meet the needs of our combatant commanders.

As of FY13, the latest year for which accurate numbers are available, the DoD had leased approximately more than $1 Billion worth of COMSATCOM. This breaks into ~$780 Million per year for wideband COMSATCOM and almost $240 Million for narrowband mobile-user COMSATCOM. Focusing on the larger component, commercial lease costs are roughly four times the cost of DoD-owned wideband MILSATCOM based on year-by-year lease costs and is a barrier to the expanded use of COMSATCOM at current cost levels.

DoD has considered use of longer-term leases, however Congressional funding is on a year-by-year basis. Consideration of longer term leases to reduce costs must include the risk of future year reductions with early lease termination fees that effectively increase the prices for longer term leases. Based on such considerations, the AF has embarked on a series of purchases (acquisition Pathfinders) of COMSATCOM resources to demonstrate COMSATCOM costs can be substantially reduced with an acquisition (purchase) versus short-term lease approach to COMSATCOM.

In Pathfinder 1, cost reductions on the order of a factor of four versus 1-year leasing was demonstrated where innovative contracting purchased two transponders on a commercial satellite. However, the satellite was an older, end-of-life satellite operating in an inclined orbit, not typical of commercial satellites. As a result, the 4-to-1 reduction in commercial costs achieved in Pathfinder 1 is not anticipated to be repeated for traditional COMSATCOM services.

Planned Pathfinders 2-5 will build on the lessons learned from Pathfinder 1 to demonstrate additional scenarios for increased savings of acquiring COMSATCOM for military use. High Throughput Satellites (HTS) offer prospects for order of magnitude savings, potentially even less than a follow on to Wideband Global SATCOM (WGS). COMSATCOM technologies hold promise to reset this relationship.

RYAN SCHRADIN

In the aforementioned keynote address, General Raymond stated that the military isn't currently equipped to utilize the next generation of high throughput satellites. What does the military need to do to take advantage of these cost-saving, higher-bandwidth satellites? What can industry do to help the military prepare to utilize this technology?

CAPTAIN ANNICELLI

The use of High Throughput SATCOM (HTS) is already being considered by the Air Force's Pathfinder initiative; however, HTS requires a more complex approach to ground infrastructure and more flexible approach to terminal architectures than used for traditional systems. The ability of terminals to offer flexible technology on ramps for HTS products is not an available capability.

HTS system exploit closed network, tightly coupled terminal, modem, satellite systems which are largely indigestible to legacy DoD terminals. High terminal cost barriers, and inflexible architectures also render terminals resistant to change. Pathfinders are working to identify common very flexible terminal/modem on ramps to access order of magnitude HTS capacity and affordability improvement.

RYAN SCHRADIN

In addition to HTS, there are other, lower cost satellite services and offerings available to the military that could help decrease costs and increase efficiency. I'm thinking—specifically—about hosted payloads and inclined satellites. Where does the Air Force stand on hosted payloads? Are there plans to increase hosted payload usage in the near future and what barriers may be in the way?

CAPTAIN ANNICELLI

This is another area that is being given careful consideration. The use of hosted payloads is not new to the Air Force and DoD; however, its use has so far been limited to military payloads on military owned and controlled satellites. Integrating military payloads on commercial platforms presents challenges. For example, synchronization with a host satellite requires the government to make some compromises regarding satellite location and project schedule. Moreover, legislation prohibits the launching of military payloads using non-U.S launch providers, which limits the availability of suitable hosts.

Lastly, obtaining approval to transmit military frequencies on a commercial payload is a timely process that could impede synchronization of both military and commercial programs. The DoD is pursuing pathfinders to overcome these constraints. Leveraging hosted payloads is viewed by the Department as a promising means to incorporate mission assurance into our architectures.

RYAN SCHRADIN

What about inclined satellites for use in UAV and other similar missions? These satellites represent a cost-savings opportunity for the USG and are currently being used/leveraged by ACC. Are there plans to utilize them more in the future?

CAPTAIN ANNICELLI

The MQ-1/9 community is currently using inclined orbit satellites for CONUS test and training and some OCONUS contingency operations. Initial testing of inclined orbit operations completed in July 2014 and ACC began transferring some real-world operations at that time. Additional purchases of inclined orbit bandwidth were completed in FY15 and a larger transition will complete by mid-February 2016.

RYAN SCHRADIN

The commercial industry believes COMSATCOM adds significant resilience to the military's communication requirements. With approximately 200 COMSATCOM satellites around the globe, hundreds of teleports, diversified and encrypted command and control elements and compatibility with the Protected Tactical Waveforms (PTW) of the future, what can industry do to further improve our resiliency?

CAPTAIN ANNICELLI

The DoD has identified six factors that enhance resiliency of space systems (Distribution, Diversity, Protection, Proliferation, Disaggregation, and Deception). In general, any initiatives that contribute to these factors could potentially promote system resiliency. COMSATCOM already implements some of these factors to varying degrees and the wideband SATCOM AOA intends to leverage, to the maximum extent feasible, COMSATCOM offerings to deliver assured satellite communications to the warfighter.

RYAN SCHRADIN

During his SATCON address, General Raymond addressed some steps that he's taken – including the launch of the Commercial Integration Cell (CIC) within the Joint Space Operations Center – to improve the relationship and collaboration between industry and the Air Force. What has the impact of the CIC been on the partnership between industry and military, and what else can be done to move this partnership forward?

CAPTAIN ANNICELLI

To date the CIC has been extremely valuable both as a portal in determining the scope of anomaly reporting and in improving the SSA common operating picture. CIC collaboration contributes to improved cooperation and operational effectiveness between government and industry in several key areas of space operations including; improved situational awareness for making better decisions, enhanced ability to detect and mitigate anomalies, the identification and tracking of objects in space and options for technical solutions on automation, common standards and protocols.

What else can be done to move this partnership forward?

The CIC is still in a pilot, research and development period. During this time collaboration between the government and industry will continue and expand. In addition to the CIC there are multiple partnering opportunities between the government and industry that enhance our ability to operate in space and contribute to the responsible use of space.

RYAN SCHRADIN

What benefits do you anticipate from the closer integration and partnership between the military and COMSATCOM providers?

CAPTAIN ANNICELLI

Leading up to the wideband AOA, we have engaged substantially with our industry partners, who have offered a continuous flow of new technology developments to leverage commercial innovation to meet our military requirements. Efforts to work through cultural, technological, acquisition, and CONOPs limiting factors, such as those within our pathfinder programs, will improve prospects for the DoD to leverage promising technology offerings.

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

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

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A NEWTEC PERSPECTIVE: FIVE STEPS TOWARD EFFICIENT PEACEKEEPING OPERATIONS

By Koen Willems, Market Director, Government + Defense, Newtec

Peacekeeping, conflict or crisis management missions operate in the most dangerous and difficult environments in the world.

SATCOMS KEY ROLE IN PEACEKEEPING OPERATIONS

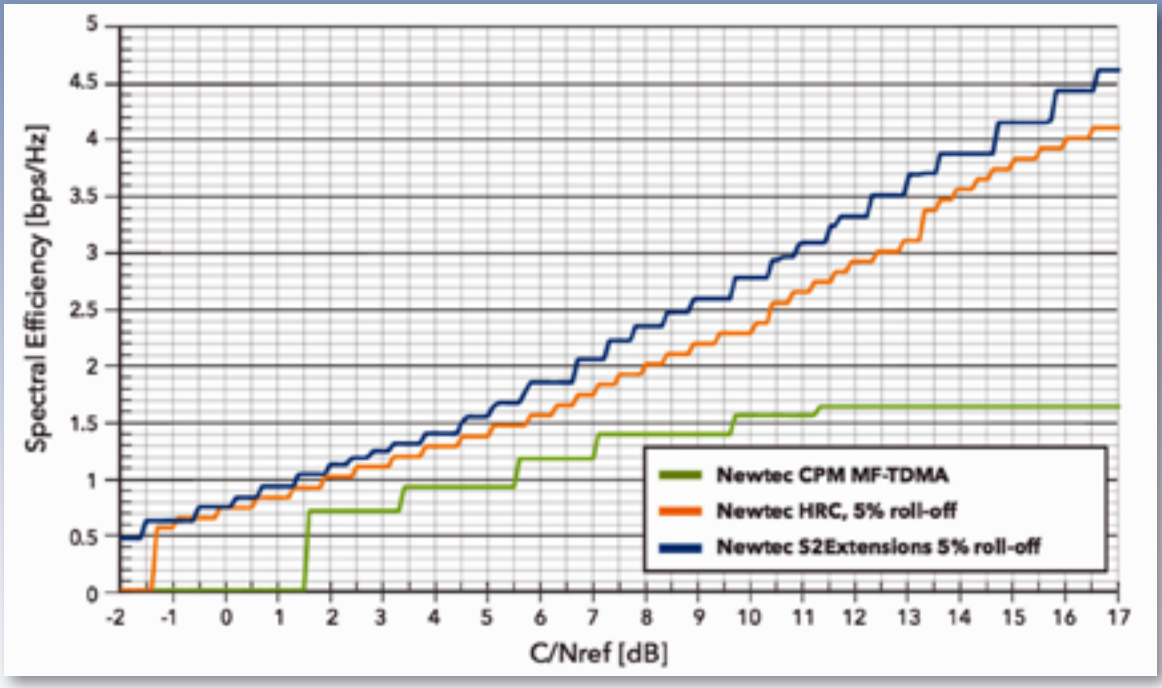
Peacekeeping involves multiple nations, organizations and Non-Governmental Organizations (NGOs) that need to work together to resolve the crisis or conflict. The campaign can range from military intervention into a conflict to guiding the peace process, supporting elections and economic and social development. We also must not forget the coordination of the refugee flows caused by the conflict and provision appropriate humanitarian assistance.

The success of a peacekeeping, conflict or crisis management operation depends on multiple factors, such as the preparation of the operation, the strategy and the knowledge of the theatre and the local people. The intelligence gathered and the flexibility to adapt to the changes at hand is also crucial. Not only does the conflict need to be resolved, but the aftermath also needs to be addressed.

Communication plays a key role in the different stages, from conflict management to the guidance of local and regional parties through the political process towards peace. In the majority of the cases, the peacekeeping organizations, participating nations and NGOs need to rely on satellite communications due to the fact that the terrestrial communication networks are either destroyed, non-existent, insecure or unreliable.

The complexity of the peacekeeping operation is directly reflected in the complexity of the SATCOM network. Multiple applications (Intelligence, Surveillance and Reconnaissance (ISR), tactical, logistics, welfare, humanitarian, etc.) and services (video, voice, data) need to be addressed through the same network. Moreover multiple nations and international organizations may be involved. Depending on the stage of the operation, the mix of services and applications will change. Selecting the correct VSAT platform and technology is crucial for the success of the peacekeeping network deployment over satellite.

The VSAT platform will require the flexibility, scalability and efficiency to embrace the complexity of peacekeeping operations. The platform needs to be capable of regional or worldwide deployment, as well as the ability to offer a mix of applications and services, but it doesn't stop there.



Comparison efficiency of 3 optional return link technologies (MF-TDMA, SCPC and Mx-DMA)

CURRENT VSAT TECHNOLOGIES ARE NOT ALWAYS THE MOST EFFICIENT

When deploying a VSAT platform for peacekeeping, conflict and crisis management operations, multiple elements need to be taken into account. The majority of the VSAT platforms are missing one or several of these key elements:

- *First is spectral efficiency. Using dated waveforms and MODCODs will limit the amount of information that can be sent over satellite. Such information (or the lack of it) can be vital in making correct decisions, especially with bandwidth hungry applications such as ISR.*
- *The traffic going through the peacekeeping SATCOM networks can be quite diverse, ranging from bursty traffic with large variations in the instantaneous traffic flow to static constant flow traffic typical for video and voice communications. In most cases, aggregated video, data and voice traffic will be exchanged over satellite, which results in a variable traffic pattern. If the waveform is not able to adapt to the changing traffic patterns in an efficient way, the end-user loses a lot of bandwidth and throughput.*
- *Some VSAT technologies in the market will switch between SCPC and MF-TDMA or adapt their SCPC dynamically according to the traffic. However, if this operation is not seamless and buffering is required because the technology needs to tear down and pull up a carrier with every change in traffic, the risk of packet loss increases incrementally in more complex networks.*
- *Next to packet loss, poor service availability will result in the end-user missing out on mission critical data. With the large amount of HTS capacity that will be deployed worldwide, an adequate solution needs to be provided to match high availability services with high bandwidth efficiency. Fading effects due rain, interference, and shadowing can seriously hamper satellite communication. The control of the power is typically not fully automated, resulting in manual rain fade combating and the pain of interference as a consequence. This interference is not only affecting the service but is also the neighboring services.*
- *Finally from an operational perspective, capacity management and carrier planning is a manual and time-consuming process. Every change in the carrier plan can result in the need for technicians in the Network Operation Center or in the field to perform a configuration update. The installation of remote terminals should be quick and simple in order not to delay or block the peacekeeping operation.*

TO THE RESCUE

This is where the Newtec Dialog® Multiservice VSAT platform comes into the picture. The Newtec Dialog platform is a scalable and flexible multiservice satellite communications platform that allows operators and satellite service providers to build and adapt their networks easily as peacekeeping, conflict and crisis management operations change or grow. As such, Newtec Dialog gives them the power to offer a variety of on-the-move, on-the-pause and fixed services while making hassle-free decisions on which technology to use. A set of key technologies bolsters the high availability platform to offer highly reliable services at unsurpassed efficiencies. This addresses the continued pressure on the ever-increasing need for more data throughput.

- *The Newtec Dialog platform supports three return access technologies from a single hub: MF-TDMA, SCPC and the Newtec's unique Mx-DMA™ (Cross-Dimensional Multiple Access). Mx-DMA incorporates MF-TDMA flexibility and on-demand variable bandwidth allocation at SCPC efficiency.*
- *MF-TDMA satellite access technologies typically target applications with very bursty traffic patterns or very low data rate. This technology enables operators to share the bandwidth with a very high amount of users at the expense of the overhead of the TDMA scheme (guard times, synchronization overhead, etc.).*
- *SCPC on the other hand has more applicability in very high data rates and voice and fixed rate video return links ranging from 1 to 40 Mbaud. SCPC uses S2 Extensions to provide the highest efficiency, but has no means to share capacity or to overbook services.*
- *In between resides the majority of the peacekeeping, crisis and conflict management applications with low to medium overbooked services and important throughput rates up to 75 Mbps. This is where Newtec Mx-DMA return technology comes into the game.*

STEPS TOWARD EFFICIENCY

The Newtec Mx-DMA return technology allows network operators to deploy anything between dedicated to low-to-medium overbooked services at any given time and at minimum space capacity cost. In technical terms, this

Overview of the Newtec Dialog Platform.

translates into the fact that Newtec Mx-DMA cross-correlates and assigns in real-time. Return frequency plan, symbol rate, modulation, coding and power based on return traffic demand, QoS management and channel conditions are all adapted simultaneously for each terminal in the network. With each carrier assigned to just one terminal, highest return SCPC-like efficiencies are achieved while maintaining the flexibility of MF-TDMA

The Newtec Mx-DMA return technology on the Newtec Dialog VSAT platform brings five main benefits to the table for peacekeeping, conflict and crisis management operations. These benefits will be explained in the following steps.

Step 1: Industry Leading Efficiency

Implementing Newtec Mx-DMA for peacekeeping, crisis and conflict management operations immediately results in important efficiency gains (30 to 50 percent) in satellite bandwidth, which can be exploited for different purposes:

- *Provide double throughput through the same bandwidth*
- *Cut OPEX costs and reduce the gained bandwidth*
- *Groom the gained bandwidth towards other applications or end-users craving for bandwidth*
- *Increase the service availability of the link*
- *Optimize the User Experience of the end-user*

The Newtec Mx-DMA return technology is based on optimal modulation techniques implemented in the Newtec High Resolution Coding (HRC™) waveform. The innovative next-generation waveform is typically applicable for low to medium rate applications between 32 kbps and 75 Mbps. HRC has an efficiency comparable to DVB-S2 with a 5% roll-off factor in order to get as many bits through the available bandwidth as possible.

In contrast to DVB-S2, the HRC coding also handles low throughput speeds in SCPC mode without the harmful latency effects that could hamper voice traffic or video streaming services. HRC optimizes low to medium rate traffic and avoids latency over satellite by using short block codes.

The high granularity of MODCOD choices (40 MODCODs from QPSK to 32APSK) provides the best modulation and coding per link. In combination with ACM (Adaptive Coding and Modulation) the most efficient mode is selected automatically depending on the available bandwidth and instant satellite link conditions.

Step 2: Seamless Real-Time Dynamic Bandwidth Allocation

As mentioned earlier in this article, a large set of applications within peacekeeping, crisis and conflict management applications today have varying traffic patterns over satellite. These patterns can be exploited by adapting the carrier plan on the fly based on the actual incoming traffic in the terminal. This not only creates higher efficiency over a group of terminals, but also allows service providers and operators to offer overbooked services based on a fine grained, but deterministic QoS model and priority schemes. As such, the flexibility of MF-TDMA can be maintained. It remains possible in Mx-DMA to allocate bandwidth on demand and in real-time without the typical MF-TDMA overhead.

Unlike other return technologies in the market, Newtec Mx-DMA's carrier resizing based on incoming traffic is seamless with zero packet loss and almost no jitter. The Newtec Mx-DMA does not need a buffer to tear down and pull up a carrier with every change in traffic.

When resizing the carrier, two considerations need to be taken into account. Firstly, the operator should not experience a hit whilst carriers are resizing. Secondly, the resizing of the carrier should not impact other users on the same satellite transponder. In a network with five return carriers for example, three out of the five carriers could require to grow due to changing incoming traffic rate.

In case of traditional SCPC system, these resizing carriers cannot be shifted without traffic impact. Increasing the size of a carrier without impacting the other terminals will result in fragmentation of the carriers over the used capacity. In Mx-DMA, the complete carrier plan for all terminals is updated seamlessly. This keeps the used capacity to a minimum without any fragmentation of the carriers.

Benefit 3: Highest Availability @ Minimal Cost

Keeping the satellite link alive and maintaining maximum service availability for mission critical communications is imperative for peacekeeping, conflict and crisis management operations. The availability of such a service is defined by the capabilities of the technology to handle certain amount of fading effects such as rain, interference and shadowing effects.

Traditional VSAT networks will either take a big rain margin per return carrier to compensate for the fading effects or will use different MODCODs in Adaptive Modulation and Coding (ACM) to accommodate an operational link under fading conditions in the return channel. In Newtec Mx-DMA, different technologies go hand in hand to assure the maximal service availability.

- *First, Newtec FlexACM operates alongside adapting MODCODs to compensate for fading effects. Moreover FlexACM also considers noise and distortion effects and small variations (scintillation effects etc.) in order to be as close to the zero margin level as possible and use the maximum available bandwidth under fading effects.*
- *In case of a deep fading effect beyond the minimal MODCOD, Newtec Mx-DMA will automatically adjust the symbol rate to keep the connectivity.*
- *Finally, instead of considering a rain margin for every single carrier, Newtec Mx-DMA will implement a rain margin for the total population of terminals and*

satellite carriers through statistical multiplexing, which provides additional gains on top of other Newtec Mx-DMA efficiency technologies. In case of a fading effect at a remote site both symbol rate and center frequency will dynamically be adjusted and consume some of the statistical multiplexed margin. As such, fixed bitrate service such as video and voice can be maintained.

Benefit 4: Optimized SWaP-C For Remote SATCOM Terminals

Some of the primary concerns for peacekeeping, conflict and crisis management operations are size, weight, power and cost (SWaP-C). Newtec modems running Mx-DMA return technology represent a significant step towards improving these characteristics.

As these terminals need to be transported and sometimes carried to the conflict areas, the SWaP (size, weight and power) become increasingly important to support the flexibility and the mobility of these operations. How does Newtec Mx-DMA solve the SWaP-C question?

Through the Newtec Mx-DMA technology, important efficiency gains between 30 to 50 percent can be made depending on the network configuration and legacy VSAT technology. This basically means that,with smaller terminals, higher throughputs can be achieved. Smaller terminals also require less power, are lighter and are less costly.

On top of that, Newtec Mx-DMA implements automatic uplink power and regrowth control for the Newtec terminals. The output power of the terminal is constantly monitored by the Newtec Dialog hub and adapted depending on the link condition and the carrier size. During a fading effect, end-users typically crank up the power to the maximum output level. Through that operation, this also increases the spectral regrowth.

By managing the power and measuring the regrowth automatically, the output back-off (OBO) can be reduced during fading conditions. As such, more power (up to 3dB) can be obtained out of the same BUC. This reduces the need for a more powerful or expensive BUC and more throughput can be achieved at the same time.

Benefit 5: Unmatched Operational Efficiency

Peacekeeping, conflict and crisis management operations continuously pursue the improvement of their operational efficiency. Every element that increases the operational efficiency provides an extra step towards a successful operation. Newtec Mx-DMA contribution towards operational efficiency is achieved both at the Network Operation Center (NOC) as well as in theater through the Newtec terminals.

Instead of engaging into a manual and time consuming capacity management and carrier planning workflow as in SCPC and MF-TDMA networks—where for every change in the carrier plan a human interaction is required—Newtec Mx-DMA automates the process. The start frequency and stop frequency are determined at the initial carrier planning phase.

Within that bandwidth envelope, the different carriers will be brought up via the Newtec Dialog Hub. From there Newtec Mx-DMA takes over. Every change in incoming traffic or link conditions will be automatically managed. No human intervention is required anymore at the NOC, except for monitoring and control.

In peacekeeping, conflict and crisis management operations it is up to the deployed personnel (often possessing only basic IT skills) to install the VSATs. To help these people to quickly set-up a satellite link, Newtec provides both a Point&Play® tool and auto-commission services. The quicker the terminal is up and running, the quicker the deployed personnel can focus on their core operational tasks.

The Point&Play tool provided with the Newtec Dialog VSAT terminals allows the installer (be it a professional installer or the end-user) to easily position the antenna correctly by identifying the satellite and providing feedback on both signal quality and lock. Once the VSAT terminal is in lock, it will be auto-commissioned by the Newtec Dialog hub and monitoring can start.

The carrier belonging to the terminal will automatically be added to the network and the automated Newtec Mx-DMA will do the rest. The terminal certification is an automated process verifying the installation quality: pointing accuracy and cross polarization discrimination. This process assures that each terminal works at maximum efficiency reduces the interference risk.

VSAT technology needs to embrace the complexity of peacekeeping, conflict and crisis management networks over satellite. The efficiency of these operations are directly linked to the efficiency of the VSAT platform. Firstly you need a multiservice VSAT solution such as Newtec Dialog platform that allows operators and satellite service providers to build and adapt their networks easily as peacekeeping, conflict and crisis management operations change or grow. Moreover you need the technology to provide flexible and efficient services.

The Mx-DMA return technology that runs on the Newtec Dialog platform brings 5 main benefits for the service providers and operators involved in peacekeeping, conflict and crisis management networks over satellite. Spectral efficiency and dynamic bandwidth allocation go hand in hand in the Newtec Mx-DMA technology and immediately result in important bandwidth and throughput gains up to 50% at the highest service availability.

In case of variable traffic over the network, the Mx-DMA technology will automatically resize the carriers in a seamless way without packet drop or interfering with neighboring carriers. In order to answer the stringent SWaP-C demands, Newtec Mx-DMA allows for smaller terminals and BUCs in the network to improve the transportability, mobility and affordability. Finally, carrier planning and capacity management is fully automated to reduce human intervention and improve the operational efficiency at both the NOC and the remote site.

newtec.eu/

Koen Willems started his career in 1998 with Lernout&Hauspie as a project manager in the Consulting & Services division. More recently, he joined Toshiba as a Product Marketing Manager for the Benelux and, later, for the European market. In a total of 6 years, Koen contributed to all of the major Toshiba Retail IT product releases. Mr. Willems is, currently the Market Director for Government and Defense for Newtec, a Belgium-based specialist in satellite communications. Koen holds a degree in Germanic Languages (University Ghent, Belgium, 1997) and completed a Masters degree in Marketing Management program at the Vlekho Business School in Brussels (1998). He acquires a Six Sigma Black Belt for product development and process improvement in 2006.

A HARRIS CAPROCK PERSPECTIVE: SPACE SEGMENT MANAGEMENT OPTIMIZATIONS

Harris CapRock Communications provides managed communications services in remote and harsh locations for energy, maritime and government customers.

Harris CapRock uses a combination of a dozen teleports on six continents and links from more than 60 satellites to connect remote customers.

SETTING THE SCENE

Harris CapRock provides managed communication services to the energy, government, and maritime markets, utilizing satellite, wireless and terrestrial networks. Mindy Feuer, Senior Strategic Engineer—Space Segment Management, explained, "*We provide end to end turn-key solutions that include network engineering and design, procurement, installation and commissioning, and 24/7 support. Most of our customers are located in areas typically not serviced by traditional telecommunication services, such as the middle of the ocean. Satellite communications tends to be their most viable solution. My team is responsible for delivering satellite bandwidth to our customers.*"

Mindy described the challenges, "*My team is tasked with delivering services to customers often under tight deadlines. This includes designing the customer circuit based on the information contained in a ticket and managing the inventory used to deliver that circuit. This means we are dependent on receiving accurate technical and commercial data to engineer circuits and update our databases.*"

At Harris CapRock things are never static. "*We are always advancing both our technology and our internal processes,*" said Mindy. "*Our legacy ticketing system was cumbersome and inflexible. It was a static system, not process-based, and it was not evolving at the rate of our organization. As the technology changed it became more difficult to update this system. Changing data or processes was a long and involved effort. There came a point when the only way to make changes was a complete rewrite of the code. We needed a more robust and flexible solution.*"

THE SOLUTION

Using PNMsoft Sequence BPM suite, Harris CapRock built an intelligent solution to manage all of the services requested from Mindy's team.

"*We now have a total of nine separate workflows in the solution, each mapped to a specific business process. There are three pre-sales queries used to request inventory and pricing information for proposals. There are an additional three requests to manage post-sales requests for active customers. These cover processes for activating a customer, terminating a customer and renewing a customer. In addition, we have a process flow for managing contracts,*" Mindy said.

> *"Our new solution has provided a wide range of benefits that span process improvements and time savings."* Mindy Feuer, Senior Strategic Engineer—Space Segment Management

The Results Sequence has been rolled out to 125 internal users consisting of Project Managers and operational staff. Sequence manages nine workflow processes, handling approximately 300 inquires per month.

Mindy described the outcome, "*The solution we built using Sequence helps us manage an important piece of the Harris CapRock organization. We manage a very large inventory of satellite bandwidth. As in any company, a well-managed inventory can have a significant impact on the bottom line. More importantly, the solution manages the workflow used to deliver a manager component of our turn-key solution. Up-to-date data now available to us via Sequence is critical to the timely and accurate delivery of services to our end customers.*

"*Our new solution has provided a wide range of benefits that span process improvements and time savings. It provides teams with a clear understanding of their assigned tasks. This has streamlined our execution, and tickets are less apt to get lost in the queue.*

> *"There are so many tasks you can perform without creating any code at all. Creating forms, placing fields on forms, changing the look and feel of the forms – all these things can be done without writing any code."* Mark Rauch, Applications Development Manager—Government Solutions

SharePoint is another great feature which helps pull the application together very easily.

"In addition we have been able to modify these processes on-the-fly. The ability to update and manage our forms and tickets on-the-fly is a huge benefit in an environment where technology requirements are changing constantly."

LOW-CODE BPM

Mark Rauch, Applications Development Manager—Government Solutions, leads the team which developed the solution. He described his experience of working with Sequence.

"*Sequence makes it possible for developers to complete complex and time consuming tasks in very little time. Our team consists of experienced .NET developers, so that made some of the tasks even easier. But PNMsoft has made the product easy to use even for inexperienced users.*"

He added, "*There are so many tasks you can perform without creating any code at all. Creating forms, placing fields on forms, changing the look and feel of the forms—all these things can be done without writing any code. For example, dropping a field validator on the form without any code, allows you to ensure that the user enters data correction.*

"Sequence has a very flexible workflow design tool. It contains various controls like forms, messages, and tasks which are added to the workflow graphically as you would do in Microsoft Visio. Sequence's integration with

"Creating messages that users can see within the application or having those messages sent to an individual's email or to a group of emails is simple to do in Sequence. Formatting the email, creating the content, and including specific fields and information from the workflow – either in the subject or the body of the email – is very simple to do."

BENEFITS

Harris CapRock has experienced several benefits from its intelligent BPM solution...

- *Improved customer service*
- *Improved inventory management*
- *Greater collaboration on processes*
- *Increased data visibility*
- *Adaptability to change*
- *Faster development*
- *Easier system maintenance*
- *Rapid modifications*

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PRODUCT FOCUS: THE COTM COBRA FROM EM SOLUTIONS

By Dr. Rowan Gilmore, CEO and Managing Director, EM Solutions Pty Ltd.

Satellite Communications-On-The-Move (COTM) terminals that offer communications anywhere, anytime, while moving, have now become fairly commonplace and they range in size from tens of centimeters to several meters.

Flat panel antennas at Ka-band frequencies even hold the promise of providing a low profile solution to broadband communications, but their difficulty in meeting antenna radiation specifications without waiver, and to maintain their gain off-axis, means their data throughput, power, and scope of application will always be limited. Mission-critical communications requires guaranteed antenna gain, satellite access, clear line of sight regardless of weather, and robust electronics.

By being the first mobile terminal to use a unique "monopulse" beacon tracking system, EM Solutions' military Ka-band Sat-tracker COTM terminal was highly innovative in achieving exceptional pointing accuracy, and provided good broadband communications availability even under the most rugged off-road vehicle movements. However, its 48cm antenna size has proven to be smaller than desired by the network operators, as the antenna requires more satellite resources to achieve broadband communications than would otherwise be necessary with a larger antenna. The system is also unusable when the military WGS system is congested in Ka-band, or when rain fade is present.

Both of these problems have been overcome with EM Solutions new Cobra series COTM terminals. Cobra emerged after several design iterations as a result of field experience, and now in its third generation, provides a common stabilized platform capable of accurately pointing the antenna while on the move in both land and maritime environments.

The greatest innovation in the new Cobra multi-band terminal is an antenna feed system that supports simultaneous operation on three different frequency bands—without any manual intervention to mechanically interchange components. This is necessary to allow standard operation at military (WGS) Ka-band, with interoperation on WGS X-band in the case of rain fade, or fall-back (by software command) in the case of congestion to operation on the Inmarsat GX satellite system.

Other innovations in Cobra include a larger 1 meter antenna size, while the common stabilizing platform retains the flexibility to fit a smaller antenna if required. The larger antenna reduces the satellite power required by a factor of over four (compared with the original) to achieve the same data rate.

This has been accomplished while maintaining only a marginally greater footprint, so the terminal can be used on a range of vehicles, including off-road troop carriers and small patrol boats. At the same time, re-engineering effort has been applied to reduce cost, top weight, and overall terminal volume consistent with the other operating constraints.

Although much larger maritime terminals with dual X-band/military Ka-band capability already exist, none offer fall back to commercial Ka-band in the case of congestion on the WGS system. There is currently no other terminal in the market that offers universal on-the-move capability using simultaneous

tri-band operation in a versatile footprint, bringing the benefits of assured communications whenever a satellite is visible without manual changeover of hardware.

The new Cobra terminal will satisfy both WGS and Inmarsat specifications in Ka-band and be ready for deployment by the middle of 2016. The advantages of a dual use terminal that can rely on the capabilities of the military constellation for normal operation but fall back to commercial operation when called upon, without interruption of service, are enormous, since it provides the redundancy required for mission critical communications.

Compared with other existing terminals, the benefits of the new terminal include:

- *Fully transportable and operational on-the-move capability with unparalleled satellite tracking capability in three bands across all ranges and types of motion (land, sea, air)*
- *Support for broadband communications (data rates up to several Mbps) without using excessive satellite transponder resources consumed by a very small terminal, but with the option to reduce footprint and weight if necessary by changing antenna size*
- *Fall-back to a fully integrated commercial capacity (with built-in modem) in the event of failure or congestion of the military network*
- *Network survivability with assured communications in a contested environment*
- *Rapid and automatic self-healing in the event of rain fade or other link outage by switching satellites or band*
- *Configurability for a range of platforms to suit either a small or medium vehicle or vessel, with simplified field repair and cost optimization*
- *Universal stabilization to the most severe motion conditions, i.e., the terminal can be used either on land or at sea*
- *All X-band and Ka-band electronics are integrated within the radome in a single RF "can", avoiding the need for expensive and lossy waveguide runs to external equipment racks, and simplifying maintenance.*

To offer such a service, Inmarsat has partnered with EM Solutions to develop the world's first combined MilSATCOM/Global Xpress (GX) maritime SATCOM terminal, which is initially being created for an Australian Government customer.

Andy Start, President, Inmarsat Global Government, said,"*This is a further example of Inmarsat's strategy of responding quickly and effectively to customer demands. In this instance, the Australian Government customer was looking to increase the operational capabilities of their satellite communications within significant budget constraints and the requirement to reduce the footprint of satellite equipment on-board its new vessels. We are seeing a growing understanding within government SATCOM circles of the important role that commercial satellite communications can play in augmenting existing MilSATCOM capabilities. Partners, such as EM Solutions, play a vital role in helping us to develop new solutions, which are tailored specifically for government users.*"

EM Solutions has adopted an innovative approach to the development of its satellite terminals, adopting monopulse tracking techniques that provide exceptional accuracy and stability in addition to reducing the demand on motors and other moving parts, which minimizes power, weight and operational stress.

As a specialized developer of RF components and subsystems for the SATCOM industry, the new terminals make use of EM Solution's Diamond Series Ka-Multiband Block Up Converters, which use the latest in Gallium Nitride (GaN) technology and cover both commercial and military Ka frequency bands in a highly efficient, single package. GaN devices are very robust, with good tolerance to high temperatures. They complement the robust packaging of the terminal itself.

emsolutions.com.au/

Rowan Gilmore is the CEO and Managing Director of EM Solutions Pty Ltd, an Australian designer and manufacturer of advanced microwave components, systems and terminals used in satellite and wireless broadband communications networks around the world.

Until June 2011, he was CEO of the Australian Institute for Commercialization, where he helped numerous start-up companies and worked to accelerate technology transfer between research institutions and industry. Prior to this role, he worked extensively in the ICT industry, and was formerly based in London and Geneva from 1998 as Vice President of Network Services (Europe) for the airline IT company SITA, now France Telecom's Orange subsidiary.

He is an engineering graduate and winner of the university medal from the University of Queensland, and earned his Doctor of Science degree from Washington University in St. Louis in the US. He is a Fellow of the Australian Academy of Technological Sciences and Engineering, Chairman of the ARC Centre of Excellence in Engineered Quantum Systems, and holds adjunct professorships at the University of Queensland in both the School of Business and the School of Information Technology and Electrical Engineering.

SAVING ENERGY + SPACE IN C4ISR EARTH TERMINAL + TELEPORT FACILITIES

By Tom Phelps, Vice President of Engineering, Quintech Electronics & Communications, Inc.

In today's environment, C4ISR organizations continue to face ever-increasing demands for bandwidth and data processing. The need for increasingly complex and evolving interconnection for the global community is driving the proliferation of increased data transmission and RF communications.

At the same time, pressure to manage operating expenses and increase energy efficiency at communications facilities is as important as ever. The DoD spends $4 billion a year of its total energy bill of $18.9 billion[1] on the energy to power its fixed installations[2], managing over 500 installations worldwide in nearly 300,000 buildings. Industry leaders are looking to a new generation of RF switching products for satellite communications installations to slash electrical power consumption, cooling, and space requirements while expanding operational flexibility and performance.

Integral to a modern RF communications facility is an RF matrix system that provides flexible on-demand routing of RF signals. The currently installed base of older, large-configuration legacy RF matrix switching systems require miles of coaxial cable and thousands of watts of power to operate. These older systems are very labor intensive to install and maintain and occupy large areas of valuable rack space.

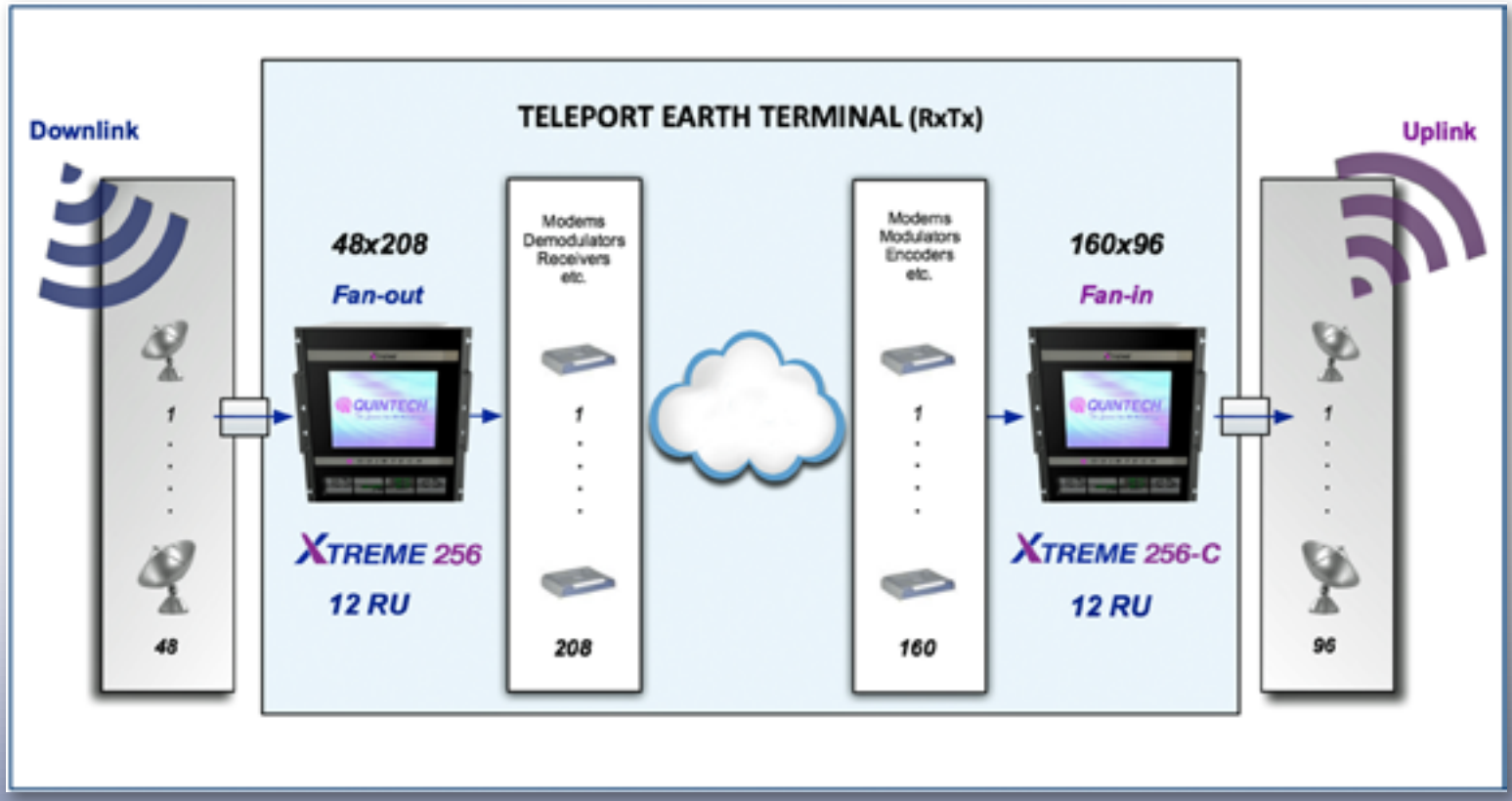
The next generation of L-band matrix switching products offers exciting opportunities for Network Operation Centers (NOC), Command and Control Centers, Earth Terminals, Monitoring Facilities and related C4ISR agencies to expand capabilities while dramatically reducing the technical space and power consumption. Quintech Electronics & Communications' *XTREME 256* Port L Band matrix defines the next generation of L-band matrix switching products.

"*We believe that this is an exciting opportunity now for C4ISR organizations to refresh legacy L-band matrices with the XTREME 256 technologies. It greatly increases operational capabilities while vastly reducing power requirements, cabling and rack unit footprint,*" said Frank Elling, President of Quintech Electronics & Communications, Inc.

The Quintech *XTREME 256* and *XTREME 256-C* matrices feature 256 port connections in a compact 12U chassis. The *XTREME 256* delivers full fan-out (splitting) non-blocking L-band signal management where any input can be routed to any or all outputs, while the *XTREME 256-C* delivers full fan-in (combining) where any or all inputs can be routed to an output.

This complementary pair of RF switches takes reliability, redundancy, resilience, and flexibility to the next level while achieving industry exclusive gain flatness over the entire frequency band for maximum RF performance.

The *XTREME 256* technology allows the user to minimize rack unit space requirements with its highly scalable packaging and exclusive (patent pending) flexible matrix architecture.



This architecture supports a large variety of symmetric or asymmetric configurations such as 64x192, 192x64, or 128x128, all in a single 12U chassis. In addition, having both splitting and combining matrices supports and completes the needs of the modern teleport for both downlink and uplink signal management.

Unlike older large configuration legacy matrix switching systems that require miles of cable and large power consumption, the *XTREME 256* liberates the legacy system's rack unit footprint by as much as 75 percent and the number and length of cables and connections by up to 97 percent, all contributing to enhanced RF system performance. By using built-in splitter/combiner port technology, the *XTREME 256* can offer system sizes such as 96x416 or 256x256 without the use of external splitter/combiner modules, saving additional valuable rack space.

Multiple simultaneous matrix control options are available. Local control is provided with an integrated 15" touch-screen monitor on the front panel. The embedded GUI web browser interface provides a simple method to manage the switch or check status, while SNMP and a command protocol via TCP/IP round out the options for remote control over Ethernet. Fast cross-point reconfiguration and signal switching times are facilitated with separate controllers for the GUI interfaces and internal switch configuration control.

The *XTREME 256* matrices were designed from the ground up to provide outstanding reliability and resilience, starting with a passive backplane and front to back cooling. All active cards, fans, and power supplies are hot-swappable and easily accessible from the front panel. This enables fast and easy replacement without requiring special tools or disconnecting cables, greatly simplifying and reducing labor and maintenance time while maximizing productivity and uptime.

Resilience is enhanced with redundant fan trays and power supplies, while redundant control cards with independent Ethernet connections offer the highest level of redundancy in control. Built-in test signal generation and self-test diagnostics (BIST) allow a fault to be immediately identified, isolated, and corrected.

"*With its superior operational cost savings, reliability and enhanced feature set, Quintech's XTREME 256 Port L Band Switch Matrices brings Expansion by Reduction to the NOC, Command and Control Center, Earth Terminal and Monitoring facility*," said Quintech's Frank Elling. "*Government C4ISR agencies and large commercial network operators are choosing Quintech for its reputation of delivering RF signal management solutions with the highest value.*"

By delivering expanded RF capacity and flexibility, freeing up critical rack space, and slashing power consumption and total-cost-of-ownership, The Quintech XTREME 256 fan-out and fan-in matrices have become the L-Band signal management system of choice for a growing number of facilities.

quintechelectronics.com/

Tom Phelps is Vice President of Engineering at Quintech Electronics & Communications, Inc. Mr. Phelps earned his BSEE from Michigan Technological University. He began his career with the United States Department of Defense and has been with Quintech for more than 15 years.

For more than 15 years, Quintech Electronics and Communications Inc. has been manufacturing RF matrix switching systems for government and military requirements. Globally, our products are integral to C4ISR applications such as; satellite earth stations and terminals, command and control centers, and maritime satellite communications. Custom RF designs allow for reliable modular and high-density signal management solutions.

Quintech RF matrix switching systems provide optimal signal performance while handling high RF input power levels while providing industry leading gain flatness. Quintech manufactures the world's largest configuration L-band matrix switching systems. Our full suite of RF products and solutions are utilized in critical earth station communications environments worldwide.

References

[1] ***http://www.acq.osd.mil/ie/energy/energymgmt_report/FY%202013%2AEMR.pdf***

[2] ***http://www.acq.osd.mil/ie/energy/index.shtml***

DRIVING ELECTRIC PROPULSION IN NEXGEN SATELLITES

By Bryan Reid, Director, Business Development, International Markets, Marotta Controls, Inc.

A unique Multi-Function Valve made a big difference in the GOCE mission, optimizing thrust control that improved the performance and extended the life of the mission.

Now Spacebus Neo, Europe's Thales Alenia Space Ltd.'s next generation satellite platform of telecom satellites, is capitalizing on this technology as part of a Xenon Pressure Regulation Assembly—simplifying electric propulsion systems, eliminating long-term leakage, and enabling uniquely flexible performance on a long-life satellite mission.

System simplification is essential in the highly competitive SATCOM market. By recognizing value in multi-function components, operators can create advantages in program cost, assembly time, reliability and satellite mass.

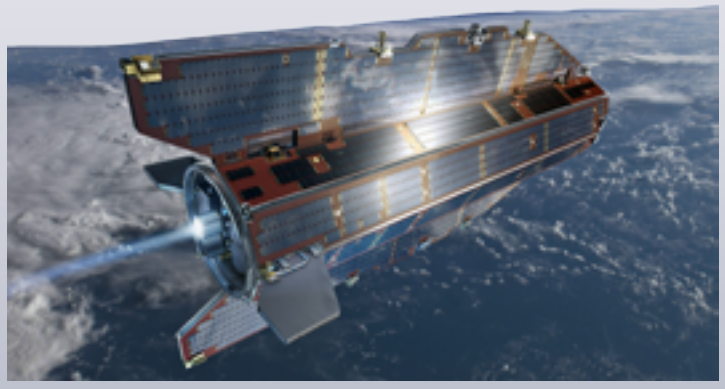
These gains can be demonstrated by a unique Multi-Function Valve (MFV), a key feature of an Spacebus Neo's electric propulsion system's Xenon Pressure Regulation Assembly (XPRA). Designed with fewer components than traditional mechanical regulators, the XPRA is driving down costs, reducing system weight, and enabling more payload in next generation satellite systems.

Patented and flight-qualified, this flexible device is enabling greater accuracy, robustness and system stability, even while equipping operators with new capabilities to adapt performance remotely over the course of mission deployment. While competitive with mechanical regulators, benefits of the multi-function system are significant—reducing weight and overall cost by as much as 50 percent compared to traditional systems.

PRECISE + FLEXIBLE CONTROL

The XPRA essentially acts as a digital device that can be reprogrammed as needed, allowing satellite operators to change flow rate or regulate pressure on the fly; the device's unique characteristics also eliminate downstream thruster isolation valves by creating the high sealing force that ensures fail-to-close leak-free operation over its lifetime.

These advantages are enabled by the device's MFV, performing several functions in one component, acting as pressure regulator, flow regulator and monostable isolation valve. Although similar in construction to a normally closed solenoid valve, the MFV has no dynamic seals and just one moving part. It uses the unique physical properties of magnetostrictive material as the actuation mechanism to modulate between open and closed positions.



Artistic rendition of GOCE, courtesy of European Space Agency.

The magnetostrictive material itself grows or shrinks depending on the electrical field that is applied, behaving in a way that is controllable and repeatable. This controlled movement in turn enables the MFV's single moving part to make tiny adjustments that allow precision control or modulation of flow or pressure.

With this level of proportional control, scientists and satellite operators can think differently about their electric propulsion requirements—including droop-free end-of-life regulation and reprogramming performance from the ground as new issues impact a mission.
These capabilities were validated during the GOCE (Gravitational Ocean Circulation Explorer) mission, where the MFV was initially flight-qualified and helped extend the planned 20-month flight to 55 months while increasing the in-flight performance of the satellite.

The MFV was the key element in the electric propulsion system used for critical drag compensation and withstood near-continuous use during the 55-month extended mission, acquiring approximately 39,000 hours of operation without the need to switch to its redundant pair.

DEFINING MULTI-FUNCTIONALITY

Developed and patented by Marotta Controls, the flight-qualified MFV has also been tested with both Hall Effect Thrusters and Ion Engines. The device provides the foundation for the Spacebus Neo XPRA, designed to optimize xenon flow and pressure rate; the XPRA dynamically regulates xenon supply pressure according to flow demand, enabling significantly more flexible missions based on acute control of onboard propulsion assets.

Capitalizing on the flexibility of magnetostrictive material, the device applies varying amounts of magnetic field to create precise, minute adjustments in opening or closing the valve's orifice. As the magnetostrictive material is controlled by an electromagnetic field outside the pressure boundary, there are no seals that can leak or cause excessive friction.

A SMART APPROACH

A certain number of positive-sealing barriers are specified between high and low pressure areas of a propulsion system; however, because mechanical regulators do not fail to the closed position, additional valves must be integrated into the system. In contrast, an MFV fulfills a role as one of the required barriers, ensuring parameters are met while reducing complexity and eliminating components.

A mechanical regulator's setpoint performance also degrades over time. For instance, the sealing force behind its internal spring becomes gradually less powerful, causing the potential for costly and damaging leakage of propellant. The MFV is impervious to this type of issue, by virtue of its design as well as the inherently stable characteristics of the magnetostrictive material. Sealing force remains consistent and the system is assured of leak-free performance over its lifetime.

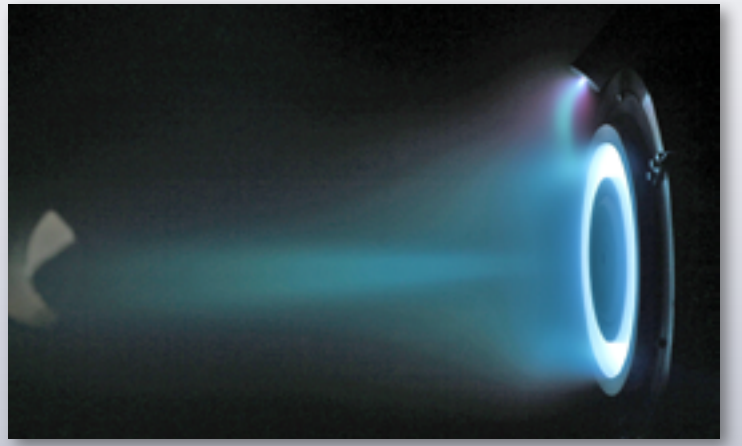
Developed and patented by Marotta Controls, the Multi-Function Valve (MFV) performsseveral functions in one component, acting as pressure regulator, flow regulator and monostableisolation valve. The MFV offers the potential to reduce the number of xenon feed system components, and reduces weight when compared to a traditional regulator-based system. The MFV is a key component of the XPRA for Spacebus Neo.

CHANGING THE ENGINEERING MINDSET

Once a satellite is in orbit, every day that the mission can be extended adds direct value to the bottom line. Efficient, accurate and dynamic control of propellant enables fuel optimization, systems are simpler, more precise, contain fewer components and weigh less.

System designers can count on predictable, droop-free regulation performance throughout the mission life, enabling more efficient budgeting of propellant. With reduced weight, operators also have more options for additional payload, such as packing more fuel and planning to keep the satellite deployed longer, or adding a greater number of sensors for more capabilities. This new level of flexibility is directly enabled by multi-functionality—the less space required for critical systems, the more room for fuel or payload.

In this environment, and as satellites such as Spacebus Neo are being designed for longer deployment, the limitations and complexities of mechanical regulation have become more profound. System engineers and propulsion architects must build-in additional propellant to account for leakage, accommodate the mission, and protect decommissioning maneuvers. Because every kilogram onboard reduces payload options, developers must explore proven new methods well before designing their electric propulsion system architecture.



The MFV successfully completed Xenon testing with the Sitael5 kW Hall Effect Thruster last year. The MFV performed with a high-pressure inlet supply of 35 bar, demonstrating its ability to operate as a Xenon flow controller without using an upstream regulator and validating its ability to reduce weight and complexity of satellite feed systems.

In the risk-averse culture that drives space technology, multi-functionality offers essential value—creating system-level impact on next generation satellite design including reducing costs and component count, eliminating long-term leakage and enabling significantly greater flexibility in mission performance.

marotta.com

Bryan Reid possesses more than 30 years of experience in the international Aerospace and Defence industry in both technical and commercial roles. He is instrumental in developing Marotta's space strategy and securing significant technology content on major platforms. He was also involved in the support structures for the Ariane 5 first stage Vulcain Engine, the Cold Gas Thruster Module for the Tethered Satellite System as well as several commercial aircraft applications. Contact Bryan at ***breid@marotta.com****.*

Additional Insights Into Multi-Function Development + Qualification

Multi-Function Valve (MFV) research and development dates back to the 1990s. Driven by a global push to commercialize and launch massive constellations of satellites, the objective was to uncover a propulsion method more economical than traditional systems of the era.

The holy grail of mass satellite production never materialized . However, Marotta uncovered a method for actuating the valve and achieving super-fine control of very low flow rates using a unique magnetostrictive material, capable of converting energy from one form to another.

When the European Space Agency's mission GOCE (Gravitational Ocean Circulation Explorer) program arrived in the early 2000s, the MFV innovation was poised to quickly meet its unique propulsion requirement for fine, dynamic control of xenon flow rates.

Because the mission required an extremely low orbit—collecting the most accurate gravity measurements at ~255 km above Earth, or ~500 km lower than most Earth observation satellites—GOCE encountered constant changes in drag. Yet the satellite had to be kept stable in 'free fall,' ensuring true gravity measurements by counteracting the effects of buffeting from low altitude residual air.

The electric propulsion system had to operate almost continuously through the mission to protect a stable orbit without a potentially dangerous slowdown in speed; however existing technologies were insufficient to deliver the continuous, minute changes in thrust level that would keep the satellite in a constant orbit.

Through a development, engineering and qualification contract, Marotta's MFV was established as the optimal option, continuously generating precise changes in the flow rate of xenon gas in the electric ion thruster system.

Optimized fuel usage helped extend this challenging 20-month mission to 55 months, and precise propellant flow control helped reduce the orbit even lower (to ~235 km above Earth) because the satellite could better handle worst-case meteorological conditions.

The resulting improvement in its sensitivity enabled higher accuracy in gravity field measurement.

PRODUCT FOCUS: COMTECH XICOM.... AN EFFICIENT X-BAND BUC

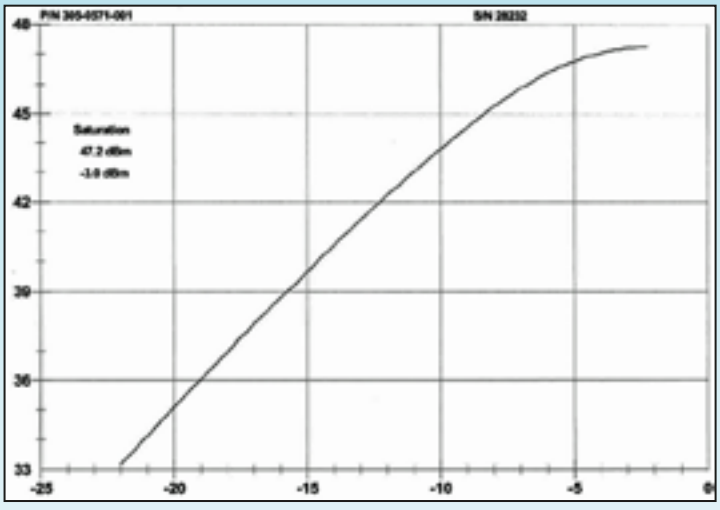
By Heidi Thelander

Comtech Xicom's new XTSLIN-20X-B1 block upconverter (BUC) packs a tremendous amount of power into a 5.5 lb box—more than ever seen previously at X-band.

Comtech Xicom's New 20W Linear X-band BUC.

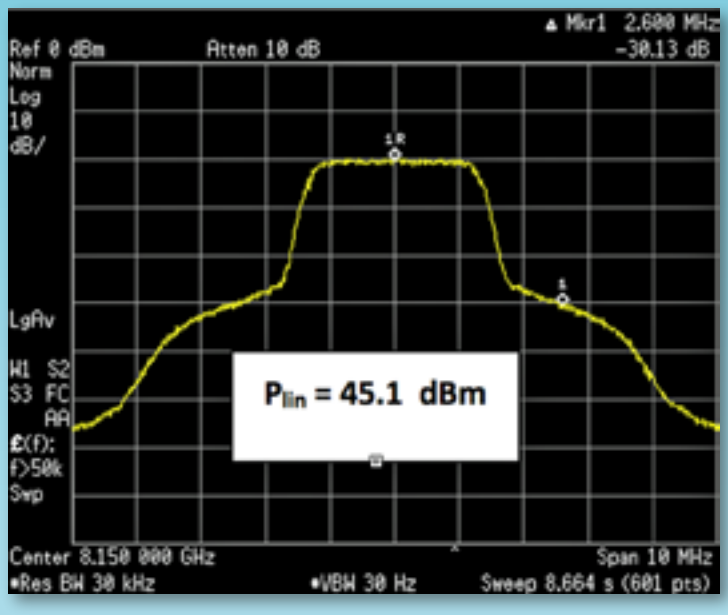
This compact and highly capable unit provides 20 watts of MIL-STD-164 linear power in a 5.8" x 5.1" x 3.9" box that can be feed mounted. The BUC is designed to handle tough environments and meet the stringent X-band RF requirements, while drawing very little power for extended battery operation as needed.

With increasing use of both military and commercial X-band systems, significantly more users are taking advantage of relatively more available X-band capacity. This new BUC enables integrators to offer highly compact transportable and manportable satcom terminals that take advantage of Skynet, Xstar and WGS to provide much higher data rates and more efficient operation.



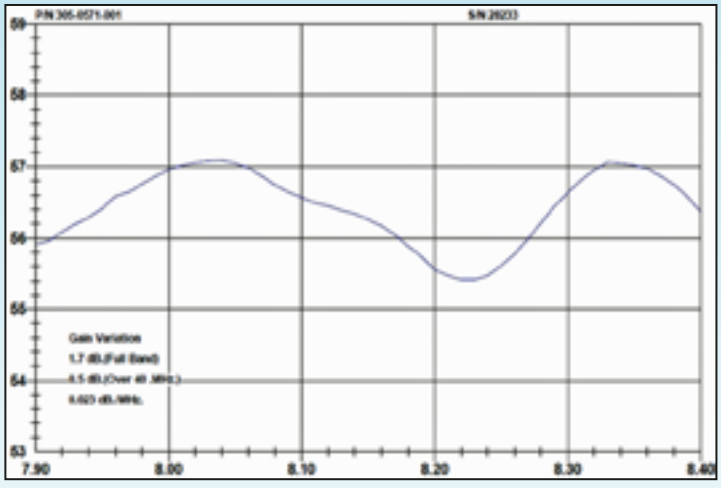
Pin vs Pout Curve: The XTSLIN-20X-B1 BUC Provides 50W Saturated Output Power

The XTSLIN-20X-B1 provides around 50W saturated output power, 32W linear power using MIL-STD-188-164 definition at midband and ambient temperature, and 20+W linear power over its 500 MHz frequency band (7.9 - 8.4 GHz) and 100 degrees Celcius temp range (-40 degrees Celcius to +60 degrees Celcius).



This high linear output power level is achieved at less than 120W prime power consumption across all conditions, and comes in a 5.5 lb self-cooled feed-mount outdoor package that can handle the toughest environments.

This unit accepts a 950-1450 MHz L-band input, upconverts it to 7.9 to 8.4 GHz X-band and uses GaN transistors to amplify the signal to achieve full output power. Features include temperature compensation, gain control, harmonic filtering, tight gain variation and stability, a serial RS-232 digital monitor and control interface, and options for operating with 24 VDC or 48 VDC prime power, provided over the IF line or through a separate connector.



XTSLIN-20X-B1 Gain Variation is <2 dB p-p over the band.

Linear RF Output Power (W)	Linear RF Output Power (dBm)	Worst Case Measured Prime Power (W)
20	43	108
16	42	98
10	40	84
8	39	79
5	37	71
2	33	60

Low Prime Power Draw Enables Longer Operation From Batteries

One of the critical features with such a compact unit is the efficiency. This GaN BUC operates as a Class AB amplifier with power draw ranging from 108W at 20W linear RF power output down to 60W at 2W output power level. Optional proprietary features offer even greater efficiency with Battery Saver mode for further extending battery life. With this new BUC capability, SATCOM integrators will be able to offer their customers the highest X-band data rates possible in the smallest packages. Now, that's powerful.

Comtech Xicom Technology, Inc. was established in 1991 in the heart of Silicon Valley. Xicom provides rugged, efficient and reliable Traveling Wave Tube Amplifiers (TWTAs), Klystron Power Amplifiers (KPAs), Solid State Power Amplifiers (SSPAs), and Block Upconverters (BUCs) for commercial and military applications around the world. Comtech Xicom leads the industry in technology across a broad array of products available for fixed locations and mobile platforms.

www.xicomtech.com

Bulletin

Comtech Xicom Technology, Inc. has completed the initial installation and full operation of its new family of very high power SuperCool™ traveling wave tube amplifiers (TWTAs). This family of amplifiers has many practical advantages over traditional air-cooled amplifiers: reduced heat load in hubs with flexible and more compact installation; ease of service and maintenance; higher reliability; ambient noise reduction; and gain stability over ambient temperature. The new Comtech Xicom design incorporates integrated cooling channels in the amplifier baseplate, external to the sealed high voltage and RF circuitry compartment, with drip - free connections. Elimination of the need for air flow provision dramatically simplifies hub layout and design , and provides more space for maintenance operations and additional equipment.

Data sheets are available at Comtech Xicom's website.

PRODUCT FOCUS: ND SATCOM... AN INNOVATIVE SOLUTION FOR ADVANCED COMMS

By Volker Jarsch, Director, Satcom Solutions, ND SatCom

Is significant innovation still possible in the field of military communications? Isn't it sufficient for a DoD to have one or more anchor stations in their home country and each connects to a bunch of terminals in the mission area?

OK, the majority of the communication traffic is between staff and units within the mission area. One could say they just have to accept that all communication between them is first forwarded back to the anchor station in the home country and then back to the partner who is also in the mission area. And when they talk to each other, each question-and-answer passes four times over the satellite. This is one second of delay and response time for each interaction. That's life and we have to accept it. True?

Not true. The German company ND SatCom has just issued a completely new product for the multi-party communication over satellite which changes the paradigm of connectivity: SKYWAN 5G. This innovation is the breakthrough which overcomes the typical constraints of current MILSATCOM systems.

Using SKYWAN 5G as a hub, the network can have one or more anchor or other stations in the home country. But unlike typically known systems, this anchor station is not a rack full of boxes; it is just one box, one rack unit high. You can even insert it into one slot of your current rack.

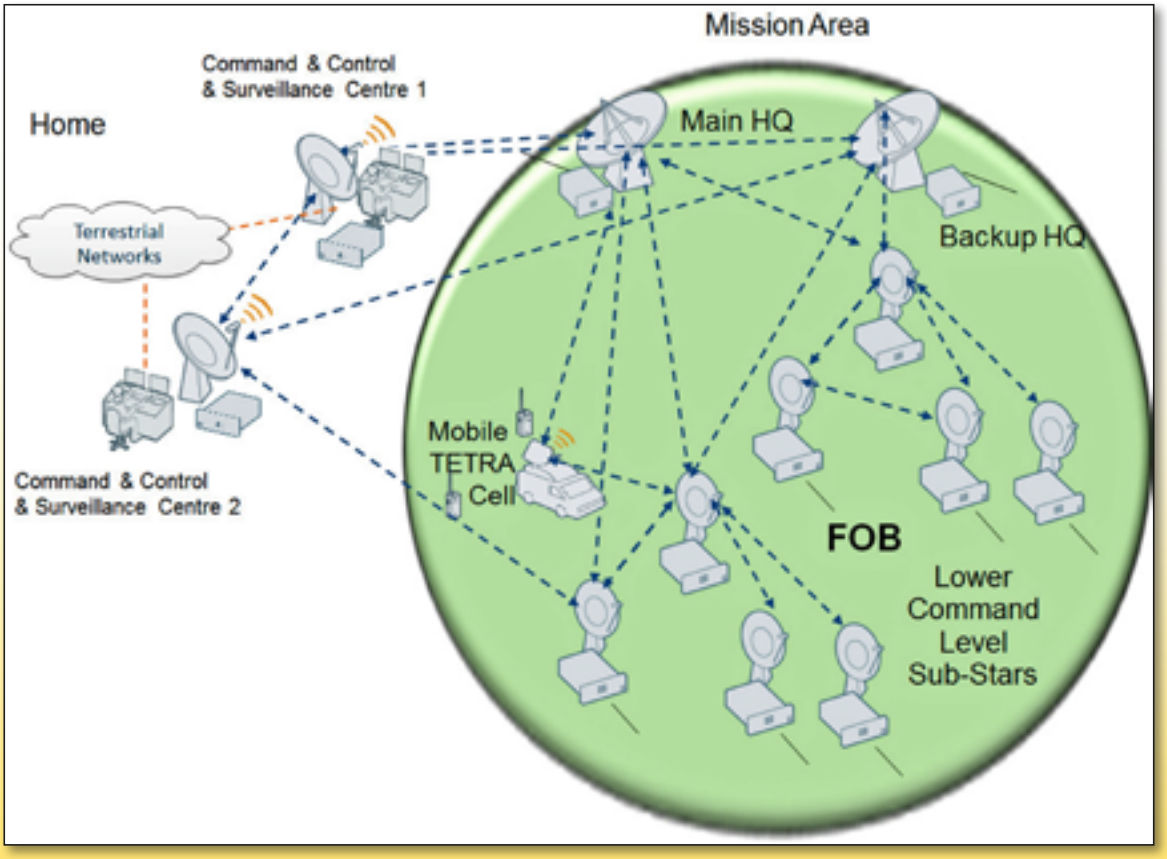
The new "SKYWAN 5G" box contains an IP router, which is the interface to the terrestrial IP network at the site or in the country. It accepts data packet streams from various sources and forwards them via the satellite to the destination, according to the address information. The router contains QoS (Quality of Service) functionality and achieves an excellent quality of all voice and real-time transmissions. The router forwards the to-be-transmitted data and voice packets to the satellite modulator and receives incoming data from the satellite via the demodulator.

Another innovation is that the modem (modulator plus demodulator) can transmit packets to several sites and receive packets from several sites all at the same time. There is no blocking as known from other systems which use a dedicated modulator and demodulator for each connection to explicitly one other site.

The usefulness of this feature for the military user becomes clear when we turn away from the anchor station and have a look at the user terminals. Each of them has the same functionality as described above for the anchor station: router plus satellite modem. Now, if each terminal can receive at the same time traffic from one or more other terminals and can transmit at the same time to one or more other terminals, we have achieved the following innovative connectivity: In principle, each terminal in the mission area can communicate to each other terminal in the mission area, directly, in one single hop over the satellite.

There is no de-tour required over an anchor station back in the home country. This avoids the above mentioned waiting time and makes the person-to-person communication much more acceptable than before.

Of course, communication with one or more of the anchor stations is possible in the same way, as well as communication with users or equipment which is reached via an anchor station. The anchor station serves then as gateway to a terrestrial network, military or public.



An innovative and secure ND SatCom solution for military communication..

The SKYWAN 5G built-in routing functionality allows that such traffic cannot reach only one anchor station, but several at the same time.

This allows that—for example—different instances in the military organization receive the same report at the same time. Also, the dynamic routing detects a possible failure of a connection via one of these gateways and chooses automatically an alternative route to reach the final destination. This is an important contribution to increase the communications availability under adverse conditions.

We said above that "in principle" each terminal can communicate with each other terminal. This would be physically possible, but of course the communications network ensures that the traffic is forwarded only to those receivers at a site, which are the nominated destination. This built-in privacy, in combination with the single hop forwarding completely in the private network can complement or substitute other privacy features known from terrestrial networks, such as IPsec.

VRF SUPPORTED SEPARATION OF SUBNETWORKS

The inbuilt virtual routing and forwarding (VRF) function supports different routing domains. This can be utilized for segmentation of the one network into divisions that have to be strictly separated from each other. This together with an unprecedented dynamic bandwidth management granting CIR and EIR (Committed and Excess Information Rate) separately or jointly for the afore-mentioned is an absolute highlight of the SKYWAN 5G.

The next technological highlight of SKYWAN 5G is the best of all throughput in all directions. Each SKYWAN 5G modem can transmit and receive data at user data rates from a few kilobit per second up to more than 20 Mbit/s (20/20/20 for forward/return/point-to-point). Not only is the data rate between an anchor station and a terminal more than enough for Command and Control Applications, but also the return link has an unparalleled throughput of up to more than 20 Mbit/s. This allows the reporting from a site by means of e.g. high quality live video. But not only to a single central site. In the same way more than one site in the home country can be reached and other sites in the mission area as well.

While current MILSATCOM networks may comprise several technologies for point-to-point, star, narrowband or broadband traffic, SKYWAN 5G can substitute them with one single hardware platform. This simplifies the logistics, spare parts warehousing and shipping, and of course training. Optionally, a DVB-S2 overlay can further extend the available forwarding capacity, where required.

DIRECT SINGLE-HOP CONNECTIVITY

The SKYWAN 5G connectivity, which allows the direct single hop communication between all sites which need to communicate, matches exactly the reporting and command structures of each military organization. Also directly in the mission area it supports the communication between the local mission control and the acting teams, without relying on terrestrial lines or backwards communication to home.

USER FRIENDLY NETWORK MANAGEMENT SYSTEM

Based on a new software platform and software architecture the network management system (NMS) provides several key features like Client-Server architecture, NMS software as virtual appliance (VMware standard platform with Linux operating system), transaction based configuration and management (i.e., secure network changes with possibility for roll-backs), user interface in web-design, multiple customer support, multi-language support ready, backup & restore function, network configuration and maintenance wizards, built-in security functions, support of license-controlled features and generation of station related reports.

FLEXIBLE NETWORK DEPLOYMENT + ADAPTATION

Flexible and rapid network deployment is another innovative and unique feature. Each SKYWAN 5G modem can be activated to play the role of network control. So each such terminal, when taken to a mission, can be the start of a new (e.g., regional) network. This network can be stand-alone or it can—at any time—be integrated with one or more other networks, e.g. to support joint missions.

TURNKEY SOLUTIONS

ND SatCom not only deliver modems to Defense Customers. Using our experience from building and integrating the "SatComBw" network for the German Army and other network for other Governmental Customers, we can supply turn-key network solutions, including various types of integrated terminals. These include mobile or portable terminals for communications on-the-move or on the halt, and networks for surveillance, disaster recovery and blue light applications.

SKYWAN 5G

www.ndsatcom.com

ENABLING LOW COST ACCESS TO SPACE BY LEVERAGING PROPULSIVE ESPAs

By Christopher Loghry, Space Systems Engineer, Moog, Inc.

Moog has been supporting the space industry since the 1950s and the company has a rich history in many critical spacecraft and launch vehicle components and systems.

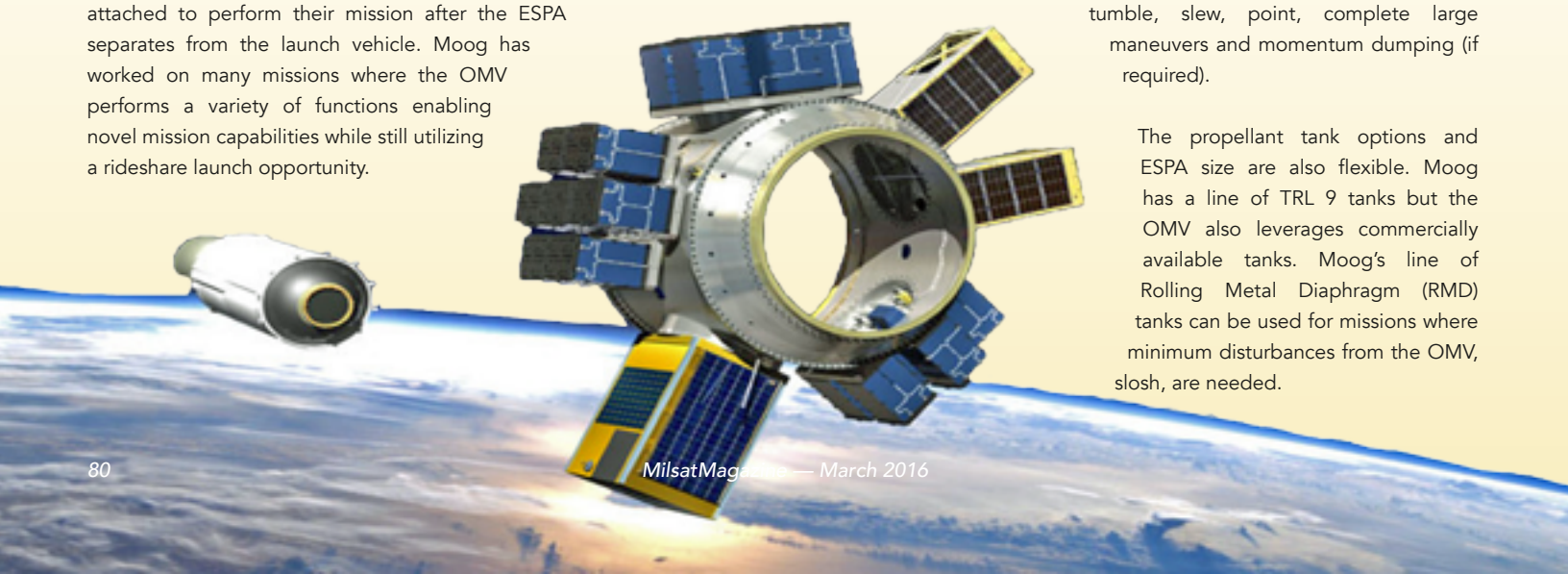
Moog has developed a family of orbital maneuvering vehicles (OMV) that form a suitable basis for rideshare-based payloads. The system has been designated an orbital maneuvering vehicle primarily because its target missions include delivery of multiple small satellites to varied orbits and it has the ability to host science payloads and instruments in LEO, GEO and other orbits, such as the Earth-Sun Lagrange points or Lunar orbits.

The baseline EELV Secondary Payload Adapter (ESPA) structure is modular with a set of "building-block" subsystem components that can be upgraded to meet tighter mission requirements. The OMV comprises of an integrated avionics unit (IAU) for both Command and Data Handling (C&DH) and Electrical Power System (EPS), Guidance and Navigation Control (GNC) sensors and actuators, a chemical propulsion system and other functions in a modular form that can be tailored to specific missions to take advantage of lower launch costs through rideshare.

Through acquisitions—CSA Engineering, AMPAC In-Space Propulsion and Broad Reach Engineering—Moog now has in-house capability for a majority of OMV subsystems. Moog has provided subsystems and components to similar spacecraft including LCROSS, DSX and EAGLE. It is important to realize that Moog's OMV concept is fully scalable and adaptable in terms of propulsive and electrical power capability, including undefined requirements at this level to allow for flexibility of various payloads with minimal cost to change.

The family of OMVs can be used in a wide variety of mission applications from supporting small spacecraft deployment (including Cubesats), hosted payload applications, carrier/tug vehicles, and motherships for applications in Earth orbit and beyond. In many cases, a combination of these missions can be accomplished by a single OMV to provide cost-effective options for space access and operation of multiple payloads.

The OMV concept can be used where the ESPA ring itself acts as the core spacecraft structure. In this mission scenario, port mounted payloads and other hardware are not deployed from the ESPA but stay attached to perform their mission after the ESPA separates from the launch vehicle. Moog has worked on many missions where the OMV performs a variety of functions enabling novel mission capabilities while still utilizing a rideshare launch opportunity.



When working with a customer, Moog performs early sizing analyses of OMV subsystems against both mission performance and cost to allow identification of a baseline. This baseline is incrementally modified as the mission moves from concept to design phase. This flexibility allows for a wide range of applications by many different end users from tug opportunities, to a hosted payload platform, to GEO orbit, and beyond.

OMV AVIONICS

The system is built around the Moog Broad Reach integrated avionics unit (IAU) which incorporates command and data handling (C&DH) and an electrical power system (EPS). The IAU can include a GPS receiver that operates in LEO or GEO orbit.

The C&DH subsystem uses the RAD-hard BRE440 spaceflight processor and the radiation-hardened Virtex-5QV FPGA. The IAU architecture is very flexible using a wide range of flight-proven options that can be tailored for the mission specifics to lower risk.

OMV GUIDANCE NAVIGATION + CONTROL

A GNC suite includes attitude determination and control (ADCS) hardware such as reaction wheels, sun sensors, star trackers and an IMU. Moog Broad Reach flight proven C&DH and GNC software controls the OMV. Our flight heritage software has successfully executed NASA and Air Force missions including rendezvous and proximity operations activities.

The flexibility of the OMV architecture allows for efficient tailoring of the GNC system. Coarse pointing for orbital adjustments and payload deployment is achieved with thrust vector control while fine pointing for hosted payload applications can be achieved via additional sensors and actuators. This includes utilizing existing Technology Readiness Level (TRL) 9 hardware such as sun sensors, star trackers, GPS receiver, and/or reaction wheels.

OMV PROPULSION

For rideshare missions, the OMV may require propulsion for delta-V and/or attitude control, which drives the propulsion system configuration requirements. The baseline monopropellant propulsion system consists of heritage Moog hardware. A total of four translational thrusters and six reaction control thrusters currently provide the capability to de-tumble, slew, point, complete large maneuvers and momentum dumping (if required).

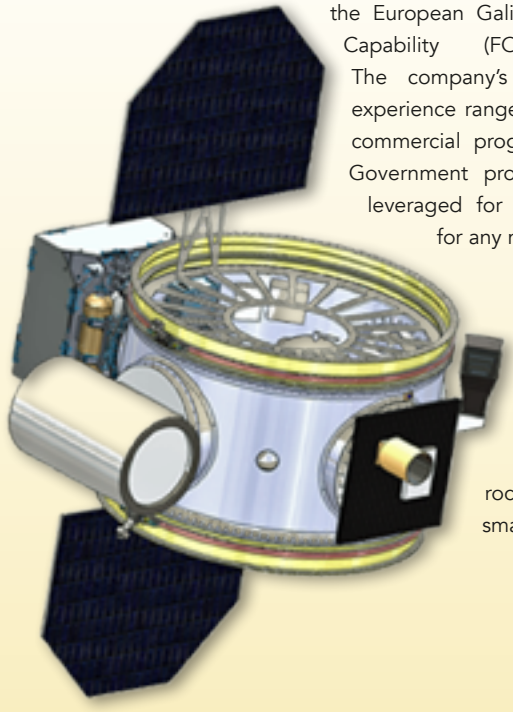
The propellant tank options and ESPA size are also flexible. Moog has a line of TRL 9 tanks but the OMV also leverages commercially available tanks. Moog's line of Rolling Metal Diaphragm (RMD) tanks can be used for missions where minimum disturbances from the OMV, slosh, are needed.

The propulsion system can be configured to use some Green propellants like LMP-103S or as a high efficiency "dual mode" bipropellant system to provide over 1 km/s of delta-V. Depending on the final altitude, the propulsion system may also be required to provide deorbit capabilities.

Each propulsion system configuration is designed to be capable of at least 400 m/s for the corresponding full payload configuration (1080 kg for Standard ESPA and 1500 kg for ESPA Grande). Each propulsion system option is designed to be common across the various configurations as much as possible to minimize cost and schedule. This flexibility allows for the ability to do a wide range of missions and the ability to easily configure the OMV to meet the requirements.

OMV Example Payload Mass Performance

The OMV leverages Moog's extensive propulsion system heritage used on many critical programs including two key US Government programs: Fermi/GLAST program that launched in 2008 and the Landsat Data Continuity Mission (LDCM) or Landsat-8 system that was launched in 2013. In addition to unique single spacecraft systems, Moog delivered 18 propulsion systems for the ORBCOMM Generation 2 (OG2) constellation and is currently sending completed propulsion systems for the European Galileo Full Operational Capability (FOC) Constellation. The company's propulsion system experience ranges from large volume commercial programs to unique US Government programs that can be leveraged for OMV configurations for any market.



Moog currently operates a primary facility in Niagara Falls, New York that has hot fire capabilities to test rocket engines, big and small.

The Niagara Falls facility used for production programs—every rocket engine Moog builds is tested with actual propellant in a vacuum chamber.

Moog recently announced plans for a new $12 million manufacturing and test facility for space propulsion products to be located at Moog's headquarters in East Aurora, New York. The new state of the art 35,000 square foot facility will allow Moog to support propulsion system activities for the next several decades.

OMV Power

The electrical power system is designed to be modular to meet the largest variety of mission requirements with minimal changes. Lithium Ion "battery blocks" are used to easily scale the size of the power system based on the mission particulars. The OMV can use battery power alone for short missions (1-2 day) or solar arrays for longer duration and hosted payload missions.

For an SSO-type mission a deployable, fixed array would be used. Other mission types would use a deployable sun-tracking array leveraging Moog technologies used on many spacecraft in orbit today.

For specific mission applications, Moog will leverage its Modular Electric Power System (MEPS) technology. MEPS is an architecture that allows ultra-capacitors to be connected to a power system to function as an electric accumulator. MEPS is agnostic to the upstream energy system, that enables the use of many different energy sources, including batteries, flywheels, auxiliary power units (APU) generators, or nuclear, but Moog has focused its early development leveraging the use of lithium ion batteries. In this form, MEPS is a hybridization of batteries and ultra-capacitors. The intent of architecting a power system in this manner is to optimize the benefits of the individual technologies while maintaining a small form factor and fulfilling the total system need. The MEPS technology has applications on not just the OMV but spacecraft and launch vehicle applications as well.

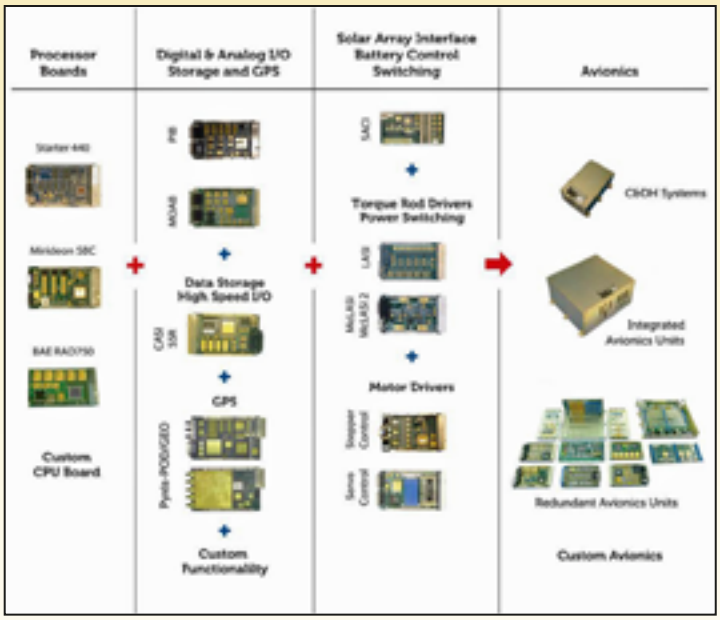
OMV Communications

The OMV communication system is specified for each mission based on the orbit, CONOPS, data rates, and data throughput requirements. Typically, the communications portion of the OMV is considered part of the payload chain to be specified by the customer. TRL 9 hardware is used to leverage the lowest cost ground station solution that meets the mission requirements.

Another communication option that leverages Moog technology is the Swift Broadband for Satellite (SB-SAT) terminal. Moog developed this technology together with the Defense Advanced Research Projects Agency (DARPA) and NASA Ames along with industry partners the European Space Agency (ESA), COM DEV International (COM DEV) and Inmarsat Plc (Inmarsat). SB-SAT can be thought of as a terrestrial Inmarsat satellite handset but operated in space.

A LEO spacecraft which carries an SB-SAT terminal employs an antenna pointing mechanism to acquire and maintain a link with Inmarsat Geostationary (GEO) assets which route the communication link through Inmarsat's existing Broadband Global Area Network (BGAN) to ground users through a simple, secure Internet connection.

Currently, typical LEO spacecraft have limited ground contacts with a duration of approximately ten minutes that can occur as little as twice a day depending on orbit geometry and ground station geographical distribution.



Consequently, data gathered from payload sensors drive platform storage requirements and cannot be delivered to users without latency that could be on the order of many hours. Utilizing an SB-SAT link, LEO spacecraft are able to relay and receive user information within one to two seconds.

OMV STRUCTURES

The OMV is based on the flight heritage ESPA ring that was originally developed by Moog for the USAF to access unused launch capacity for high value US Government missions. The ring is a multi-payload adapter for large primary spacecraft (up to 9072 kg/20,000 lb) and six auxiliary spacecraft (up to 180 kg/400 lb).

A larger variant called the ESPA Grande can accommodate five auxiliary spacecraft (up to 300 kg/660 lb). These auxiliary payload ports can be utilized by other customers or as accommodations for hosted payloads. The ESPA mounts directly to the launch vehicle upper stage, below the primary spacecraft. Stacked ESPA configurations are also possible. The auxiliary spacecraft are deployed after safe jettison of the primary. This concept is now well proven and has been flown on Atlas V, Delta IV, and Falcon 9, allowing use of full launch vehicle capability.

Since the maiden flight of the ESPA ring, in March 2007 for the STP-1 mission, further ESPA options have been developed to offer varying port configurations, ring heights, and increased auxiliary spacecraft carrying capability. The first NASA mission to utilize an ESPA, Lunar Reconnaissance Orbiter (LRO)/Lunar Crater Observation and Sensing Satellite (LCROSS), launched in June 2009.

LEVERAGING ADVANCED TECHNOLOGIES FOR THE OMV

Moog is also taking the opportunity to look at how advanced technologies such as Additive Manufacturing (AM) can be used to reduce the cost, mass, and lead time of elements of the OMV. Moog has been investing in AM for several years including the addition of its additive manufacturing center in its East Aurora facility.

The specialized tools and experience developed in this facility has recently won a technology development contract under the Booster Propulsion Technology Maturation Broad Agency Announcement from the US Air Force. Moog will focus its efforts on additive manufacturing of parts for liquid fueled first stage rocket engines.

Moog will explore the material properties unique to additive manufacturing and discover the fault tendencies of the materials using in-house additive manufacturing technologies and failure analysis techniques. This will improve the additive manufacturing processes to avoid such faults in the production phase. The experience from this program will be leveraged to support elements of the OMV development.

OMV FOR MULTI-MANIFEST MISSIONS

The flexibility of the ESPA and the OMV allows for multi-manifest missions with NASA, US Government and commercial companies. It is entirely possible to have a single OMV act as a secondary adapter to deploy commercial payloads, then act as a tug to deploy additional payloads at varied orbital parameters, and finally, it would remain on-orbit as a hosted payload platform for a third customer.

Moog is currently in discussions with Spaceflight Industries on potential collaboration to use Orbital Maneuvering Vehicle as a hardware solution for Spaceflight's future SHERPA platform.

Spaceflight is a pioneer in the area of commercial rideshare and have launched 81 payloads with another 135 manifested into the future. They are a small business which was founded in 2010 to enable small spacecraft frequent low-cost access to space.

Starting in late 2017, they are also providing Dedicated Rideshare Missions to Sun-Synchronous Low Earth Orbits and Geostationary-Transfer Orbits on an annual basis.

Moog is excited to collaborate with Spaceflight and shares their vision of providing more launch opportunities for rideshare payloads.

Moog sees the OMV as a key enabling technology to enabling low-cost access to space including achieving optimal orbits and enabling new and exciting missions to a wide range of orbits and destinations.

Moog is proud to support the global in-space propulsion industry and continues to develop and support products and technologies that are key to the space industry where performance really matters.

moog.com/space

Christopher Loghry is Space Systems Engineer supporing Moog's Space Sector with background in spacecraft propulsion. He currently works in the Space Access and Integrated Systems business unit in an engineering and business development role supporting propulsion, launch vehicle and spacecraft missions. He can be reached at ***cloghry@moog.com****.*

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THE ONUS OF SECURITY IS A SHARED RESPONSIBILITY

By Dan Fallon, Director, Federal Systems Engineers, Nutanix

After a spate of data breaches compromised over 6.6 million records from the US Postal Service to the White House, media outlets dubbed 2014 "The Year of the Data Breach."

Then, 2015 showed us that distinction was premature. Since early October 2015, a record 33.8 million records were exposed through numerous breaches, most notably the breach of the Office of Personnel Management (OPM). Although some of this may be attributable to user error, we must ask whether our dependence on legacy technology is to blame.

A perennial issue for the government, and one that directly contributed to the OPM breach, is its reliance on legacy technology well beyond its useful life. Since more than 70 percent of the total annual federal IT budget is spent on maintaining these legacy infrastructures, little room is left for innovation.

Federal data centers are rife with legacy three-tier architectures that require modern security capabilities to be bolted on, like accessories. How can we effectively protect our nation's critical data by pasting a security façade on porous, brittle legacy technology?

HOW DID WE GET HERE?

Current procurement practices and budget cycle obstacles limit an agency's ability to move away from the "norm," leading to a cycle of doing and buying the same thing over and over. This is perpetuated by the now-annual continuous resolution period, which restricts agencies to purchase only what they've always purchased—to maintain the status quo—and prohibits new investments.

From a security perspective, agencies are often unwilling to integrate anything new into their environments, even though there are companies bringing innovative products to market that comply with Common Criteria, FIPS, TAA, among other certifications required for consideration in the federal marketplace.

Another contributing factor is the expensive and arduous certification and accreditation (C&A) process, which can take as long as six to nine months and cost hundreds of thousands of dollars in man-hours and lost productivity. C&A, by definition, produces a snapshot of compliance—a single point-in-time when all the dials were in the right places.

the thumbs-up? Does this process really have an impact on improving data and infrastructure security? Compliance checks similarly evaluate a point-in-time status of a system. We have essentially created a system of snapshot compliance, in a world where attacks are constant.

Finally, technology procurements are still evaluated and executed according to silos of compute, storage, networking and security, despite the availability of modern, proven technologies that converge these elements into a single platform. Purchasing and installing security as a separate line item on a PO is a major contributor to security vulnerabilities. This has been the approach for the last 25 years, but we cannot afford to let it continue—those that mean to do us harm are innovating like there's no tomorrow.

FIXING THE PROBLEM

While there is no silver bullet solution to this issue, vendors have an obligation to be part of the solution by ensuring critical features are natively incorporated throughout the product development cycle.

By offering solutions that are secure by design, agencies can rely on the technology to function, as intended, with minimal oversight or time investment. Such would significantly reduce the time requirements associated with the C&A process and enable agencies to deploy mission-critical solutions—both emerging and traditional—much faster than ever before. Additionally, vendors should take the following steps to enhance security:

- Increase agility, decrease response time
  The open disclosures of Common Vulnerability Enumerations (CVEs) have long been known to be the most exposed threats exploited by hackers because agencies are frequently not agile enough to address them. In many cases, vendors do not proactively monitor these disclosed vulnerabilities, and are unaware that such deficiencies exist until a breach occurs. Agencies should expect vendors to deliver solutions that are production ready out-of-the-box, addressing common vulnerabilities proactively to mitigate the threat landscape and continually monitor and address these vulnerabilities as new threats emerge. This is an inherent vendor responsibility that few, if any, accept as theirs to address.

- Native hardening of all code and dependencies
  Rarely is a product or solution delivered with 100 percent natively written code that is hardened from the first boot. In almost every case, there are dependencies on open source and third-party components that comprise more than half of the code provided in a solution. Most development lifecycles never include the inspection and proper configuration of these dependencies to harden them for use in production environments, leading to agencies performing time consuming security testing and quality assurance for vendors in the field. Agencies should expect the technology they consume to inherently address the proper modifications and configurations of all open source and third-party components that are provided in generally available products.

- Benefits of a machine-readable
  Security Technical Implementation Guides (STIG)
  The traditional C&A process requires an agency to manually verify compliance, line-by-line, against DISA STIGs, a time consuming process that's vulnerable to human error. However, this pain can be avoided when vendors take a proactive security posture and work together with DISA to create an embedded STIG that ships out-of-the-box, fully compliant with DISA controls. Not only does an embedded machine-readable STIG turn many days of manual verification into a five-minute compliance report printout, but it also allows a continuously monitored security baseline. This inherent feature allows agencies to move past a point-in-time snapshot of security compliance to a continuously monitored and enforced security posture, helping to protect against real-time threats that are growing daily.

By working proactively to harden solutions before they reach a government environment, vendors have a real opportunity to positively impact the security posture of agencies, dramatically reduce the standard C&A time, and provide a continually compliant security baseline. Doing so would foster additional trust in the vendor community, and would have a compounding ripple effect across the government. The onus of security is a shared responsibility and should be addressed as such.

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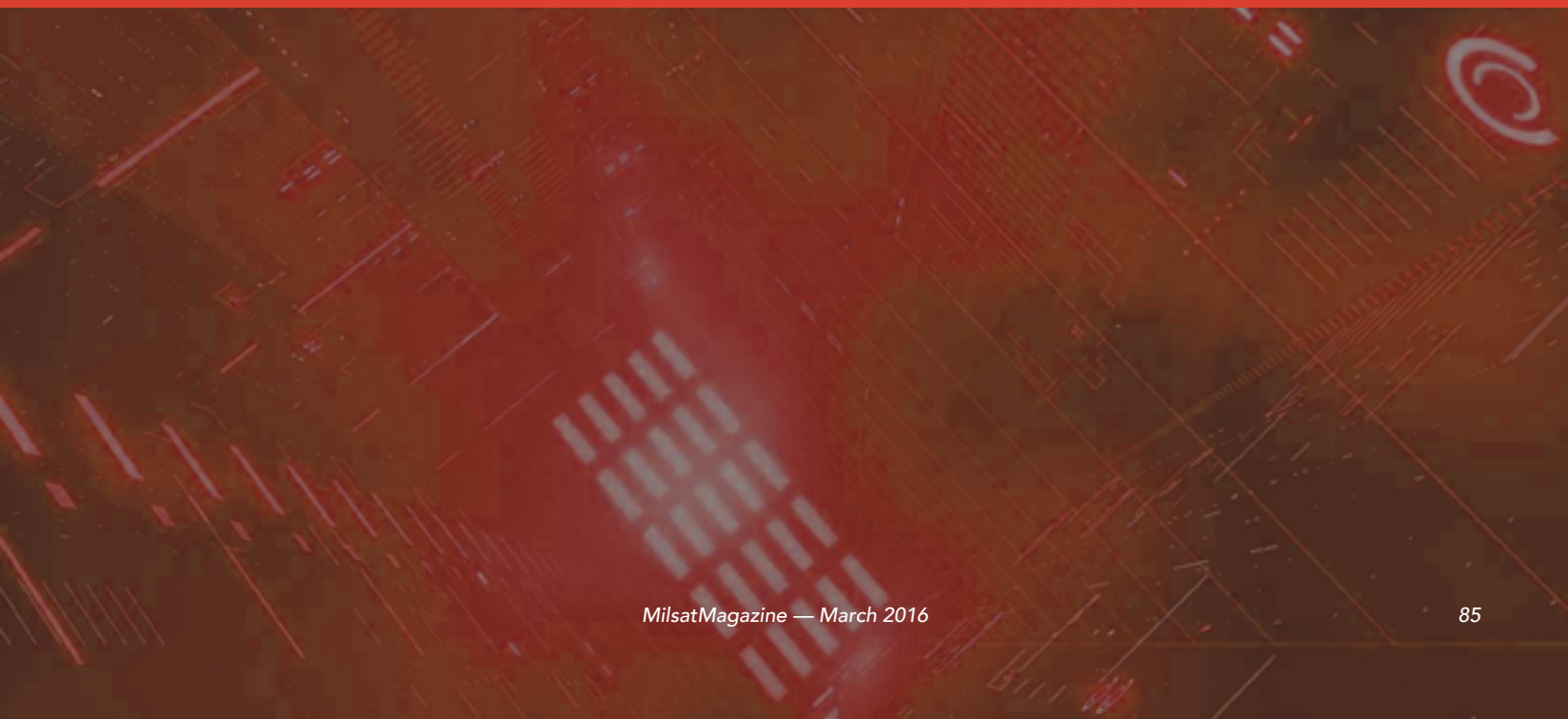

"ESSENTIAL INFRASTRUCTURE" INCLUDES SPACE INFRASTRUCTURE

By Elliot Holokauahi Pulham, Chief Executive Officer, Space Foundation

The 2016 US presidential election is far from over, and the subject of national infrastructure will no doubt continue to pop up in debates and whistle stops between now and November.

Living in Colorado Springs, a.k.a. "The Pothole Center of the Universe," I'm particularly sensitive to the disconcerting disrepair of America's roads, bridges and highways. While these transportation arteries are highly visible—as would be a jobs program aimed at improving them—we should remember, however, that there is much more to infrastructure than asphalt and concrete.

Space infrastructure today provides much of the backbone for modern life, and it, too, is in need of attention and reinvestment.

All of us who are part of the space "choir" already know that much of modern life depends upon space systems, especially satellites, and space technologies, which tend to become embedded in other industries.

The importance of space systems is pretty easy to explain, even to politicians. Without GPS satellites, for example, the navigation system in your car won't work and all the hauling, trucking and delivery systems go down; your ATM can't access financial networks, banks can't wire money back and forth, even the neighborhood gas pumps go down.

There are more than three billion GPS-based apps running on smart phones, and your Yelp!, Foursquare, WhatsApp, Google Maps, Facebook, Yik Yak, and yes, even Tinder, all just become so many useless ones and zeros. Your mobile phones become useless because the cellular networks cannot talk to each other.

And that's just GPS. Weather satellites, commercial and military communication satellites, imaging and remote sensing satellites, tools and applications for emergency first responders -- all are part of a vast, interconnected space infrastructure that is aging, and threatened by the increasingly congested, contested, competitive space environment.

So space infrastructure is essential infrastructure. Our transportation systems, banking systems, defense and security systems, voice and data networks, first responders, and much, much more, depend upon them. All the shiny new bridges in the world aren't going to help you if you can't navigate, communicate or pump gas! And, like the much more visible roads and potholes, space infrastructure is aging, and taking a beating.

What is less well understood, and more difficult to explain in election-year sound bites, is the role that space technology plays in things like better bridges and highways. Concrete and steel sounds like pretty dumb tech, but it's not.

For example, one of the basic technologies now going into bridges and buildings is a shock-dampening technology developed by NASA; originally devised to protect launch facilities from the shocks and stresses created at launch, these systems now protect bridges and high rises from the effects of earthquakes.
If you're driving a newer stretch of highway and notice a pattern of grooves in the concrete, that is water-wicking and braking technology developed by NASA for the space shuttle landing strip at Kennedy Space Center.

Gotta hit the brakes? Thank NASA again for anti-lock braking technology. Did an air bag just save your life? Thank the space program for the accelerometer that deployed those bags.

The point is that none of these systems came out of the highway department. Research and invention doesn't work that way. It is by pushing the boundaries of technology, which is what the space program does, that we create new technologies and, importantly, new technologists.

This is how you not only improve your infrastructure, but also create entire new industries that create permanent, well-paying jobs. Not just transient job programs.

The *View From Here* is that **Space Infrastructure is Essential Infrastructure**. Serious reinvestment in national and commercial ways and means in space must be a fundamental part of any plan to move the nation forward.

spacefoundation.org/media/space-watch

Editor's note

Our thanks to the Space Foundation and Mr. Pullham for giving MilsatMagazine permission to republish this Op-Ed from their Space Watch infosite.

Named Chief Executive Officer of the Space Foundation in 2001, Elliot Pulham leads a premier team of space and education professionals providing services to educators and students, government officials, news media and the space industry around the world. He is widely quoted by national, international and trade media in coverage of space activities and space-related issues. Before joining the Space Foundation, he was senior manager of public relations, employee communication and advertising for all space programs of Boeing, serving as spokesperson at the Kennedy Space Center for the Magellan, Galileo and Ulysses interplanetary missions, among others.

He is a recipient of the coveted Silver Anvil Award from the Public Relations Society of America - the profession's highest honor. In 2003, the Rotary National Awards for Space Achievement Foundation presented him with the coveted Space Communicator Award, an honor he shares with the late legendary CBS News Anchor Walter Cronkite and former CNN News Anchor Miles O'Brien. Pulham is a former Air Force Civic Leader and advisor to the Chief of Staff and Secretary of the Air Force and a recipient of the US Air Force Distinguished Public Service Medal. He serves on the editorial board of New Space Journal.

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