

# MilsatMagazine

## MILSATCOM Technologies

### Featuring:

#### COMMAND CENTER

*Peter F. Hoene, President & CEO, SES GS & Tip Osterthaler, Former President & CEO, SES GS*

*Advances in COTM*

*Emerging DoD Needs Require Innovation*

*Discriminating, Affordable Technological Innovations for MILSATCOM*

*HPA Corner: New and Advanced Technologies*

*Extending the Lifetime of High Power TWTAs*

*Instability Drives Mobility for Special Ops & Army*

*Driving Down the Cost of Phased Array Antennas*

*Eyes On Targets: Aerial Surveillance*

*A Case in Point: KenCast Aids JMA's Himawaricast*

*GPS Signal Solutions: A Moog Technical Focus*

*Expeditionary Warfare Demands Exceptional Communications*

*More Classified Programs and Technical Track Expansion at the Space Foundation's 31st Space Symposium*







# MilsatMagazine

March 2015

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## DISPATCHES: STS GLOBAL DEBUTS

**David Hershberg, CEO, has announced the launch of STS Global Inc. ([www.stsglobal.com/](http://www.stsglobal.com/))** The new company will provide state-of-the-art satellite communications and other telecommunication products and services to broadcasters, media, governments and other private enterprises across the world.

Solutions will include network design, integration, management and maintenance. STS Global will reside in the CEWIT (Center of Excellence in Wireless and Information Technologies) Building at Stony Brook University in New York, where it will participate in its incubator program and work closely with the university.

STS Global capabilities include broadcasting live events, supporting new media broadcast centers, secure private networks for large corporations

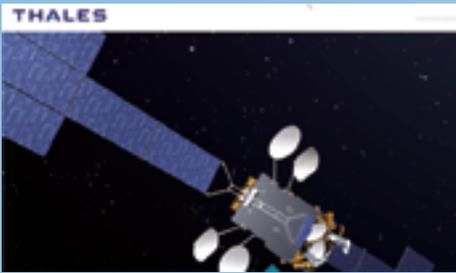
and the complete range of satcom possibilities from better wireless connections to tighter cyber security. By adding sophisticated SATCOM to today's widely developed terrestrial technologies, STS Global creates unique systems that can provide reliable services anywhere on Earth.

Customers will appreciate the Cost/Value approach, 24/7 dependability, training and support to achieve peak performance.

Hershberg, who is the founder and former CEO of Globecom Systems Inc., said, "I am pleased to announce the creation of this new company. We are primed to deliver excellence in reliable systems and services with great customer value."

STS Global will be at booth #7127 at Satellite 2015 in Washington, D.C. March 16-19.

## SICRAL 2 SAFELY SETTLED @ GUIANA SPACE CENTER FOR LAUNCH IN APRIL

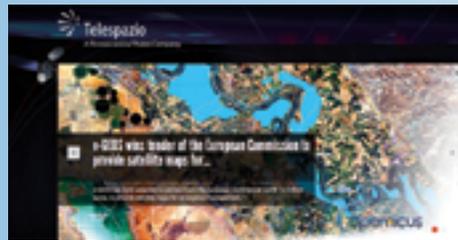


**The Sicral 2 telecommunications satellite, a joint undertaking of the Italian Ministry of Defense and the French defense procurement agency DGA (part of the Ministry of Defense), has arrived safely at the Guiana Space Center in French Guiana for an Ariane 5 launch on April 15th.**

After being developed at the Thales Alenia Space plants in Rome, l'Aquila, Cannes and Toulouse, the satellite has been integrated in Rome and Turin facilities and then underwent environmental tests at the company's plant in Cannes.

The satellite is now undergoing final tests and pre-launch procedures at the Guiana Space Center.

Sicral 2 is one of the basic building blocks in Italian-French defense cooperation. It is a technological state-of-the-art system, designed to bolster the military satellite communications capabilities already offered by Italy's Sicral 1 and Sicral 1B satellites, and by the Syracuse system in France.



Sicral 2 is a joint program funded by the Italian and French Ministries of Defense, with shares of 68 and 32 percent, respectively, as part of a broader Framework Agreement between the two countries.

This agreement also involves the countries' space agencies and recently led to the launch of the dual-use broadband communications satellite, Athena-Fidus.

The satellite weighs 4360 kg with 7KW power and will host a UHF and SHF payload for the Italian mission, a SHF payload for the French mission as well as a payload for remote control, Telemetry and Ranging with use of Expanded Spectrum modulations.

Thales Alenia Space is the main industrial partner in the Sicral 2 program. In line with its role on the Sicral 1 and Sicral 1B missions, Thales Alenia Space was responsible for the space segment, the system ground segment architecture and the development of the mission control and communication center.

Telespazio is involved in the ground segment for the design, realization, integration and



*Artistic rendition of the Sicral 2 satellite. Image is courtesy of Thales Alenia Space.*

testing phases of the Satellite Control Center in Vigna di Valle and Fucino. Moreover, Telespazio took an active role in the development of Sicral 2, contributing part of the development costs and receiving in turn the use of part of the satellite's transmission capacity. It will enable it to offer satellite communications to the armed forces of NATO member countries.

Telespazio is also responsible for satellite launch service from Kourou, for early orbit services (LEOP—Launch and Early Orbit Phase) and for satellite first In-Orbit Tests (IOT) from Fucino.

The Sicral 2 system will strengthen strategic and tactical satellite telecommunications for both France and Italy, guaranteeing interoperability with existing satellite resources, NATO allies' terminals and national telecommunications networks.

## COM DEV'S STRATEGIC GROWTH PLANS UNCOVERED

**COM DEV International Ltd. ([www.comdev.ca/](http://www.comdev.ca/)) has revealed that exactEarth Ltd. has presented its shareholders, COM DEV and Hisdesat Servicios Estrategicos S.A. ([www.hisdesat.es/index2.html](http://www.hisdesat.es/index2.html)), with strategic growth plans that are expected to expand its existing vessel tracking business into the much larger maritime data services market.**

Given the success of exactEarth in developing the satellite AIS (Automatic Identification System) data services market, COM DEV and Hisdesat are supportive of these strategic growth plans.

Accordingly, exactEarth has retained Canaccord Genuity to advise its Board of Directors on implementation of private and public funding options as well as potential merger and acquisition opportunities.

"Our success in building out exactEarth's space- and ground-based infrastructure, achieving a position of market leadership, and reaching positive cash flow has opened up some exciting growth opportunities and new directions for the company," said Peter Mabson, President of exactEarth. "We strongly believe that exactEarth is poised to become an even more significant player in this expanding market."

In light of the central role of exactEarth in COM DEV's core strategic plan, as well as successful progress on other strategic initiatives including its acquisitions and dividend policy, COM DEV is also taking steps to refresh and update its strategic plan. As part of this initiative COM DEV has retained Canaccord Genuity in a separate engagement.

"The strategic options under consideration for exactEarth will be instrumental in helping it reach its full potential, while at the same time unlocking significant value for COM DEV's shareholders," said Michael Pley, CEO of COM DEV.



## WIN-T INCREMENT 2 FROM GENERAL DYNAMICS INFUSES STRYKER BRIGADES



The 1st Armored Division Stryker Brigade trains on the U.S. Army's Mobile Network. Photo + story courtesy of Amy Walker, PEOC3T.

**The U.S. Army is fielding the General Dynamics-built Warfighter Information Network – Tactical (WIN-T) Increment 2 to the 2nd Stryker Brigade Combat Team, 2nd Infantry Division (2/2 SBCT) at Joint Base Lewis-McChord, Washington, and the 1st Stryker Brigade Combat Team, 1st Armored Division, Fort Bliss, Texas.**

The WIN-T Increment 2 secure communications network backbone is also fielded to 12 infantry Brigade Combat Teams



(BCT) and four division headquarters. WIN-T is the Army's top-tier, mobile command and control system that connects and protects voice and data communications to support the full spectrum of Army operations worldwide.

"Fielding WIN-T Increment 2 to Army Stryker Brigades closes the communications gap between fast moving SBCTs and 'boots on the ground' soldiers," said Chris Marzilli, president of General Dynamics Mission Systems. "The highly mobile and operationally simplified Increment 2 allows soldiers to quickly and simultaneously address multiple missions in any environment, across the mission field or between continents."

General Dynamics Mission Systems' engineers and technology experts are working continuously to make the WIN-T Increment 2

system easier to use, while reducing the size, weight and power needs of the system overall.

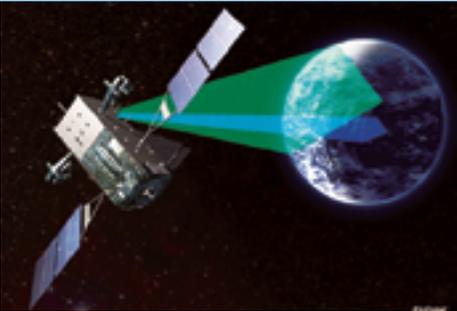
Ideas and suggestions for system improvements come from soldier feedback during evaluation events, from soldiers returning from their deployments and from training activities both at home base and at the Signal School at the Cyber Center of Excellence at Fort Gordon, Georgia..

More information about WIN-T, tactical radios, satellite communications and the cyber-defense products that make up the Soldier's Network is available at [www.thesoldiersnetwork.com/](http://www.thesoldiersnetwork.com/).

General Dynamics (NYSE: GD) combined the resources of Advanced Information Systems and C4 Systems into "General Dynamics Mission Systems" on January 1, 2015.

For more information about General Dynamics Mission Systems, please visit [gdmissonsyste.ms.com/](http://gdmissonsyste.ms.com/)

## U.S.A.F.'S NEW SBIRS GROUND SYSTEM SUCCESSFULLY INTEGRATED



Artistic rendition of SBIRS. Image is courtesy of Lockheed Martin.

**The Space and Missile Systems Center, along with the Airmen from the 460th Operations Group, successfully commanded on-orbit missile-warning satellites from its new Space Based Infrared System (SBIRS) ground system, currently in development.**

During the first three days of the test, the Increment 2 system demonstrated its ability to transmit and receive commands to and from each of the missile-warning satellites individually: Defense Support Program (DSP), Highly Elliptical Orbit (HEO), and

Geosynchronous Orbit (GEO). This marks a major risk reduction milestone as the Air Force plans to transition full missile-warning operations to the Increment 2 system in 2016.

The Increment 2 ground system will replace the existing Increment 1 ground system, which has been operational since 2001. Under the Increment 1 system, the three satellite types are controlled via three separate ground software systems located at separate facilities.

Under the Increment 2 system, all operational control will be consolidated under one primary Mission Control Station (MCS) with a single backup control station. Increment 2 will also introduce a significant increase in performance capability across its four mission areas: missile warning, missile defense, battlespace awareness, and technical intelligence.

Colonel Mike Guetlein, the Director of the Remote Sensing Systems Program Office, commented that the Increment 2 ground system "is an enormous leap forward in capability and technology. The system will increase the

warfighter's ability to better characterize world-wide threats, more accurately determine their launch point and impact points, and alert the COCOMs to an impending attack in time for them to respond appropriately."

The SBIRS program is managed by the Remote Sensing Systems Directorate at the U.S. Air Force Space and Missile Systems Center. Lockheed Martin Space Systems Company, Sunnyvale, California, is the SBIRS prime contractor, and Northrup Grumman Electronic Systems, Azusa, California, is the payload integrator. The 460th Space Wing at Buckley AFB in Aurora, Colorado, operates the SBIRS system. The SBIRS program delivers timely, reliable and accurate missile warning and infrared surveillance information to the President of the United States, the Secretary of Defense, Combatant Commanders, the intelligence community and other key decision makers.



## FULL SITUATIONAL AWARENESS WITH FMV COMING WITH INMARSAT GOVERNMENT'S LAISR



**Inmarsat Government has announced that its new L-band Airborne Intelligence, Surveillance and Reconnaissance (LAISR) service has completed successful customer airborne testing and will be available for U.S. government customers by June of this year.**

This innovative new LAISR service will meet the high-speed, beyond line-of-sight (BLOS) connectivity requirements of Airborne Intelligence, Surveillance and Reconnaissance (AISR) missions across the globe.

Additionally, it will provide guaranteed L-band data transmission rates up to 10 Mbps. Potential government customer applications for LAISR include...

- **electro-optical and infrared**
- **real-time high-definition video streaming**
- **laser range finder and designator transmission**
- **support of signals intelligence applications and synthetic aperture radar applications**
- **unmanned aerial systems**
- **backup command and control**

LAISR allows transmission of high definition full-motion video and data from a variety of manned and unmanned aircraft, providing full situational awareness for the military and intelligence community.

The service uses an integrated terminal that provides a simplex broadband return link to support AISR mission requirements and a full duplex channel for command and control.

This capability can easily be added to existing platforms supporting Inmarsat SwiftBroadband service. Operating in L-band ensures the highest availability of service allowing aircraft to fly over urban, mountain and jungle



environments, at low altitudes, in cloud cover and in dense rain.

The SATCOM link offers an alternative communication path to mitigate electronic attack and eliminates the need for a communications relay payload or retransmission vehicles, freeing-up additional assets for AISR missions.

LAISR provides up to 10 Mbps simplex Single Channel per Carrier (SCPC) transmission for high-quality video and data unidirectional traffic from airborne platforms to the Inmarsat Satellite Access Station (SAS).

The customer payload data is uplinked by a high-gain aero antenna using the standard or extended L-band frequency. A second channel using Inmarsat's SwiftBroadband service runs through the same single antenna solution, providing full-time two-way data communications to support the aircraft, its payload and the Monitor and Control of the simplex link/ SCPC modem.

Inmarsat Government has pioneered a unique capability with LAISR in providing uniform high-throughput AISR capabilities throughout the complete coverage area of the Inmarsat Alphasat and Inmarsat-4 (I-4) satellite constellations.

This unique capability is enabled through the LAISR Network Management System, providing dynamic beam switching and frequency allocation across the 600 active narrow spot beams globally.



Multiple terrestrial and satellite options provide traffic backhaul from the SAS to the customer's specific destination, which can include ground control stations, operation centers and remote terminals anywhere worldwide.

The service operates on Inmarsat Government's global, secure, scalable, redundant and high-capacity Multiprotocol Label Switching (MPLS) network. It can be configured to meet unique requirements of U.S. government customers, and is managed 24/7 by a U.S.-based, security-cleared operations team.

"LAISR is a game-changing SATCOM service for AISR," said Susan Miller, president and CEO of Inmarsat Government. "It has multiple benefits and applications that are unmatched in the industry, and will operate on Inmarsat's advanced Alphasat L-band satellite, covering Europe, the Middle East and Africa, with further plans to operate globally on Inmarsat's extended L-band fleet. Today's volatile and rapidly changing world requires increasingly sophisticated AISR capabilities, and we'll soon be offering this new LAISR service in support of our U.S. government customers and channel partners," Miller concluded.

Inmarsat Government info site:  
[www.inmarsatgov.com/](http://www.inmarsatgov.com/)

## THALES' VENUS SOTM TERMINALS X20 FOR FRENCH FORCES' SYRACUSE III PROGRAM

**The French Defence Procurement Agency (DGA) has awarded Thales a contract to supply a further 20 ground terminals as part of the Syracuse III satellite program (satellite-based radiocommunication system) is a series of satellites that enables French forces stationed in France or deployed overseas to access best-in-class satellite telecommunications services with throughput and anti-jam protection.**

Installed on VAB light armored vehicles, these SATCOM terminals will operate as fully-functional network nodes for France's satellite communications on-the-move capability. The 20 terminals will be delivered from early 2016 to mid-2017.

These VENUS (Véhicules de commandement Nomades commUniquant par Satellite, nomadic command vehicles communicating via satellite) terminals equipped with satcom on-the-move (SOTM) systems from Thales enable commanders to stay in touch while on



the move in the theater. The command vehicles communicate via the Syracuse system, which connects them directly to other deployed assets. With Satcom OTM technology, vehicles fitted with satellite antennas can establish and maintain a satellite link whether they are moving or stationary.

The innovative Satcom OTM solution from Thales complements other radiocommunication systems and has standard interfaces to connect other tactical communication equipment for higher data rates and overall availability. By providing a permanent command communication capability in the theater of operations, the solution meets the requirements of ground force units on-the-

move in terms of information exchange and force protection.

This latest contract award is an endorsement of newly developed active antenna technology with electronic scanning, which offers better coverage and availability than conventional parabolic antenna solutions. The contract for the first 10 stations was awarded by the DGA in 2009 as part of an urgent operational requirement for Afghanistan.

The 10 VENUS terminals delivered in 2010 have been deployed in Afghanistan and Mali, where they provided front-line vehicles with a permanent tactical communication capability in environments where other communication systems were unable to operate due to range limitations or terrain features such as, deep valleys and high mountains. Users have appreciated the performance and dependability of the Thales solution and its ability to operate in all types of terrain.

## BITS & PIECES OF DMSP-13 NO THREAT TO ESA MISSIONS



A U.S. Air Force Defense Meteorological Satellite Program (DMSP) satellite, a military weather satellite located in LEO. Image courtesy of U.S.A.F.



ESOC serves as the Operations Control Center for ESA missions, and hosts the Main Control Room (shown here), combined Dedicated Control Rooms for specific missions and the ESTRACK Control Center, which manages the worldwide ground tracking stations. ESOC also hosts facilities for satellite communications, navigation, networks and other special functions.



Simulations of orbital debris show that actively removing large items of debris, such as entire derelict satellites, should help stabilize its population and prevent a collision-based cascade effect. ESA has performed a system study for an Active Debris Removal mission called e.Deorbit. Image courtesy of ESA.

**After studying the recent explosive break-up of a U.S. satellite, ESA space debris experts have concluded this event does not increase the collision risk to nearby ESA missions in any meaningful way.**

The U.S. Air Force's Defense Meteorological Satellite Program Flight 13 (DMSP-13) broke up into some 40 pieces on February 3rd. The military weather satellite was in a LEO at more than 800 km altitude.

ESOC serves as the Operations Control Centre for ESA missions, and hosts our Main Control Room (shown here), combined Dedicated Control Rooms for specific missions and the ESTRACK Control Centre, which manages our worldwide ground tracking stations. ESOC also hosts facilities for satellite communications, navigation, networks and other special functions.

"The event is not considered major," said Holger Krag of ESA's Space Debris Office. "Should the reported number of fragments stabilize at this level, we can consider it to be within the range of the past 250 on-orbit fragmentation events. For our missions—with CryoSat-2 being closest to the event altitude—we do not expect any meaningful risk due to the event."

Based at ESA's ESOC space operations center in Darmstadt, Germany, the Space Debris Office receives space debris data from the U.S. Joint Space Operations Center and performs analyses and simulations of the present and future debris environment, as well as working with missions to prepare 'collision avoidance maneuvers.'

Satellite fragmentations are typically triggered by break-ups of tanks or batteries caused by remnant onboard energy sources under the influence of the harsh environment in space.

Seventy percent of all cataloged objects are in Low Earth Orbit (LEO), which extends to 2000 km above the Earth's surface. To observe the Earth, spacecraft must orbit at such a low altitude. The spatial density of objects increases at high latitudes.

The dispersion of the fragments associated with the DMSP-13 event is fairly large—however, the largest concentration of fragments resides near the altitude in which the satellite operated. This is still about 100 km above ESA's satellite constellation.

The fragments will slowly decay over the years and decades to come. ESA's Clean Space initiative—tasked with reducing the environmental impacts of the space industry on both Earth and space—is looking into the technology to mitigate the debris levels in heavily-trafficked LEOs. At orbital velocities, even a 1cm nut could hit a satellite with the force of a hand grenade.

On March 18 to 17, technical experts will meet at ESA's ESTEC technical center at Noordwijk, the Netherlands, to discuss debris mitigation technologies: methods to ensure that satellites can remove themselves from key LEOs well in advance of such a fragmentation event occurring, while also reducing the risk posed by reentering satellites.

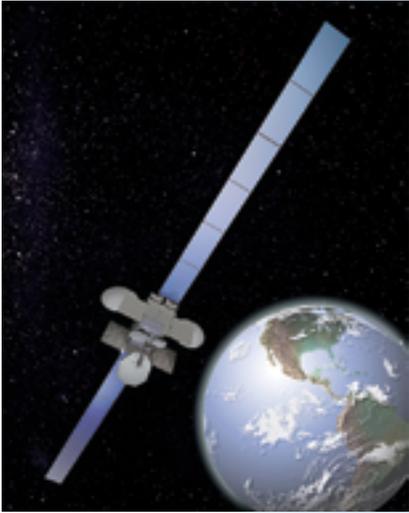
Simulations of orbital debris show that actively removing large items of debris, such as entire derelict satellites, should help stabilize its population and prevent a collision-based cascade effect. ESA has performed a system study for an Active Debris Removal mission called e.Deorbit.

"International regulations state that low-orbiting satellites are removed within 25 years of their mission end-of-life," said Luisa Innocenti, heading Clean Space. "Either they should end up at an altitude where atmospheric drag gradually induces reentry, or alternatively be dispatched up to quieter 'graveyard orbits'. The challenge is to introduce these mandated mitigation methods while minimizing the impact to the mission itself, especially for lower-mass satellites."

However, mitigation can only go so far. Projections show that the debris population will continue to grow through a chain reaction of collisions unless individual large items of debris—derelict satellites or launcher upper stages—are periodically retrieved.

ESA's e.DeOrbit mission, currently undergoing preliminary Phase A/B design for launch in 2021, aims to demonstrate the feasibility of active debris removal.

## AN EQUITY STAKE BY BOEING IN SOFTBANK'S DISASTER RESPONSE SATELLITE SYSTEM



Artistic rendition of a Boeing 702HP satellite. Image courtesy of Boeing.

**Boeing has taken an equity stake in SoftBank Satellite Planning, which will develop concepts for a satellite-based disaster response communications system for Japan.**

The group will evaluate the concepts and propose them to Japan's Ministry of Internal Affairs and Communications.

Boeing's background in providing satellite-based disaster response systems started in the 1990s with the Thuraya satellite system, which delivers mobile telephone, data, fax and messaging services throughout the Middle East, North and Central Africa, Europe, Central Asia and the Indian subcontinent.

Boeing is currently under contract for Mexsat, a communications system for Mexico that will provide disaster response, emergency services, telemedicine, and telecommunications access for remote areas when it becomes fully operational in 2016.



The Boeing portfolio includes a version of the Boeing 702HP (high-power) satellite that is

designed for mobile communications. Boeing comes to the SoftBank team with knowledge of system technical requirements and a track record of on-orbit experience.

Boeing infosite: [www.boeing.com/](http://www.boeing.com/)

Softbank Satellite Planning Corp:  
[www.softbank.jp/en/corp/group/sbsat/](http://www.softbank.jp/en/corp/group/sbsat/)

## COMMAND CENTER: PETER F. HOENE, PRESIDENT & CEO, SES GOVERNMENT SOLUTIONS

## SPECIAL GUEST APPEARANCE: TIP OSTERTHALER, FORMER PRESIDENT & CEO, SES GOVERNMENT SOLUTIONS

**B**rigadier General Peter Hoene, (Retired) was named President and CEO of SES Government Solutions on Jan 19, 2015. In his previous role, he served as the Corporate Vice President for Development for SES Government Solutions, headquartered in Reston, Virginia.

As Corporate Vice President for Development, he worked with United States warfighters and other government users to help determine their requirements and offer communications support, hosted payload opportunities, and network solutions. He then communicated those requirements to the SES parent organization to take advantage of existing on-orbit SES fleet capacity, or to influence future satellite designs.



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

During his tenure at SES, the U.S. Government business has been transformed from a primarily indirect sales channel into a solutions-focused independent subsidiary responsible for all aspects of SES's U.S. Government business. Under his leadership, SES Government Solutions transitioned into a Proxy Corporation structure, allowing the company to broaden its business base to include a wider range of customers and technologies.



*Artistic rendition of the upcoming SES-16 / GovSat satellite, which will be built by Orbital ATK. Image is courtesy of Orbital ATK.*



Hoene retired from the U.S. Air Force in 2010 as Brigadier General, following 30 years of service. He is a graduate of the U.S. Air Force Academy, as well as a distinguished graduate of both the Air Command and Staff College and the National War College. He holds two masters degrees and served in a wide variety of Space, Command and Control, and research, development, acquisition, test, staff and command assignments.

In his last active duty position, Hoene served as the Defense Information Systems Agency (DISA) Program Executive Officer for Command and Control, where he managed a portfolio of Joint and Coalition Command and Control and Information Sharing programs. Prior to his DISA assignment, he was Commander, 350th Electronic Systems Wing (C2&ISR Wing), Electronic Systems Center, Hanscom Air Force Base, Massachusetts, where he managed a portfolio of 49 command and control (C2), ISR, Space and Cyber programs valued at more than \$9 billion.

### **MilsatMagazine**

*Mr. Hoene, what initially prompted you to serve in the U.S.A.F., and how did you move into the space, ISR and C2 environs?*

### **Peter Hoene**

I was a senior in high school playing in the Minnesota State Ice Hockey Tournament. One of the Air Force Academy hockey coaches was there and

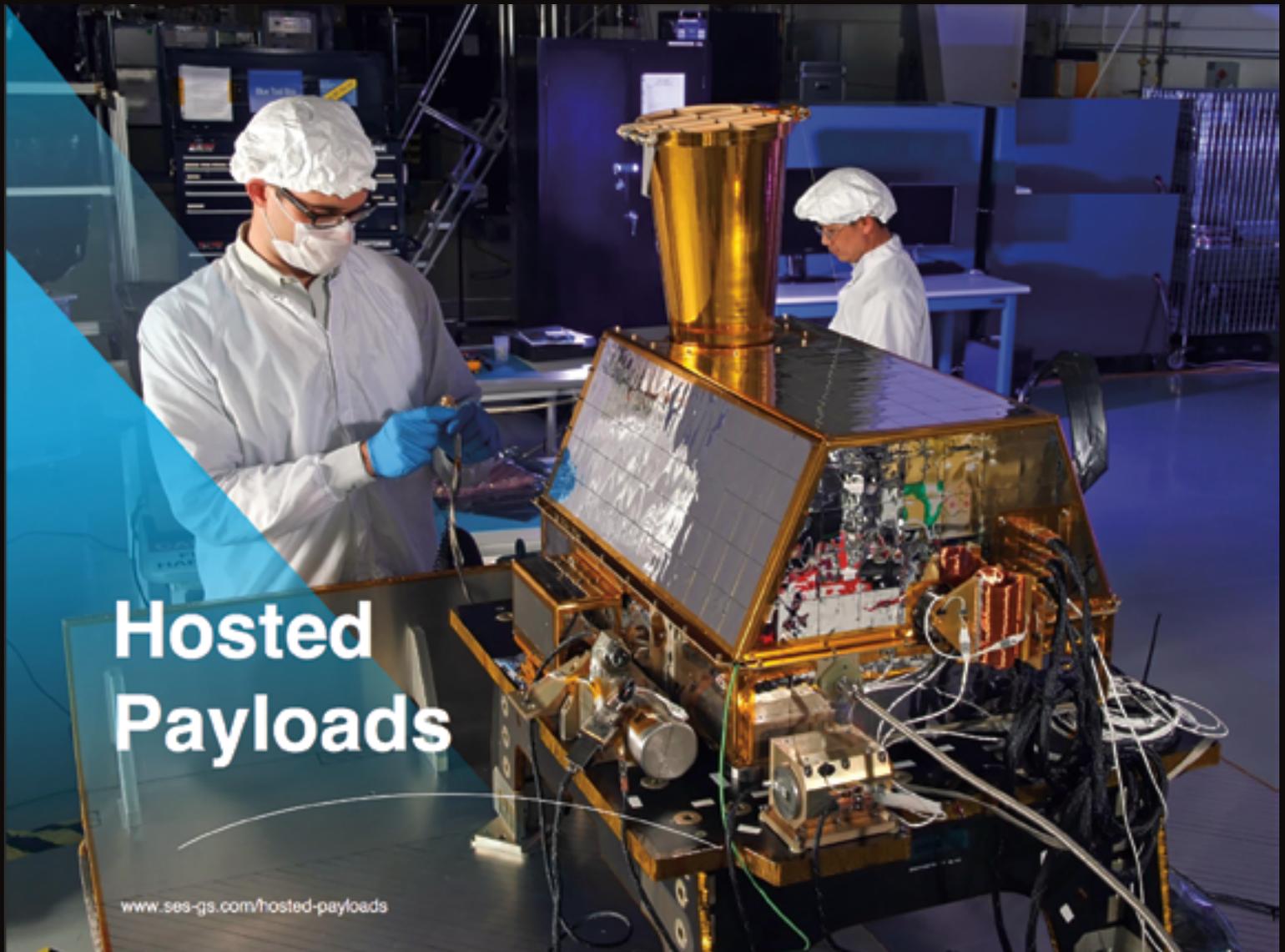
From 1997 until 2006, Tip was a Senior Vice President at Science Applications International Corporation (SAIC) where he led an international security organization within the Strategies Group. Prior to joining SAIC, Tip served in the U.S. Air Force for 28 years, retiring as a Brigadier General and Deputy Assistant Secretary of Defense for European and NATO Policy. Earlier positions included Vice Commander of the Air Intelligence Agency and numerous command and senior staff assignments.

Mr. Osterthaler is a Command Pilot with over 3,200 hours of flying time in fighter aircraft including multiple models of the F-15 Eagle.

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

### **MilsatMagazine**

*First, we certainly do wish you and yours a most rewarding retirement and we thank you for your past service to our nation. You have definitely witnessed numerous changes in MILSATCOM through your experience as a Brigadier General, in the U.S.A.F. and also during your leadership role at SES GS—how has SES GS grown since you joined the company in 2006 as President and CEO?*



# Hosted Payloads

[www.ses-gs.com/hosted-payloads](http://www.ses-gs.com/hosted-payloads)



recruited me. While pretty late in the process for a Service Academy, I liked what I heard from the coach. Additionally, I was fortunate to have good grades, have the coach recruit me for hockey, and to receive an appointment.

This was a fantastic opportunity for me to attend a very prestigious school, play Division I hockey, and serve the nation in the Armed Forces. After four years at the Air Force Academy, I graduated and was commissioned as a second lieutenant in the U.S.A.F. My first assignment was to the Air Force's Space Division in El Segundo, California. I served in five different jobs in five years in space related activities, each with increasing responsibility.

These early assignments taught me a lot as I had the opportunity to work with extraordinarily competent Airmen, government civilians, and industry partners. I also met a number of mentors who helped guide and shape my professional development. This was a great start to a 30-year Air Force career.

The C2 and ISR efforts were much later in my career (at the 20 year point when I was a Colonel). I was busy as the Deputy Program Director for the GPS program in Los Angeles and I was selected to lead a new experimental effort at Langley AFB, Virginia, called Combined Air Operations Center—Experimental (CAOC-X) for General Jumper and General Lyles. This effort combined users, developers, and testers to short-circuit the often lengthy acquisition process and rapidly assess and field new capabilities for Air Operations Centers (AOCs) worldwide.

We were successful as a team and fielded the first "Block 10" AOC at Prince Sultan Air Base, Saudi Arabia, a year later. Ironically, we declared Final Operational Capability at the end of August, 2001. Two weeks later, after the 9-11-01 attacks, this AOC became the "nerve center" for all C2 and ISR for air operations supporting Operation Enduring Freedom over Afghanistan and later Operation Iraqi Freedom over Iraq.



**The Coalition Compound at Prince Sultan Air Base in Saudi Arabia.**

### **MilsatMagazine**

*What drew you to join SES Government Services (SES GS) as the company's Vice President of Development in 2011?*

### **Peter Hoene**

First and foremost, I was drawn to the company due to the reputation of Tip Osterthaler. I was impressed by Tip's vision for the company and the quality of the company's leadership team. I was also interested in SES GS as a company that would allow me to work in the space business from the commercial side while also allowing me to continue to serve Army, Navy, Air Force, Marine Corps, and other U.S. Government customers. Additionally,

### **Tip Osterthaler**

When I joined SES in late 2006, the company was a conglomerate consisting of three satellite companies: Astra in Europe, Americom in the U.S., and New Skies Satellites operating globally.

In 2015, SES operates as a single global enterprise and has become the largest owner operator in the world by revenue and by number of satellites. As that transition has taken place, U.S. Government business has been consolidated under SES Government Solutions, which now is approximately three times as large in terms of both people and revenue as it was in 2006.

### **MilsatMagazine**

*What would you say is your biggest accomplishment during your time at SES GS?*

### **Tip Osterthaler**

The evolution of Americom Government Services into SES Government Solutions has created a satellite communications solutions company that is sharply focused on the needs of its U.S. Government users. While this might not seem unique or important, the industry in general, and SES in particular, have traditionally been focused more on the needs of commercial than government customers. I have worked hard to help SES understand and appreciate the benefits of doing business with the U.S. Government, and I have also, together with many of my colleagues in the industry, worked hard to help our government users better understand and appreciate what the industry can do for them. This work will never be completely finished, but I am proud to have played a part in creating a stronger and sustainable relationship between the government and SES as well as the other owner operators.

### **MilsatMagazine**

*The missions for private industry and the militaries within MILSATCOM have been fewer over the past several months, thanks to budget slicing by those not in-the-know—these monetary cutbacks have been crippling too many companies and military organizations. Is there any remediation you can see in regard to these cutbacks? What can private industry accomplish to mitigate such debilitating assaults to ensure the continued technical leadership and military prowess of our nation and those of our allies?*

### **Tip Osterthaler**

The wind down of operations in the Middle East and Southwest Asia, reinforced by a cyclical downturn in defense spending, has indeed put a lot of pressure on companies like SES and on the government organizations they support. It's my personal view that a healthy long-term national security posture requires both a strong economy and a broad political consensus about the where defense spending sits on the list of national priorities.

The economic crisis that precipitated the original defense downturn and eventually the Budget Control Act of 2011 has largely passed, but the political disagreement about priorities has not. In fact, the Budget Control Act has created a zero-sum game between defense advocates and supporters of other spending priorities, and the rules of the game are irrational and damaging to the interests of both sides as well as to the nation.

Unfortunately, there seems to be no near-term alternative, so I expect our U.S. Government customers, and we, will continue to feel some level of pain while a new political bargain is hammered out. From an industry perspective, we need to be both patient and persistent in trying to help the government get the capabilities it needs now and in the future, even in the face of fierce resistance to change from some of the people we are trying to help.



I was most impressed with the parent company as a whole and their high standard of professionalism.

### **MilsatMagazine**

*To move from a position of command responsibility for the acquisition and distribution of technology from private industry, to one of moving innovative products and technologies to acquisition agencies and force command structures must have been somewhat challenging. Please describe your transition from that of a Brigadier General in the U.S.A.F. to that of private industry. What were the most challenging issues you faced?*

### **Peter Hoene**

During my time on active duty, we had a clear mission focus. My team and I were able to support our warfighters in innovative ways to respond and adapt to the emerging threats posed by well-defined enemies and less well-defined terrorist organizations.

As I transitioned to industry, I met some great people, with great ideas, who wanted to help our warfighters but were constrained by: 1) U.S. Government contracting strategies that weren't flexible enough and don't allow for partnerships with industry; 2) bureaucratic decisions that cut funding for the programs we supported but we believed were vital to our warfighters; and 3) a perception that some government personnel have that "U.S. Government contractors are motivated by profit only."

While our company needs to make a profit to remain in business, we are also committed to ensuring the correct end result for our U.S. Government customers. In fact, SES GS has provided significant support to efforts, such as the U.S. Air Force CHIRP hosted payload and major networks on a fixed price basis. Every day, our people work above and beyond what's required by the contract because we want to exceed our customer's expectations and ensure their missions are successfully accomplished.

The three points above represent challenges for industry, which is governed by the ability to get things done, deliver on revenue commitments and meet profit and loss objectives. I've found that these key areas for industry are not always considered by our U.S. government counterparts and raising their awareness to help us better partner and meet their needs is extremely important.

### **MilsatMagazine**

*Can you tell us about some of your greatest accomplishments as Program Executive Officer for Command and Control at DISA?*

### **Peter Hoene**

The single biggest success we made was to move expensive, rigid, and tightly coupled applications to a much more flexible and affordable Service Oriented Architecture (SOA—an Architecture built around re-usable and exposable services). Great examples of this were the Global Command and Control System—Joint, and Global Combat Support System—Joint. Both of these programs made major progress by exposing data previously unavailable to enterprise users and to make the migration we initiated with the Joint Program "Net Enable Command and Control (NECC)." While NECC was eventually canceled, this project paved the way for an entire generation of SOA and Net-Enabled capabilities, which have made our DoD IT-based infrastructure more efficient and effective for our warfighters and more affordable.

### **MilsatMagazine**

*What does SES GS have in store for the future under Pete Hoene's leadership?*

### **Tip Osterthaler**

This is a question you should ask Pete, and I hope you will. What I will say is that Pete is an accomplished executive with an extremely strong background in both government and the satellite industry. We undertook a rigorous search and could find no one with his combination of skills and experience; at the end of the process, the members of the search committee, the Board members, and the shareholder representatives unanimously agreed that Pete is the person to take SES Government Solutions into the future, and I expect he will be so successful as to make everyone quickly forget my name.

### **MilsatMagazine**

*If you would care to let our readers know, what are your short term plans for some R&R? Will we see Mr. Osterthaler once again involved in the industry at some point in the future?*

### **Tip Osterthaler**

When I made my decision to retire, I deliberately decided I would make no professional plans or commitments until the transition is completed, and that does not happen until March.

I very much look forward to having unstructured time, fewer travel requirements, and less pressure, and I certainly will not jump right back into any full-time commitments. Some future involvement within the industry is certainly not out of the question.



## **MilsatMagazine**

*How would you describe your management style during your command career in the United States Air Force (U.S.A.F.) as opposed to that of private industry?*

### **Peter Hoene**

*I grew up playing team sports, including ice hockey, football, and baseball. I learned we won and lost as a team and that shaped my future leadership style. As a result, I became a highly participative leader and manager.*

*I like to roll up my sleeves and lead teams to solve problems and make things happen. Additionally, during my time in the Air Force, I happened to work for some great leaders and learned from them that if you communicate effectively, focus on satisfying your customers (internal and external), lead by example, and work together as a team, anything is possible.*

*I also learned to surround myself with the best and brightest people, delegate to them, and see how creative they can be when you unleash their potential. Finally, I've learned that the same style I used in the Air Force has also served me well in private industry—the style is based on solid leadership principles and those apply equally, no matter if for the military or for private industry.*

## **MilsatMagazine**

*How will you ensure our militaries and those of our Allies are made aware of SES GS solutions, especially during budget-restrictive times?*

### **Peter Hoene**

In 2013, SES GS sat down with industry leaders and created a message for Congress and the Pentagon entitled "Seven Ways to Make the DoD a Better Buyer of Commercial SATCOM." Our task was to show how SES GS capabilities complement these "seven ways."

This is possible through our fleet and end-to-end solutions as well as with the help of our industry allies. We engage with our customers on-site in the U.S. and around the world—working closely to ensure we understand their demands.

We're constantly providing innovative solutions to address their needs and work diligently within their budgetary restrictions. Industry associations as well as publications, such as *MilsatMagazine*, allow for us to reach a narrowly targeted audience and ensure governments around the world are made aware of the type of solutions we offer.

## **MilsatMagazine**

*May we have your thoughts regarding the viability of Hosted Payloads? As the company is a member of the Hosted Payload Alliance, how will you continue to promote such cost-saving functionality for the military and government agencies? Are there any near-future plans by SES GS to work on another hosted payload mission?*

### **Peter Hoene**

We are the proud hosts for the CHIRP program and it is a prime example of the viability of Hosted Payloads. We were able to structure a contract in weeks and launch the satellite and CHIRP hosted payload in approximately three years from the time we received the contract award.

Senior Air Force leaders, including the SecAF and Commander of Air Force Space Command have praised the responsiveness of SES GS and the performance of CHIRP. In fact, we were able to accomplish 85 percent of the Air Force's mission objectives at about 15 percent of the cost such would have taken to build and launch a dedicated satellite. The payload



**CHIRP installation within fairing.**

was even granted a two-year extension by the U.S. Air Force Space as it was able to exceed its estimated life expectancy after being placed into operations on orbit.

As a member of the Hosted Payload Alliance, we will continue to engage directly with the government through meetings, workshops and panels to promote how hosted payloads provide consistent, dependable and affordable access to space.

SES GS is one of 14 awardees granted a share of a contract worth in total a maximum of \$494,900,000 under the Hosted Payload Solutions (HoPS) Program. This indefinite-delivery/indefinite-quantity (ID/IQ) contract will provide a streamlined method for the U.S. Government to host government payloads on SES spacecraft.

## **MilsatMagazine**

*Additional areas of consideration for the SATCOM world revolve around High Throughput Satellites (HTS) and SmallSats, certainly contradictory in terms of size. What do you foresee as the acceptance, and use of, these technologies within the MILSATCOM communities?*

### **Peter Hoene**

The MILSATCOM community can sometimes be a catalyst for change, but often the commercial industry frequently becomes the trend setter and advancer of new concepts and ideas. When WGS was first conceived with its 5 to 8 Gbps, it was a High Throughput Satellite (HTS) compared to other satellites operating in the MILSATCOM and commercial arena.



Photo courtesy of Ronan Liétar

**SES Government Solutions hosted the first ever experimental U.S. Air Force sensor on an SES satellite operating over the United States. CHIRP (Commercially Hosted Infrared Payload) was successfully launched on September 21, 2011 from Kourou, French Guiana. The CHIRP flight demonstration program tested a new type of infrared sensor from geosynchronous orbit. This sensor has been integrated onto a commercial satellite and the data it receives is transmitted to a ground station for analysis.**

Photo is courtesy of Ronan Liétar

Now HTS satellites frequently exceed 40 Gbps and some cross the 100 Gbps capacity line. The MILSATCOM community will need to adjust its CONOPS and, in some cases, the hardware to take advantage of these new systems. Older modems and network designs that require all of the users to be in the same coverage beam can't take advantage of the new HTS capabilities and need to be updated.

HTS satellites achieve their efficiency through one primary concept—use tens to hundreds of smaller, more powerful beams to cover the same area previously covered with a single beam. The biggest driver that will move the MILSATCOM community from monolithic large beams to HTS capacities is the price per Megabit. HTS satellites will provide capacity at rates below \$1,000/Mbps while traditional satellites are in the \$2,500 to \$6,500/Mbps range. The second driver is the dramatic increase in throughput per user. A typical ISR UAV will consume 10 MHz of typical GEO satellite capacity to transmit an HD video feed. This same HD video feed will consume approximately 2 to 3 MHz on a GEO HTS satellite. Many of the new HTS satellites being built today are purposely designed with overlapping traditional wide beam and HTS coverage areas to reduce transition risk and facilitate uptake on the HTS capacity.

Likewise, many of the ground systems (teleports) currently supporting traditional Geostationary capabilities are being enhanced to support HTS. The DoD uses many of these facilities today. All security elements of the ground systems and the existing DoD network injection points will continue in operation further reducing DoD's cost and risk of migrating to HTS.

Current DoD maritime platforms and commercial aviation platforms already support basic frequency agility to allow the use to transition from one GEO satellite to another. Unfortunately this isn't the case for many of the ISR UAVs in service today. In order to take advantage of the HTS capability, these older, outdated modems will require upgrades. The good news is that the commercial In-Flight Entertainment business is driving the technology evolution in this area and the MILSATCOM community will reap the benefits of this new capability.

Terminal, hardware, and network changes required to exploit the cost/performance benefits of HTS are already in operation and there are more to come.

### **MilsatMagazine**

*Additionally, airborne intelligence, surveillance and reconnaissance (AISR) and steerable spot beams are also under the MILSATCOM spotlight. How will you ensure SES GS be able to address these needs?*

#### **Peter Hoene**

SES GS has partnered with O3b networks to provide high throughput satellite capabilities (1.2 Gbps per spot beam) with fiber-like speeds. The lower cost per Megabit creates a lower cost while steerable beams offer flexibility in terms of coverage area.

O3b products and services are currently listed on our GSA Schedule 70 and are also available via the Future COMSATCOM Services Acquisition (FCSA) contract initiative with GSA and DISA. SES GS will continue to meet directly with the U.S. Government to showcase O3b capabilities.

### **MilsatMagazine**

*How do you believe your 30 years of experience with the U.S.A.F. will impact your new role as the leader of SES GS?*

#### **Peter Hoene**

As I mentioned earlier, I am a very participative leader and manager and like to roll my sleeves up and lead teams to solve problems and make things happen.

I will leverage the leadership principles I learned and employed in the USAF and in industry for my new role. Further, I intend to establish a clear vision for the organization, get my senior leadership to buy in and tailor their goals and objectives to that vision and strategy, and turn them loose and unleash their team's human potential to make our organization successful. Some of the key elements of that approach will be to:

- » Provide a strong customer focus and look at the challenges we face from a customer perspective. Having been on the other side of the table, looking at things from the U.S. Government perspective is critical to providing the solutions we need.
- » Provide the leadership needed to get the organization aligned and properly staffed.
- » Retain, recruit and promote the best people.
- » Create an environment of trust and teamwork, and reward innovative solutions.
- » Deliver on our promises to our customers and to our parent company.



## **MilsatMagazine**

*Now that you lead SES GS as the President and CEO, what is one of your toughest company challenges that you have had to face?*

### **Peter Hoene**

Meeting our revenue targets in an era of U.S. Government budget reductions driven by the 2011 Budget Control Act, Sequestration, and other related budget cuts, is certainly a crucial challenge to face and overcome.

Additionally, we need our U.S. Government counterparts to help by providing insight into the evolving National Security Strategy map and help identify “demand signals” for different regions of the world. These demand signals can help us work with our parent company to identify potential orbital slots and spectrum needed well in advance of future conflicts. Without this insight, we may be faced with a situation where the U.S. government needs capacity (e.g. over the Pacific), but there is not sufficient capacity, nor are there slots and spectrum to offer in support of contingencies.

Unless the DoD employs alternative funding strategies for leasing or purchasing commercial satellite capacity, they are likely to continue to purchase capacity on the spot-market. This approach is costly for the taxpayer and dangerous, as the U.S. Government will not have established partnerships with industry to ensure they will have the global commercial SATCOM capacity when and where they need it. The demand signals mentioned above and partnerships with industry will go a long way to ensuring companies like SES will invest in long-term satellite fleet development to meet U.S. Government needs. Currently, the U.S. Navy is the only service with an enduring Program Objectives Memorandum (POM) line for commercial SATCOM (through the CBSP program).

## **MilsatMagazine**

*As you look at 2015, considering your breadth of experience, what situations do you believe will be of the most importance for our industry to deal with—challenges that absolutely demand the best from companies within MILSATCOM to offset those who have intent to harm and destroy?*

### **Peter Hoene**

From a national security perspective, we believe the U.S. Government should consider Commercial SATCOM as an integral part of any of their future solutions. A great start to this would be the U.S. Government to establish a SATCOM architecture team to examine how Commercial SATCOM and MILSATCOM complement one another and use this effort to perform tradeoffs between the two.

Such a team approach could also help provide the underpinning to ensure commercial solutions are addressed for future Analysis of Alternatives for the follow on to WGS and other systems. We’ve heard some great ideas from Air Force Space Command and Congressional leaders along these lines and would like to see them put into practice.

Using this architectural framework as a backdrop, the U.S. Government can work with the owner-operators to develop innovative hosting, leasing and acquisition models to help meet their mission needs in a much more affordable and efficient manner.

Commercial SATCOM owner operators can be very responsive to emerging needs and can deliver on orbit solutions in a very timely manner. Further, if the U.S. Government wants enhanced security features and can articulate these to industry, we will do our best to include their requirements, investigate alternative means to acquire service, and ensure efficient usage in what they buy.

The Pathfinder program is a model of how the industry could meet those challenges in the future. We’re encouraged by the innovation we’ve seen from the Air Force in the Pathfinder concepts and are proud to be the industry leader for Pathfinder #1. This allowed the DoD to pre-commit to the use of satellite transponders for multiple years and lower the cost, compared to the traditional O&M leasing approach.

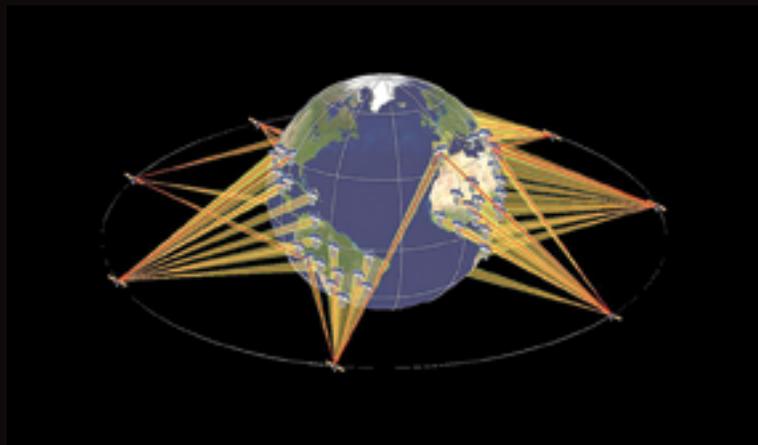
I believe we’ve made great strides on Capitol Hill, the Pentagon as well as alongside our COMSATCOM partners. We’re definitely moving more towards a streamlined satellite acquisition process but there is still much more work to be done.

When it comes to the industry as a whole—one of the ideas that Tip Osterthaler presented at SIA’s DoD SATCOM Workshop in 2014 was the idea of a proprietary SATCOM supply database. This way, the DoD knows where future capacity will be available. Meanwhile, the industry can provide more accurate business cases for future satellites to fill the gap in demand. Further, creating a tangible solution like this would demand the absolute best from companies in the MILSATCOM arena.

In terms of procurement, the DoD is looking to better understand our Commercial SATCOM capabilities. We are working with DoD end-users side-by-side to help them not only solve their problems today, but understand how to leverage all of the capabilities and potential that COMSATCOM can bring to provide even more capabilities, at affordable prices.

In summary, we understand how important the mission of our warfighters is. We are honored to support many of the DoD and other U.S. Government agencies’ most important networks and initiatives. I personally take pride when I see how the staff at SES GS comes to work every day, rolls up their sleeves, and applies their full talents and creativity to try to solve critical challenges facing our warfighters and other customers worldwide.

The SES GS infosite: [www.ses-gs.com/](http://www.ses-gs.com/)



**Artistic rendition of the O3b Network's constellation.**

## UPGRADES FOR U.S. ARMY MANPACKS RESULTANT OF GENERAL DYNAMICS UPGRADES WORK

**General Dynamics received a contract from the U.S. Army to support upgrades to the Mobile User Objective System (MUOS) waveform used in the Army's AN/PRC-155 two-channel MUOS-Manpack radios.**

The waveform is the digital 'dial-tone' needed to connect with the U.S. Navy's new MUOS satellite communications network that will provide U.S. military and government personnel smartphone-like voice clarity and data connectivity.

The total potential value of the contract is approximately \$13 million and includes waveform integration into the PRC-155 radios, radio/waveform testing, field support and soldier training.



MUOS waveform upgrades will enhance voice clarity and cyber security of voice and data communications across the MUOS communications network.

Other waveform enhancements include improved connectivity with other MUOS-Manpack radios, the MUOS ground system and satellites.

The MUOS communications network is expected to achieve global communications coverage in 2016.

"From developing the MUOS waveform and the PRC-155 MUOS-Manpack radio, to building the four MUOS ground stations located around the world, General Dynamics Mission Systems provides what soldiers need to connect with the game-changing MUOS tactical communications system," said Chris Marzilli, president of General Dynamics Mission Systems.

General Dynamics (NYSE: GD) combined the resources of Advanced Information Systems and C4 Systems into "General Dynamics Mission Systems" on January 1, 2015.

General Dynamics infosite:  
[gdmissionsystems.com/](http://gdmissionsystems.com/)

## AMERICA'S ARMY FACING SEQUESTRATION 'ENEMY' AT HOME



**Not only does the U.S. Army face rapid, unpredictable changes in the geopolitical landscape, but also the uncertainty of an adversary—sequestration—here at home, Army Secretary John M. McHugh said recently.**

Testifying before the Senate Appropriations Committee's defense subcommittee, McHugh, joined by Army Chief of Staff Gen. Ray Odierno, discussed the Army's fiscal year 2016 budget request and challenges imposed by sequestration's return as demand for the Army grows.

"It is amazing how much can change in a year," McHugh said. "Over the last 12 months, we've seen the geopolitical landscape morph, really, at an astonishing pace."

From renewed aggression by Russia and increased threats from North Korea to gains by radical terrorists in Iraq, Syria and Yemen, to the fight against Ebola, he said, "the demand for your Army to tackle contingencies around the world have grown at an alarming rate."

"Far from being foreseeable," McHugh said, "our requirements have been more unexpected, our enemies more unpredictable and our ability to handle multiple, simultaneous operations more uncertain. And yet, with such volatility and instability around the world, America's Army is faced, yet again, with an enemy here at home—the return of sequestration."

Citing unprepared units, unmaintained equipment and untrained soldiers, McHugh said the Army faces a "dark and dangerous" future unless Congress acts now to end "these ill-conceived and inflexible budget cuts." He added, "Moreover—and I want to be clear here—every installation, every component and nearly every program will feel the brunt of these cuts."

Under sequestration, McHugh said, by 2019 the Army will reduce its end strength to "unconscionable levels," likely losing another six brigade combat teams and potentially a division headquarters, along with associated affects to support infrastructure.

"It is our shared responsibility to jealously preserve the gains in readiness, modernization and training that we've achieved through your critically important support," he said. The Army secretary shared some of the Army's achievements over the past year to illustrate the service's impact.

"As Russian-backed forces rolled into Crimea and threatened regional stability," McHugh said, "our soldiers rapidly deployed to Eastern Europe [as] a demonstration of U.S. commitment. From Latvia and Lithuania to Poland and Estonia, soldiers from 173rd Airborne and the 1st Cavalry showed the world that America would stand with our NATO allies and respond to unbridled aggression."

Led by the 101st Airborne Division, McHugh noted, several elements acted to assist thousands suffering from Ebola in West Africa, providing command and control, equipment and expertise to support efforts to stop the disease.

Turning to the Islamic State of Iraq and the Levant, McHugh said, "Your soldiers quickly returned to Iraq to advise and assist security forces and turn the tide on this barbaric [group] of radical terrorists."

The Army secretary noted that in the Pacific region, thousands of soldiers and civilians support operations strengthening U.S. partnerships and providing increased presence.

While Army formations become leaner, more agile and more lethal, he said, the headquarters of nine active Army divisions and two Guard divisions are currently committed to combatant commands, and 144,000 soldiers are deployed, forward stationed or committed—including 19,000 mobilized reservists.

In the end, McHugh said, the Army's "extraordinary" success comes at a price.

"The stress of war, multiple deployments and unpredictable requirements doesn't change in the face of indiscriminate funding cuts," he said. "Through it all, we have, and we will, remain committed to supporting the needs of our warriors."

McHugh said the Army will keep faith with its soldiers, but "rest assured," the return of sequestration will have a direct, Army-wide impact on critical installation and family programs. "Simply put," he said, "we need the president's budget. Our \$126.5 billion request is some \$6 billion over the potential sequester level and is specifically designed to preserve our modest gains ... over the last year and take care of your soldiers. If approved, we'll invest \$3.4 billion above the fiscal year '15 funding levels in training, sustainment and installation programs that directly support combat readiness; and \$2.6 billion in research, development and acquisition to equip soldiers, to protect key parts of the industrial base and support new innovations."

The Army's funding request seeks vital reforms to compensation and force structure, he said, which will support near-term readiness and help place the service on a predictable path to balance. "I cannot emphasize enough how these critical reforms and funds are necessary to ensuring that your Army has sufficiently trained and ready soldiers to protect our nation," McHugh said.

McHugh said this is a "historic moment," and called for congressional action to end sequestration. "We need to stop talking and start acting," he said. "We need wisdom—not words. We need results—not rhetoric. And as I said last year, we need predictability—not politics."

As the Army faces "extreme" instability around the world, McHugh said, there must be certainty here at home. "Your soldiers—and I know you agree—deserve no less. We must have an end to sequestration this year, and we must have this budget."

*Article by Army Sgt. 1st Class Tyrone C. Marshall Jr.,  
DoD News, Defense Media Activity*

## MASSIVE PROTECTED MILSATCOM TEST SUCCESSFULLY CONDUCTED BY U.S. AIR FORCE



*Artistic rendition of an AEHF satellite. Image courtesy of Lockheed Martin.*

**The Air Force concluded a six-month rigorous and complex multiservice operational test and evaluation of its Advanced Extremely High Frequency (AEHF) system at Schriever Air Force Base, Colorado.**

The test and evaluation's goal was to ensure the AEHF system performed its missions the way it was designed to provide survivable, global, secure, protected and jam-resistant communications for military ground, sea and air assets. The Air Force Operational Test and Evaluation Center Detachment 4 at Peterson Air Force Base, Colorado, partnered with the 4th Space Operations Squadron, which is responsible for the command and control of the system, as well as other Air Force, Army, Navy and Marine units.

"In the event that we go into a nuclear war, we have to make sure a communication link for Department of Defense components and national leadership is available during a contested environment," said Maj. Matthew Collins, AFOTEC Det. 4 AEHF test director. "And (AEHF) is a system that is capable of providing that connectivity."

The Air Force concluded a six-month rigorous and complex multiservice operational test and evaluation of its AEHF system in January. The Airmen are assigned to the 4th Space Operations Squadron.

To ensure AEHF meets its mission, the team laid out test and evaluation objectives—validate the AEHF's advanced ground mobile unit, validate the system's

integration to the legacy Milstar constellation, confirm its communication capability for the end-users and ensure the system can operate in a nuclear environment.

In order to validate its advanced ground mobile units, 4th SOPS simulated a deployment of its ground mobile assets to make it easier for personnel and to save time and money. The

squadron members operated the satellite constellation from the mobile systems instead of from the squadron's normal control center in the Integrated Operations Environment.

"If for some reason, we need to go out and operate the satellites because we can't do it here at Schriever because of a threat, a war or any incident, then we go operate out of our

mobile units," said Lt. Col. Zachary Owen, the 4th SOPS director of operations. "The piece of this testing was to make sure we can operate out of those mobile units for an extended period of time."

Since 4 SOPS has a unique ability to operate its satellites using two control systems, it allowed the mobile units to operate the satellites using its dedicated system, which is the AEHF Satellite Mission Control Subsystem. For the duration of the test, 4th SOPS maximized its use of the mobile ASMCS capability and minimized its operations from the IOE; though 4th SOPS kept a presence in the IOE for command and control of the day-to-day operational mission.

"In the mobile unit, we had command and telemetry of the system so we could see the health of the satellites at all times," said Capt. Michael Meoli, the 4th SOPS Mobile Operations Flight commander. "We had an active command role in the mobile unit, while the IOE had passive telemetry; meaning, they could see the state of health of the system but could not command it."

The test also had to ensure the satellites' unique capability of operating autonomously during its transition period from IOE operations into the mobile units.

"Basically, our satellites can still provide communication to users so there is no interruption of service," Meoli said. "It gives us a certain amount of time to deploy the mobile unit, and have it ready and operational."

AEHF also has to prove its ability to integrate with Milstar, which is the legacy constellation of the protected Military Satellite Communication systems. The first Milstar satellite was launched in 1994 and is still operational. The Air Force launched its first AEHF satellite in 2010; which is the follow-on satellite to Milstar.

"One AEHF satellite has 10 times the capacity of the entire Milstar constellation," Owen said. "We operate them as one constellation instead of two separate systems."

There are now enough AEHF satellites on orbit to allow effective testing of the constellation, and its dedicated ground system, the ASMCS,

to see how well those AEHF satellites and their command and control systems integrate with legacy constellations.

"We conducted more than 250 tests in the IOE," said Capt. Aaron Doyle, a 4th SOPS mobile engineer. "Some of the tests were conducting table uploads, where you run everything on the satellite. We want to see if we can upload it to the ASMCS, change something around, then upload those changes to the satellite, and have it do a download from the satellite with that same information."

The table uploads deliver software updates to satellite so 4th SOPS operators can make adjustments to the satellite's various systems and provide assistance to distant-end users. "This way you could adjust the settings so you could optimize the satellites for users worldwide," Owen said.

The multiservice test also evaluated the AEHF's secure network. AFOTEC enlisted the 177th Information Aggressor Squadron and 92nd Information Operation Squadron to conduct a full up operational cybersecurity assessment. "They came up with a very comprehensive evaluation of 4th SOPS's network security," Collins said.

The cybersecurity assessment is a very high DOD interest item, he said. As part of the evaluation, a team came out and probed the network to check on the security of the system. Owen added, "They tried to break in, for lack of a better term; they came and acted as bad guys," he said.

The teams were very impressed with the network's security architecture, and the procedures in place to ensure it is protected from insider and outsider threats. Since the AEHF serves not only the Air Force, but other services as well, the test also looked at how the customers—Air Force, Army, Navy, Marines and international partners—use the system. "We have to make sure that AEHF can provide combat effects to the warfighters so they can accomplish their mission," Collins said.

AFOTEC deployed personnel to two Navy destroyers and two submarines, three Army locations, two Marine sites and multiple U.S. Strategic Command locations. The test also included international partners, such as the United Kingdom, Canada and the Netherlands.

"It was a huge test," Collins said. "Overall, it has taken about six months. We tested a total of 38 GSUs (geographically separated units). It was an expansive and rigorous test."

During the evaluation, AFOTEC ensured the test was as realistic as possible in an operational environment, he said. Another important test for the AEHF system is to ensure it can provide protected communication, even during a nuclear environment.

"For the first time ever, we tested the nuller and scintillation capability of the satellites in an operationally realistic environment," Collins said. "It is the unique capability of the satellites to be able to operate in a contested environment."

The team partnered with outside agencies to provide a realistic scenario mirroring a contested environment, he said. Though the test has concluded, AFOTEC will still analyze the data gathered to determine if the AEHF system is performing its mission vital to national security.

"Once AFOTEC is done with the report, the Air Force Space Command leadership will decide whether the AEHF system has reached initial operation capability," Owen said. "This is a big deal." Reaching that capability will allow for more operational users, he said. With a rigorous, end-to-end test like this, Collins reiterated the importance of teamwork not only at 4th SOPS but with other organizations as well.

"One of the most successful things in this whole test process has been the coordination and teamwork between all entities involved," he said. "We coordinated with the program office, headquarters Air Force Space Command, contractors, private organizations, combatant commands, international partners, Air Force, Army, Navy and Marines, and the only way it worked was through the active collaboration of all those entities to focus on mission success to deliver the most capable next generation of protected satellite communications to the 50th Space Wing and our warfighters world-wide. According to senior leadership at the Space and Missile Systems Center, the success of the AEHF program is what they want to see in all other space programs. This is the benchmark for all future space acquisition programs."



# ADVANCES IN COMMUNICATIONS-ON-THE-MOVE (COTM)

By Karl Fuchs, Senior Contributor and Vice President of Technology, iDirect Government



**The government and military of any country need instantly deployable, secure, high-speed communications networks that can deliver immediate access to mission-critical applications.**

Naval vessels scattered across the seas and aircraft roaming the skies need reliable ship-to-shore and air-to-land communications as well as secure ground-based communications. Ground troops require vital communications for missions such as supply logistics; intelligence, surveillance and reconnaissance (ISR); battlefield communications; airborne communications; disaster site video; and emergency management planning. Life-saving and situational awareness information is needed at a moment's notice.

Today, satellite IP communications represent a powerful solution to deliver high-speed, two-way IP connectivity in any environment as SATCOM overcomes distance and environmental challenges through an integrated network.

Advances in communications-on the move (COTM) technology allow soldiers to deploy wireless broadband networks on moving ground vehicles, deep water fleets, military aircrafts and unmanned aerial vehicles (UAVs). COTM equipment has been engineered to withstand harsh environments, and technology advances allow SATCOM signals to match terrestrial broadband speeds.

With a dynamic COTM solution, a vehicle in the field becomes broadband-enabled and capable of supporting Internet, voice, video and data services. Satellite routers can fit in the rear of a vehicle, a low-profile antenna can install on top of the vehicle, and SATCOM users inside the vehicle benefit

from wireless connectivity on laptop computers and voice-over-IP phones.

COTM meets the most demanding mobility and security requirements for soldiers, marine vessels and aircraft, enabling real-time secure and reliable video, data and voice transmission while in transit. COTM is the key to the always-on, instant communications for military and government operations, delivering all the capabilities of the next-generation IP network. COTM provides instant situational awareness, eliminates the setup and align procedures for reach-back satellite communications and doesn't require expert technicians on site for setup and operation.

In the airborne environment, the same COTM technology used in ground vehicles is applied for ISR missions, as well as for voice, video and data transmissions. High-tech planes are equipped with auto-tracking antennas and with state-of-the-art infrared cameras that provide full-motion video feeds over a secure satellite communications backbone. High-bandwidth technology is integrated into an aircraft so that the modem, antenna and the aircraft all work together.

This integrated solution substantially increases data rates and accommodates the rapid Doppler Effect that occurs during flight. This allows the antenna to react more quickly to aircraft movement and integrate into many of the ISR systems being used today. The Doppler Effect refers to the apparent satellite frequency shifts due to high speeds, turbulence and rapid altitude changes that create problems receiving satellite signals. Additionally, the high-bandwidth



*A WIN-T equipped vehicle moving across harsh terrain. Photo is courtesy of the U.S. Army.*



*WIN-T equipped vehicles supporting comms testing for COTM.  
Photo is courtesy of the U.S. Army.*

technology is able to accommodate hundreds of aircraft in one network and track their movement dynamically, if required.

Today's manportable terminals are ideal for communications on the pause (COTP) applications. Today's military requires SATCOM equipment which is smaller, lighter, draws less power, is easier to set up and yet delivers higher bandwidth than ever before.

Missions today often require rapid deployment and manportability of high-bandwidth satellite terminals. Due to this need, many next-generation terminals are incorporating flat panel antennas. However, most satellite bands, notably Ku-band, require spread spectrum technology to alleviate the problem of adjacent satellite interference that can be encountered when using a sub 1 meter or flat panel antenna. Therefore, satellite modems designed for manportable and sensor applications must support this demanding and power-hungry feature.

Manportable boards also are decreasing in size, weight and power, or SWAP, bringing more mobility to the warfighter. The increasingly portable communications technology that can support Internet, voice, video and data SATCOM will be even easier to carry and deploy for anywhere and anytime communications.

Half the size of existing boards and comparable to the size of an iPad, these next-generation, energy-efficient satellite router boards build off existing transmit key line capabilities that already improve battery performance by as much as 40 percent. The next-generation boards, in addition to transmit key line, are utilizing systems that include a processor on the FPGA architecture, further reducing the total power consumption requirements.

This is where the Department of Defense (DoD) is moving—satellite communications technologies which are smarter and able to support more agile missions, with the flexibility to deploy tailored topologies and configurations to support a host of applications, ranging from Voice over IP to file transfer.

The newest manportables will be small, lightweight and power-efficient, bringing innovation to portable communications technology, designed to support data, voice and video connectivity in highly mobile military applications. The remotes will feature high-speed data transmission, increased bandwidth capacity and higher network availability, aiding the mobile warfighter in forward-deployed locations.



*A Northrop Grumman RQ-4, which carries the Battlefield Airborne Communications Node payload for COTM during flight ops.*

Additionally, the remotes will be easier to integrate into portable solutions such as COTM applications, and they will feature quality-of-service (QoS) prioritization, Wideband Global Satellite certification, Time Division Multiple Access (TDMA), transmission security and FIPS 140-2 Level 3 certification, among other features. The units also will be energy-efficient and bandwidth-efficient. The software ensures the BUC is turned off when the unit is not transmitting in TDMA.

COTM advances will be achieved with the most bandwidth-efficient, scalable and highly secure SATCOM platform. Hubs, routers and network management software will be designed to address the growing complexity of deploying and managing global IP networks.

These advances will enable the military to communicate, share information and provide support for large mobile groups. From global logistics and disaster recovery to mobile communications, advanced satellite networks, SATCOM software and associated products will play a critical role in government and defense communications.

The military has an insatiable appetite for COTM, and this desire is continuing as the DoD looks to modernize our forces on land, at sea and in the air.

*Karl Fuchs serves as Vice President of Technology for iDirect Government and he is also a Senior Contributor to MilsatMagazine. He may be contacted at [kfuchs@idirectgov.com](mailto:kfuchs@idirectgov.com).*

## VULCAN FROM ETL SYSTEMS BRINGS RF SIGNAL DISTRIBUTION INTO A DEFENSIVE POSITION



**ETL Systems will provide RF equipment to a large U.S. Government Defence contractor.**

This was a highly competitive bid and ETL was selected after providing a successful equipment demonstration at the agency's facility which showed the unique form factor and performance attributes of its Vulcan matrix system.

The Vulcan is a compact 16U high 128 inputs x 128 inputs distributive matrix with dual redundant power supplies and CPU's, and hot-swappable RF components.

The unit also features remote control and monitoring facilities that give the user the ability to set alarms if any levels drop below pre-determined thresholds.

Susan Saadat, Vice President of ETL's North American Sales and Operations, said, "This further proves that our equipment is trustworthy and reliable as well as unique enough to stand out from the competition."

As well as the Vulcan matrix, which is installed at a location outside the U.S., ETL has been working closely with the customer to design a customized rack that will contain the matrix and auxiliary equipment, and the customer's preferred cabling system.

ETL is also providing an onsite Factory Acceptance Test (FAT) at ETL's UK facility in Hereford, along with lengthy training for the US government Agency. This will give the agency hands-on experience with the product and teach them troubleshooting strategies for seamless integration in to their system.

Ms. Saadat added, "Our Factory Acceptance Tests ensure the customer understands the equipment's full functions and operations while our in-depth training procedures make sure they can use the equipment to its full capabilities."

## KOSOVO IS THE TRAINING GROUND FOR CALVARY SCOUTS & THEIR COMM SYSTEMS



*Spc. Kevin Smith, a signal support system specialist with 1st Squadron (Airborne), 40th Cavalry Regiment, 4th Infantry Brigade Combat Team (Airborne), 25th Infantry Division, talks with Capt. Karl Kuechenmeister, commander of Apache troop 1-40th Cavalry, sets up the tactical satellite antenna for the air assault training mission near Camp Maréchal de Lattre de Tassigny (CMLT) Kosovo.*

### **Cavalry scouts loaded helicopters and headed towards the mountains for an air assault-training mission near Camp Maréchal de Lattre de Tassigny (CMLT), Kosovo.**

Cavalry scouts are responsible for being the eyes and ears of the commander during combat and keeping their skills sharp is essential for their mission.

Sgt. Robert Adarna, a cavalry scout with 1st Squadron (Airborne), 40th Cavalry Regiment, 4th Infantry Brigade Combat Team (Airborne), 25th Infantry Division, and a native of Kailua-Kona, Hawaii, participated in the training. "The objective of today's mission was to secure a helicopter-landing zone," said Adarna. "We had to find it using land navigation and then ensure it was safe for helicopters to land there."

The Soldiers hiked the mountainous terrain with snow waist deep at some parts of the trail. "It was definitely deep snow out there," said Adarna. "We were hoping it would melt before the mission but we adapted. It is all a part of the training."

Spc. Kevin Smith, a signal support system specialist with the 1-40th Cavalry and

a native of Dallas, Texas, was in charge of communications for the mission.

"Communication was great today," said Smith. "All of the radios were good today and nothing went down, which is nice." For this mission Smith stayed in constant contact with the troop back at base and transmitted information from the commander to the troop.

"I think my job is vital for the scouts," said Smith. "They have to be able to communicate with each other in order to accomplish their mission. Communication is important in the Army period. I am there to ensure the commander has constant lines of communication."

The scouts completed their training and loaded back into the birds to head home to CMLT.

"I think over all this training went well," said Adarna. "A lot of the training we did today was perishable skills. Land navigation is a vital skill that we all need to rehearse constantly so it was good that we were able to do that today."

*Story and photo by Sgt. Melissa Parrish, 4th Brigade Combat Team, 25th Infantry Division Public Affairs Multinational Battle Group - East (KFOR)*



# EMERGING DoD NEEDS REQUIRE INNOVATION: A HUGHES PERSPECTIVE

By Rick Lober, Senior Contributor and Vice President, General Manager, Hughes Defense and Intelligence Systems Division



**The DoD continues to face the dual problem of dealing with the current atmosphere of fiscal restraints while simultaneously seeking to protect its space and communications assets from becoming compromised from an ever growing list of threats.**

To that end, the U.S. Air Force's Space and Missile Command (SMC) and Congress have looked more and more to industry to deliver potential solutions through innovation and cooperation. Hughes Defense and Intelligence Systems Division (DISD) already plays a significant role in this process through the development of customized state-of-the-art technologies and solutions built from the company's enterprise strengths and evolved to better solve the specific challenges facing our government.

Budget pressure and reason require the Pentagon to examine the United States' need for satellite communications that are protected and affordable for assets currently in orbit, as well as looking to the next generation of fleet replacements. Protecting these assets presents an interesting and exciting challenge, as upgrades to hardware on orbit cannot be physically added. This is where innovation can play a major role—especially in the advancements in waveform and modem technology for terminal and ground systems.

## **SMC Protected Tactical System Study Participation**

In 2012, the Defense and Intelligence Systems Division of Hughes successfully demonstrated its advanced network management capability and a prototype was developed using SOA-based software framework and rule-engine technology, highlighting dynamic resource allocation. The capability was designed in conjunction with Space Systems Loral (SSL) for the U.S. Air Force Space and Missile Command Protected Tactical System (PTS) study. Hughes designed the PTS mission management system architecture for protected MILSATCOM and provided a cost model demonstrating lower cost compared to traditional MILSATCOM based on Hughes' proven designs and customized software.

## **Advanced Satellite Waveforms**

Hughes' enterprise-grade solutions have been subsequently engineered for military and commercial use and can be easily integrated within existing military systems and hardware. Looking to the future, Hughes' newly developed Software Defined Radio (SDR) platform can host multiple waveforms, such as the USAF SMC PTS (protected tactical SATCOM waveform), traditional MILSATCOM

waveforms, and specialized waveforms such as Hughes SCMA (Scrambled Code Multiple Access) which allow for smaller antenna sizes and other important features. Various DoD commands, including the U.S.A.F.'s SMC and the U.S. Navy SPAWAR, are developing requirements for such software definable modems and to operate with new and existing terminal hardware.

## **Network Management Techniques and Dynamic Resource Allocation**

While there is much current emphasis on waveforms, modems and terminals, advancements in Network Management will play a key role in future DoD SATCOM systems. Dynamic resource allocation (DRA) is a key network management tool that enables an affordable, protected SATCOM solution.

This has been a Hughes strength for many years and is inherent in the firm's current network of more than one million users. In addition, Hughes can provide the military and intelligence communities the tools needed to remotely manage their networks for improved operations and reliable, secure communications. Hughes' network management is achieved through an advanced set of diagnostic technologies to continuously monitor all networking devices, computing devices, and storage devices for status updates and detailed statistics, enabling efficient management and optimization of network performance. Efficient network management results in seamless integration of disparate communication systems (satellite, wireless, terrestrial) in end-to-end connectivity—a solution provided to many of Hughes' enterprise grade customers that can now also benefit the DoD.

## **Managed Services for Maximum Efficiency**

Ultimately, Hughes sees many DoD SATCOM networks (including protected communications) going to a managed services model. At Hughes DISD, our drive is to support the government customer to successfully adopt and employ managed services to fully manifest the capabilities the agency already possesses at a greatly reduced cost. Managed services are the key to supporting an agile and mobile ecosystem for command, control and situational awareness. Ground-based information processing and management will aggregate and unify diverse capabilities for the rapid deployment of information to the end-user and enhance virtual management capabilities for the individual operator.

The Hughes DISD focus is to use as a foundation the best of our advanced technologies to drive the innovation necessary to develop DoD solutions, instead of taking a COTS approach that sometimes amounts to forcing a square peg into a round hole.

The distinctive culture at Hughes DISD sets this division apart from competitors in the enterprise and consumer world as we note ample opportunities to apply the same advantages from the commercial world over to the DoD. Over the last six years, Hughes DISD has continually positioned itself as America's master-builder architect of advanced solutions for the rapidly changing requirements of the government customer.

The DoD's need for solutions to its toughest challenges drives our dedicated team to unparalleled creativity and innovation.



A Hughes SDR modem.

Hughes DIS: [defense.hughes.com/](http://defense.hughes.com/)



# DISCRIMINATING, AFFORDABLE TECHNOLOGICAL INNOVATIONS FOR MILSATCOM

Tim Frei, Vice President, Communication Systems, Northrop Grumman



**I**hwarting adversaries by deploying advanced defensive technology is one way to address the challenges faced by the 21st century warfighter. The loss of technological superiority and the resulting harm to operational capabilities is a risk our nation cannot afford.

U.S. force projection seeks the “away game” for military operations. That is, we want to bring the fight to the adversary’s neighborhood and avoid military conflict on American soil. The away game demands long-haul communications, and that satellite communications supports the vast majority of telecommunications capacity early in a conflict and far from the United States.

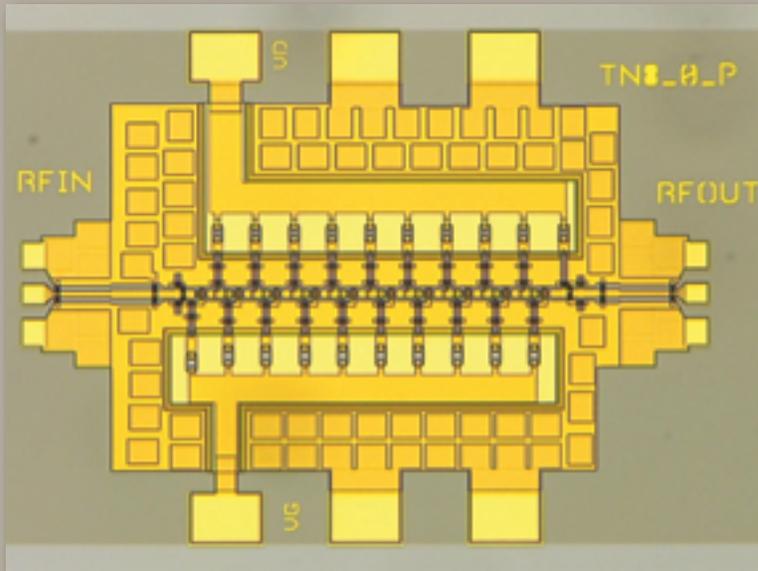
In the increasingly net-centric military of today and tomorrow, mission success depends on highly assured communications. During critical military operations, “protected” communications is not a “continuum”—our warfighters have the essential communications, or they don’t, it’s that simple.

Northrop Grumman is working to develop and deliver affordable and discriminating technologies that improve the performance of MILSATCOM architecture. As leaders from government, academia and industry work closely on how to offset the toughest technological challenges faced by warfighters, breakthroughs by our company are contributing to the solution.

## Microelectronics

Northrop Grumman’s work in advanced III/V compound semiconductors (semiconductor materials made from elements in groups III and V of the periodic table of elements) and integrated circuit technology is pushing the state of the art to enable solutions that were thought to be impossible just a few years ago. These advances have the potential to unlock many new applications.

Recently, the Defense Advanced Research Projects Agency (DARPA) recognized Northrop Grumman for developing the world’s fastest integrated circuit amplifier. The amplifier is able to operate at a speed of one terahertz, or one trillion cycles per second, surpassing our own record of 850 billion cycles per second set in 2012.



World’s fastest one-terahertz circuit built by Northrop Grumman that operates at one trillion cycles per second.

Just 10 years ago, there was doubt that an integrated circuit operating at one terahertz was even technologically possible. An interdisciplinary team of Northrop Grumman scientists and engineers worked together in scaling all facets of our monolithic microwave integrated circuit (MMIC) technology to enable this result, which may potentially be used in satellite links at much higher frequencies than are currently used. It is also expected to improve system range, and reduce size, weight and power consumption of existing systems.

In the same vein, functions that were typically realized with separate chips and technologies are now being produced as a compact system-on-a-chip by combining multiple functions with our advanced deep submicron silicon nodes that enable complex ASIC (Application-Specific Integrated Circuit) development and design. This allows size, weight and power savings compared to traditional design methodologies.

A standout technology is our DAHI (Diverse Accessible Heterogeneous Integration) 3-D technology that enables Northrop Grumman’s high-performance III/V compound semiconductor technologies to be intimately integrated with commercial scale advanced deep submicron CMOS (complementary metal-oxide-semiconductor). This hybrid approach provides revolutionary integrated circuit capabilities with substantial improvement in affordability.

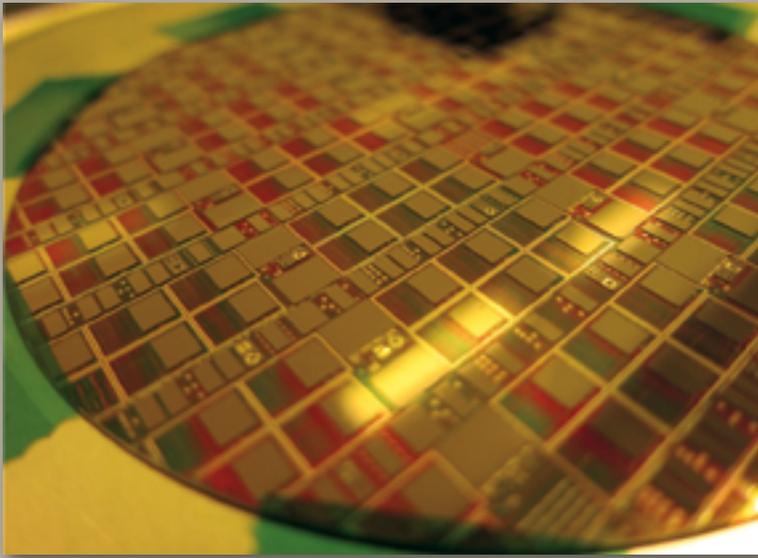
## Next-Generation Processor

An affordable and agile solution to delivering assured communications is our next-generation flexible data processor that allows users to quickly enable different applications and communication architectures. We have recently completed the development and successful demonstration of a protected satcom digital processor capable of combining advanced protection features with enhanced user data rates 20 times faster than currently available. The processor is compatible with space operations, and the demonstration validates that the hardware, firmware and software are at a technology readiness level that can move quickly to flight readiness.

The processor builds upon the proven protection features of the Advanced Extremely High Frequency (AEHF) satellite’s Extended Data Rate (XDR) waveform. New features not only enhance user data rates, but provide spectrally efficient bandwidth-on-demand connectivity. Security for the new processor is provided with an algorithm that is readily exportable and does not require physical protection when it is unkeyed, increasing the applicability to coalition forces and unmanned platforms. When implemented as part of a comprehensive protected architecture, the processor can deliver assured communications to the warfighter, enabling operation in contested tactical environments.

The need for fully processed, spread spectrum architectures with highly discriminating antennas operating across the spectrum is the best and most reliable way to counter the growing threat of low-cost commercial terminals that can be repurposed as jammers by adversaries.

A notable development in this area is our maturing knowledge of atmospheric effects on W- and V-band RF signal propagation to enable future SATCOM systems. Success in this area will enable space-ground communication links to be designed at these bands and expand the possibilities for assured communications.



Northrop Grumman's DAHI integration of compound semiconductors on commercial silicon.



Northrop Grumman's next-generation processor.

### Lasercom

Laser communications technology has long held promise as key to an enhanced MILSATCOM architecture and remains a promising enabler to help realize a space-based, wideband IP-based Internet vision. Advantages of lasercom include access to an uncongested portion of the spectrum, ultra-high data rates, low probability of intercept / low probability of detection and small terminal size, weight and power.

Significant enabling technologies such as space-qualified, reliable high-power optical amplifier, multi-gigabit optical modulator-demodulator, and high-precision pointing/tracking and fast-acquisition subsystems have been demonstrated to TRL-6 or higher and are primed for flight production for a wide variety of applications.

While lasercom has been funded and in development since the early 1980s, in 2007 the government eased off on its support. Since that time, Northrop Grumman has continued to invest and advance lasercom technology and is currently focusing on compact, affordable terminal solutions for both space relay and user platforms.

The Northrop Grumman team is at the forefront and committed to supporting strategic and tactical users for their ever-growing and continuous communications needs. Yet, the acquisition of these advances has to be accomplished much faster to get critical technology in the hands of warfighters before the adversary outpaces us and negates our advantage. Affordable, comprehensive and enduring solutions are critical to counter current and potential threats, and Northrop Grumman is excited to be part of the solution as we continue to work hard to protect our warfighters.

*Timothy J. Frei is vice president of Communication Systems in the Space Systems business area of Northrop Grumman Aerospace Systems (NGAS), a premier provider of manned and unmanned aircraft, space systems and advanced technologies. In this role, Frei leads the organization that provides architectures, systems, payloads, advanced products and technologies to satisfy communication current and future needs of air, space and terrestrial users across the DoD, Intelligence, NASA, civil, commercial and international communities.*

*Prior to his current assignment, Frei was the vice president of the System Enhancements and Product Applications (SEPA) organization, overseeing all aspects of Space Systems' growth, including all Military Satellite Communications future programs. Previously, Frei was vice president of Advanced Systems at NGAS, responsible for the formulation and execution of the sector's strategy for space-based ISR new business pursuits through identifying, qualifying and capturing both follow-on and new system and technology contracts.*

*Previous assignments spanned a range of engineering and engineering leadership positions, and, over his career, his experience spans 16 different space programs in 11 different mission areas, covering all phases of engineering—from proposals, through design, production, integration, to launch and activation. Frei earned a bachelor's degree in aerospace engineering and a master's degree in mechanical engineering from UCLA. He completed the UCLA Executive Program at the Anderson School of Business. He is also a chartered financial analyst.*

**NORTHROP GRUMMAN**

THE VALUE OF PERFORMANCE.

**Capabilities**

## FOR BATTLE SUCCESS, SPACE PLANNING IS ESSENTIAL



**“Space, the final frontier,” means a lot to people in different careers, but is the vast blackness filled with mesmerizing intergalactic-lights important to today’s warfighter?**

According to Air Force Capt. Jamil Brown, the 607th Air Operations Center chief of space plans, space is a newer concept to warfighting and his team is working to integrate the concept into exercise Key Resolve 15.

“As chief of space plans I’m in charge of integrating space into the air tasking order cycle, making sure the plan that’s put together has both the space support it needs and also the estimated space effects to make sure the mission goes along as planned,” Brown said.

Over the past few exercises, integrating space effects into KR scenarios has been an evolutionary process.

“One of the nice things about working with our Korean counterparts is we’re beginning to not only educate everyone here what space has to contribute, but we’re also integrating it into the plans so space is as essential and integral as everything else,” he said.

During the exercise process, Brown found that planners’ interest in space has increased as they seek to understand how space effects fit into their planning and maneuvers.

“It’s great they have that thirst, but now we’re catching up to that to making sure we can satisfy that interest in space knowledge,” Brown said. “That’s a challenge I’m pleased to have to overcome.”

U.S. Army Capt. Otis Ingram, a space coordination officer from the 3rd Battlefield Coordination Detachment, said space technology isn’t just applicable to flying and air combat; it’s essential to troops on the ground.

“Although solar flares and space dust aren’t directly related to what troops on the ground are doing, it directly affects elements of warfare such as GPS and satellite communication,” he said.

Brown said generating and implementing knowledge of space effects is sure to help KR run smoother, but more importantly play a role in future combat and humanitarian operations around the world.

“Space has been around for a while but, in regards to integrating it into the overall theater of operations, we will continue to improve and develop to better assist our counterparts and warfighters around the globe,” he said.

*Article by U.S. Air Force Staff Sgt. Shawn Nickel,  
354th Fighter Wing,  
Seventh Air Force Public Affairs*

## L-3 COMMUNICATION SYSTEMS-WEST GETS THE NOD FOR NODES

**L-3 Communication Systems-West (L-3 CS-West) has been selected by Laser Light™ Communications, LLC (Laser Light™) to be the prime contractor in providing its StarEdge™ Ground Node Systems for Laser Light’s SpaceCable™ network, the first all-optical commercial satellite system with a global hybrid communications infrastructure.**

SpaceCable combines the power of satellites with the power of free space optics (“lasers”) to transmit data at rates 100 times faster than conventional radio frequency (RF) satellite systems. L-3’s innovations will allow SpaceCable to deliver fiber-equivalent bandwidth connections while maintaining carrier-grade performance with low operating costs. The all-optical network is scheduled for deployment in late 2017.

The network connections that L-3 CS-West will provide for the program, referred to



as Global Access Circuits™, enable direct communications to over 100 Points of Presence (PoPs) around the globe and will be seamlessly integrated with today’s ground service networks.

L-3’s advanced networking technology also manages multiple StarEdge ground node locations to eliminate slowdowns from network congestion, outages or potential weather interruptions, ensuring dependable customer communications equivalent to global carrier services.

Robert Brumley, CEO of Laser Light Communications. “L-3’s StarEdge units are planned to be the key point of integration

between Laser Light’s Optical Satellite System and its global terrestrial network, intended to ensure seamless connectivity and network management between the two.”

Andrew Ivers, president of L-3 CS-West, said, “This contract also benefits our valued military customers as they consider laser technology for advanced wireless networking applications.”

Laser Light’s all-optical network, with no service dependency on the congested radio frequency spectrum, will deliver six terabits per second of global communications system bandwidth. L-3’s StarEdge Ground Node System enables SpaceCable to be fully integrated with the existing global terrestrial and submarine fiber telecommunications infrastructure of carriers, enterprises, governments and virtual private networks.

L-3 Communications Systems-West infosite:

[www2.l-3com.com/csw/](http://www2.l-3com.com/csw/)

### AIRBUS DEFENCE & SPACE.. YOU'RE ON TO BUILD THREE CERES SATELLITES FOR FRANCE'S DGA



*Artistic rendition of three closely positioned Ceres satellites.*

**Airbus Defence and Space has been selected by the DGA (Direction générale de l'armement) to build the three CERES satellites, which will provide France with its first operational SIGINT capability.**

"The fact that the DGA has entrusted Airbus Defence and Space with the construction of the CERES satellites demonstrates the quality of our expertise and technology, acquired through our successful development of the ESSAIM and ELISA demonstrators," said François Auque, Head of Space Systems.

"Signals intelligence is flagged as a top priority in the French Defence and National Security white paper. Airbus Defence and Space, which started working with Thales through CERES, is proud to provide France with its industrial and technological expertise, thus confirming its position as the prime contractor for all French space-based intelligence systems."

The CERES (Capacité de Renseignement Electromagnétique Spatiale or Space Signal Intelligence Capacity) system comprises three closely positioned satellites that are designed to detect and locate ground signals, along with ground control and user ground segments. CERES is due to enter service towards 2020.

Airbus Defence and Space has been entrusted with the space segment comprising the three satellites, while Thales is responsible for the payload and the user ground segment.

The two manufacturers are the joint prime contractors for the entire system. In addition, Thales Alenia Space acts as a subcontractor to Airbus Defence and Space in supplying the platform.

Intelligence is one of four priorities identified by the white paper. The 2014-2019 Military Planning Law has translated this priority into programs and funding, which include signals intelligence and one of its operational uses, the CERES program.

This satellite system will give France a capability that few countries possess. In designing and building CERES, Airbus Defence and Space and Thales will draw on the experience they acquired jointly from the ESSAIM and ELISA demonstrators.

Airbus Defence & Space infosite  
<http://airbusdefenceandspace.com/>

## U.S. ASSISTS UKRAINE... FLYS IN THE RAVENS, RADAR, RADIOS + HUMVEES



RQ-11B Raven Unmanned Surveillance UAV.

**Perhaps it's overdue, but at least the help is finally coming through—U.S. lawmakers from both sides of the aisle have voted to send non-lethal military assistance to the Ukraine to help defend themselves against the Russian-backed rebels.**

The fighting began in April, a month after Russia annexed the mostly Russian-speaking Crimean Peninsula.

News was delivered in the form of a White House statement that revealed Vice President Joe Biden had spoken with Ukraine's president Petro Poroshenko and had confirmed that the U.S. will send more aid to the country.

Concerns are growing as Russian-backed separatists are violating cease-fire agreements in eastern Ukraine and are keeping out international monitors.

Lethal assistance is not out of the picture as Victoria Nuland, assistant secretary of state for European and Eurasian affairs, told the Senate Foreign Relations Committee Tuesday that administration officials are still discussing forceful assistance. They are observing the so-called Minsk agreements, which led to last month's cease-fire, that they are implemented.

There have been new transfers of Russian tanks, armored vehicles, heavy artillery and rocket equipment over the border to the separatists in eastern Ukraine quite recently.

The items to be sent, according to U.S. officials speaking on a condition of anonymity as they weren't authorized to discuss the aid on the record, include small Raven drones that can be hand launched, 30 heavily armored Humvees and 200 other regular Humvees, as well as radios, counter-mortar radars and other equipment.

All of the aid is nonlethal and the drones are not armed. The sum total, minus the expense of the Humvees, is \$75 million.

Denials come from Vladimir Putin, the president of Russia, regarding his government's support of the rebels in the war in eastern Ukraine, which has killed more than 6,000 people and forced more than a million to flee their homes.

The fighting started in April of 2014, one month after Russia annexed the mostly Russian-speaking Crimean Peninsula.

## UK MOD'S GREATEST DEFENCE IS AIRBUS DEFENCE & SPACE



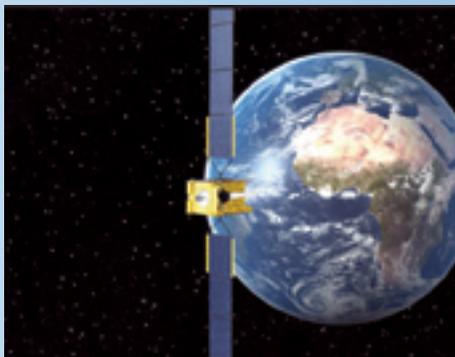
**The UK Ministry of Defence (MoD) has selected Airbus Defence and Space to provide satellite airtime for air and ground tracking of ground assets and helicopters on a worldwide basis.**

The contract is for the provision of Iridium Short Burst Data and Iridium Rudics Data Minutes for the MOD's established Asset Tracking System (ATS), Helicopter ATS (HeATS) and Ground ATS (GrATS).

The business line Communications, Intelligence & Security is the new one-stop-shop for satellite and terrestrial communications systems, intelligence and security solutions.

The UK ATS meets Operational Command situational awareness requirements by providing the location of tracked ground and air assets in near real-time.

The strategic importance of the ATS requires reliability across all of its components including the satellite airtime provided by Airbus Defence and Space to transmit GPS data from assets in the field.



Artistic rendition of an on orbit Skynet satellite.

"This service further extends our close co-operation with UK MOD, beyond the Skynet satellite network. Remote tracking and monitoring of critical assets is a rapidly expanding area and we are delighted to be able to support ATS," said Paul Millington, Head of Government Communications UK Airbus Defence and Space.

Airbus Defence and Space is a satellite services provider with complete control over its own fleet of military satellites and teleports as well as an end-to-end service provider for both military and commercial fixed VSAT and mobile bandwidth and network services.

The UK MoD infosite  
[www.gov.uk/government/organisations/  
ministry-of-defence](http://www.gov.uk/government/organisations/ministry-of-defence)

Airbus Defence & Space infosite  
[airbusdefenceandspace.com/](http://airbusdefenceandspace.com/)



# HPA CORNER: NEW AND ADVANCED TECHNOLOGIES

By Amy Akmal, Communications, Space Systems, Northrop Grumman

**A**s leaders from government agencies determine how best to develop a future space architecture, one thing is certain: Advances in technology will help drive a new approach to space.

Exciting leaps in space-based technologies present new ways of looking at issues to deliver affordable and secure solutions—with evolving technology behind hosted payloads leading us to a more efficient and smarter future.

The rigors of launch and a complex space environment requires long-term performance for critical missions and demands thoughtful refinement to adapt ground components for space use.

The good news is that technological breakthroughs in industry are enabling unprecedented progress to reduce cost, shorten delivery schedules and deliver high performance capabilities.

This column's question for HPA Members is...

**From your perspective, as members of the Hosted Payload Alliance, what new/advanced technologies are you excited about?**

"Important considerations when adding a hosted payload are power, weight and physical size. The more hosted payloads require from the host satellite, the fewer the available resources for the primary payloads. Boeing is interested in technologies that make hosted payloads more weight- and power-efficient. Gallium Nitride (GaN)-based products such as Solid State Power Amplifiers (SSPAs) and Low Noise Amplifiers (LNAs) can reduce footprints for many hosted payloads. Another relatively mature technology is a Field Programmable Gate Array (FPGA). FPGAs can be leveraged to provide fast turn digital solutions necessary for hosted payloads, and enable the customization of processors necessary to implement complex solutions within the tight schedule constraints of a commercial satellite acquisition. Separately, Boeing also has an interest in exportable encryption developments that will support payloads of national importance as hosted payloads are integrated or launched on a more diverse set of satellites and launch vehicles."—*Jim Mitchell*, Vice President, **Boeing Commercial Satellite Services**



"We think that hosted payloads will play a key role in the development of multiple new technologies. A great example of that is our work with NASA on the laser communications relay demonstration (LCRD). As the payload and ground system are being developed we are working on the interfaces so that the demonstration can meet the requirements of a commercial schedule. Optical communications use an uncongested portion of spectrum compared to the radio frequency (RF) communications



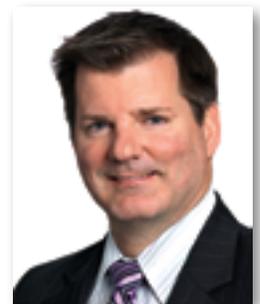
generally used to transmit data from space. We think laser communications has great potential to provide order of magnitude higher data rates than RF for point-to-point communications, to enable access to much more of the vast amounts of data that are being gathered from distant planets, including images and video. For commercial satellites, laser communications could provide data at rates that are faster than today's RF rates, with much less mass and power. It is great that NASA is looking at commercial capabilities for future space data relay needs, and we are excited at the prospects for both Earth Orbiting and Deep Space missions."—*Al Tadros*, Vice President of DoD and Civil Business, **SSL**



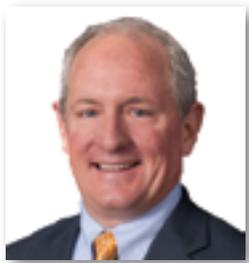
"I am most excited about the capabilities available today and, more importantly, in the near future, for hosted payloads with the new high throughput satellites (HTS) coming on-line. The innovative, efficient, and flexible designs being implemented in multi-spot, high frequency re-use satellites bring unprecedented throughputs to end-users. Designs being worked on and proposed provide even more flexibility, performance and resiliency. Hosted payloads can, and should, leverage the improved communication capabilities resident on their host satellites."—*Mark Daniels*, Vice President, Engineering and Operations, **Intelsat General Corporation**



"As government agencies continue to struggle with tight budgets, there are emerging technologies being advanced by commercial entities that are gaining the attention of scientists, investors, and Congressional members. The 2014 Congress considered a bill to advance space-based commercial weather data opportunities. Unfortunately the Senate didn't consider the bill in 2014 but we look forward to the 2015 Congress re-engaging in this great opportunity. Advanced weather collection capabilities have been hampered for years as current Programs of Record ran over budget and behind schedule. The proven and rapidly advancing technologies available through commercial investments will take root over the next few years, the only question that remains is: Will the U.S. be the leader or wait to be a follower."—*Tim Deaver*, Vice President, Corporate Development, **SES Government Solutions**



“Space calls for high speed and low power digital electronics, high efficiency RF transmitters, sensitive low noise receivers, and low weight components. Ground consumer electronics demand is moving component manufacturers in a direction that complements space needs and we can adapt advances driven by the commercial electronics industry to the space environment. Lower feature size solid state electronics enable more processing power per pound and watt, smaller total size, less total power, and reduced demands for thermal control. This fits right into the hosted payload equation. We know current payloads can be miniaturized with advanced digital, sensor, and RF technology. Payloads that today require a free flier platform can be substantially reduced in size, weight, and power while improving capacity, performance, flexibility, and reliability. That said, it requires both vision and determination to make the right choices and exploit the art of the possible to meet mission needs at lower total ownership costs.”—*Tim Frei*, Vice President, Communication Systems, **Northrop Grumman**



“Our world has become a very dynamic and fast changing place, and our customers’ mission needs change at the same pace. Reconfigurable payloads provide the flexibility needed to address customers’ evolving needs. A software defined payload architecture such as Harris’ AppSTAR™ provides a reconfigurable, multi-mission platform, enabling mission managers to change the function of the payload on the fly. The software re-programmability enables the use of a mature, space qualified hardware platform, accelerating the timelines to space, and provides greater flexibility to align host platforms and hosted payload schedules.”—*Allen Lindsay*, Vice President of Responsive Solutions, **Harris Corporation**



**Editor’s note:** HPA Chair Nicole Robinson will be representing the Alliance during the Hosted Payload and Smallsat Forum track at Satellite 2015. She is part of the panel session “Marching Toward the Milestones: Next Steps for Commercially Hosted Government Payloads” March 16th at 9:00 a.m.

Established in 2011, The Hosted Payload Alliance (HPA) is a satellite industry alliance whose purpose is to increase awareness of the benefits of hosted government payloads on commercial satellites. The HPA seeks to bring together government and industry in an open dialogue to identify and promote the benefits of hosted payloads. The HPA ([www. ww.hostedpayloadalliance.org/](http://www.ww.hostedpayloadalliance.org/)):

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

## The Benefits of Hosted Payloads

A hosted payload is a portion of a satellite, such as a sensor, instrument or a set of communications transponders that are owned by an organization or agency other than the primary satellite operator.

The hosted portion of the satellite operates independently of the main spacecraft, but shares the satellite’s power supply, transponders, and in some cases, ground systems.

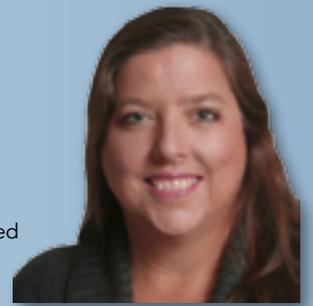
The concept of a hosted payload was developed in order to enable government organizations to make use of commercial satellite platforms in order to save costs and create a more distributed architecture for space assets.

Choosing to piggyback a hosted payload on a commercial satellite has many benefits:

- » Shorter time to space. Because the development of an entire satellite system is not required, a hosted payload on a commercial satellite can reach space in a fraction of the time that it would take to develop a free flyer program. Roughly 20 commercial satellites are launched to GEO orbit each year and each one presents an opportunity to add on additional capability.
- » Lower cost. Placing a hosted payload on a commercial satellite costs a fraction of the amount of building, launching and operating an entire satellite. Cost reductions can result from shared integration, launch and operations with the host satellite.
- » A more resilient architecture. Hosted payloads enable a more resilient space architecture by distributing assets over multiple platforms and locations. Rather than creating a single platform with multiple capabilities that could be a target for adversaries, spreading capabilities over multiple locations has the potential to contribute to a more resilient space architecture.
- » Increased access to space. Roughly 20 commercial launches each year provides multiple opportunities for access to multiple orbit locations during the year.
- » Operational options. Hosted payloads have multiple options to use existing satellite operations facilities with shared command and control of the hosted payload through the host satellite, or a completely dedicated and separate system operated by the hosted payload owner.

# EXTENDING THE LIFETIME OF HIGH POWER TWTAs

By Heidi Thelander, Senior Director, Business Development, Comtech Xicom Technology



**H**ow long will my high power amplifiers last? This question has vexed many an operations manager, teleport engineer and capital planner for a long time. Certainly longer is better, but if I'm not ready with replacements, I have a definite problem.

What if you could count on much longer operational life from your Traveling Wave Tube Amplifiers (TWTAs)? Would that help? That information would certainly help, but only if you knew how much longer of a lifetime.

What if your amplifiers notified you when they were going to reach end-of-life, with months of notice before such occurs? What if no additional maintenance was required to maintain performance by retuning linearizers as the TWTAs age?

Technology used in space to generate longer lifetimes, maintain continuous performance until near end-of-life, and provide greater diagnostics for high power TWTAs has finally come down to Earth. This Life Extension capability has been used in space TWTAs for more than 20 years—more recently, this technology has been implemented in TWTAs manufactured by Comtech Xicom Technology for ground fixed SATCOM terminal uplinks.

The need for this capability has existed in fixed uplink terminals for decades. All manner of techniques have been used by operations managers to estimate and prepare for an amplifier's end-of-life. The proliferation of global coverage High Throughput Satellite (HTS) systems and numerous big gateways to support them has resulted in large, simultaneous ground station deployments rather than having teleports and gateways grow more organically with the increase in traffic.

A large number of high power TWTAs are being deployed nearly simultaneously, increasing the risk that many will reach end-of-life within a short period of time—possibly faster than the equipment can be replaced from a normal spares pool. The major investment of replacing TWTAs across the ground system must be planned for and capitalized, and no one wants to do that before they absolutely have to make such moves, resulting in the drive to make ground-based TWTAs more like their space-based cousins.

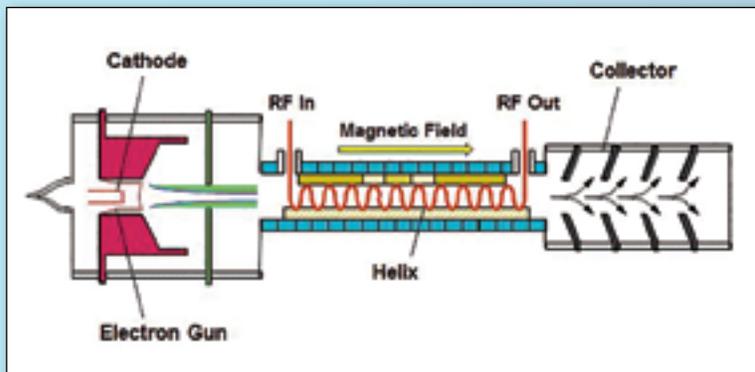


Figure 1. Helix TWT Diagram Showing Major Elements

As a TWT ages, the equipment's cathode current begins to droop over time, degrading gain and output power. TWTAs can often operate many years with reduced cathode current, but they no longer meet original performance specifications, thereby reducing the equipment's useful life and limited link margin.

This droop was historically accepted and planned for, but the added cost of link margin to account for reduced performance is quite high in high-power, higher-frequency applications where system designers are pushing the limits of amplifier capability at beginning-of-life.

Over the years, amplifier engineers have attempted various approaches to extending TWT life, including adjusting the three primary control parameters available in the helix TWT (Figure 1): cathode voltage, cathode heater temperature and cathode current.

- **Cathode voltage:** cathode voltage is a critical parameter for overall TWT performance. Since cathode voltage adjustments affect TWT gain, peak power and frequency response, this voltage is set by the TWT manufacturer and should not be adjusted in operation.
- **Cathode heater temperature:** cathode heater temperature or Cathode Temperature is used to make electrons available for use in the electron beam and is set to maximize cathode life while maintaining adequate emissions over the life of the product. Although this temperature has been used to extend the cathode life, it does little to maintain the performance of the TWT over this life. Test and analysis has shown that the TWT begins losing peak power capability as well as gain starting as early as year 1 or 2 of operation, affecting linearity performance and typically requiring multiple linearizer adjustments to maintain performance over TWT life. Lowering the cathode temperature can also create focusing issues that cause permanent damage to the TWT. The space TWT industry has moved away from this approach, due to risks of potential damage that are unacceptable for space applications.
- **Cathode current:** Cathode current has proven to be the most reliable method for extending TWT operational life and monitoring TWT performance. By continuously monitoring and adjusting the TWT's electrode or "anode" voltage to maintain a constant cathode current, the amplifier's gain and output power are maintained throughout the TWT life. This not only extends the useful life of the TWT significantly (Figure 2), but also maintains the amplifier's linearity performance throughout the product life cycle without periodic maintenance to adjust the linearizer for changes in TWT gain. This method has been shown to eliminate degradation in cathode current in the first 6 years of operation (no linearizer readjustments), and reduce any degradation in the remaining years of life (extending useful life by 2-3 years).

The space TWT industry, which has much more at stake if a TWT fails to meet life expectancy than ground systems, which can be spared and maintained, has entirely adopted this constant cathode current approach to TWT life extension. Comtech Xicom Technology has adopted this approach for ground-based, very high power TWTAs and has implemented the technology in more than 2,000 amplifiers to date (Figure 3 on the next page).

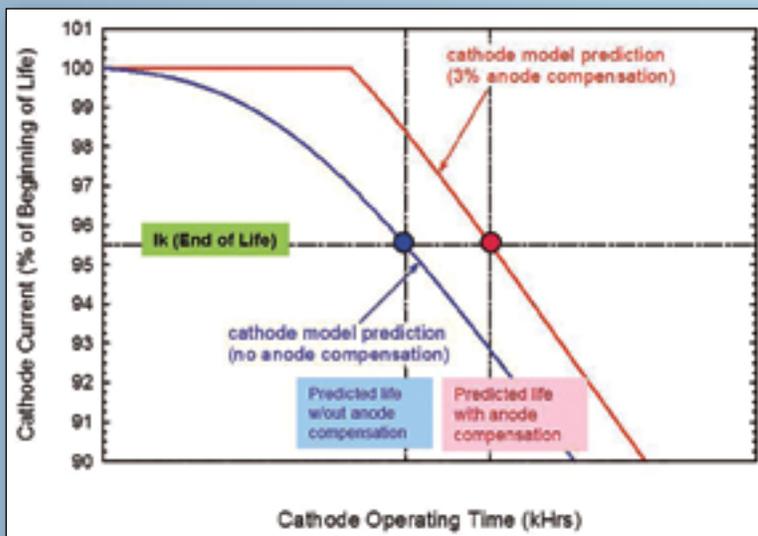


Figure 2. Constant Cathode Current Approach Extends Useful TWT Life by One-Third

Finally, Constant Current Life Extension gives the operations manager what he or she really needs most: visibility into end-of-life. The anode voltage used to maintain the cathode current at a constant level throughout TWT lifetime has a limited operational range.

For this approach, the initial anode voltage set-point will be nearer the bottom of the range to allow for increases over time. Once the anode voltage reaches its maximum allowable value, late in the life of the TWT, the remaining TWT lifetime is fairly predictable.

The time it takes for output power to degrade by 1 dB provides the operator time to buy and plan for installation of replacement amplifiers, thus taking the guesswork out of when to do it. By monitoring anode voltage over the TWT life, smart operations managers can project much further in advance when they should plan to replace the amplifiers, often after 10 years plus of service.



Figure 3. Comtech Xicom Ka-band 500W Helix TWT with Constant Cathode Current Life Extension

Source: [www.xicomtech.com/products/products-twta-xtd-500ka.asp](http://www.xicomtech.com/products/products-twta-xtd-500ka.asp)

Operators of today's very large gateways with many TWTAs having about the same operational start dates could really use that information. Low risk to the TWT, longer useful life and you know when to replace them—what more could you ask for?

Heidi Thelander, Senior Director of Business Development at Comtech Xicom Technology, has more than 20 years of experience in satellite systems and hardware design for space and ground, program management and business development for space payloads and RF amplifiers. Heidi has worked for large defense system integrators and start-ups, including TRW (now Northrop Grumman), Lockheed Martin, Centerpoint Broadband, Wavestream, and Comtech Xicom Technology. She holds a BSEE from Marquette University and an MSEE in Communication System from the University of Southern California.

Comtech Xicom Technology, founded as Xicom Technology in 1991, has grown to be a world leading satellite communications (satcom) amplifier supplier, offering the broadest product line in the industry. Xicom provides rugged, highly 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 broadcast and broadband applications around the world. These Xicom High Power Amplifiers (HPAs) are in use in critical communications links on the ground, in the air and on the sea; they support fixed traditional and direct-to-home broadcast, mobile news gathering, transportable and flyaway systems, secure high data rate communications, and broadband access over SATCOM.

Comtech Xicom Technology, part of the Comtech Telecommunications Corp., is headquartered in Silicon Valley in Santa Clara, California, and has offices in Virginia, Florida, Illinois, the United Kingdom, and Singapore. There are also 11 certified service centers and sales offices around the globe.

Comtech Xicom infosite: [www.xicomtech.com/](http://www.xicomtech.com/)



Comtech Xicom Antenna-Mount TWTAs

## O3B SELECTS AVL TECHNOLOGIES TO BUILD A CONSTELLATION OF 24 BITSATS, THAT IS THE PLAN



### O3b Networks has selected AvL Technologies to design and build the Transportable Terminal Antenna System for use with O3b's Medium Earth Orbit (MEO) satellite network.

This program calls for AvL to develop and manufacture the hardware and software for a family of Earth station antennas with reflector sizes of 0.85m, 1.0m, 1.2m, 1.8m and 2.4m. These Transportable Antenna Systems will enable O3b's customers to rapidly deploy systems to take advantage of O3b's "Fiber Speed with Satellite Reach."

The O3b network is unique in that its use of multiple satellites in MEO and Ka-band frequencies will allow for extremely wideband digital traffic with minimal latency, effectively doing away with the delay inherent in traditional satellite communications. The AvL Transportable Terminal Antenna System will enable users to realize the benefits of this technology with the ability to move and rapidly deploy the network's capabilities to meet changing requirements and evolving needs.

The Transportable Terminal Antenna System is designed to be transported in durable transit cases and to be set up and on-the-air within two hours. The 0.85m transportable terminal will be shown in AVL's booth at Satellite 2015.

"These high performance transportable antennas are designed to acquire and track the O3b satellites as they move across the orbital arc. AvL Technologies was selected by O3b because of the high quality of our antennas and our engineering expertise to design and manufacture antennas that can work in tandem to accurately follow the satellites" said Mike Proffitt, President of AvL Technologies.

Jeff Garzik, Bitcoin pioneer and CEO of Dunvegan Space Systems (DSS) has signed a contract with Deep Space Industries (DSI) to build a 24 BitSat satellite constellation as the first element of a new strategic alliance between the two firms.

The nanosats to be used in the Dunvegan constellation designed by DSI provide an order of magnitude cost advantage over traditional telecommunication satellites.

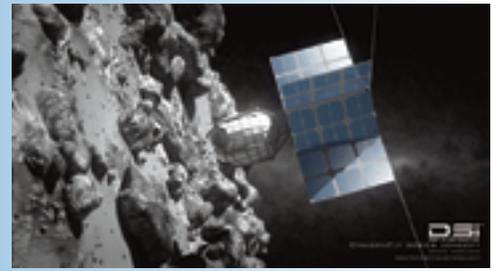
Based on the industry standard Cubesat form factor, BitSat enables a cost and performance framework that supports the open platform business model employed by Dunvegan.

Deep Space Industries is a technology and spacecraft design company, currently developing efficient means of utilizing the resources of outer space. DSI will locate, harvest, and refine asteroid materials and then manufacture and distribute products, propellants and technology solutions to in-space customers.

"Just as Bitcoin is revolutionizing financial exchanges, Dunvegan will do the same for space systems with this project," said Garzik. "To do it right we needed a partner that was both visionary and technically capable. Once I began to work with Deep Space we realized we had found that partner."

Building on expertise in open-source software and democratized financial systems, Garzik launched this new company to capitalize on the rapidly emerging commercialization of space and advancements in technology platforms. Dunvegan specializes in distributed applications and computing solutions for the space based market, including Software-as-a Service (SaaS) platforms and financialization of space resources.

"DSI's long term goal of harvesting space resources is well known, and our first steps involve developing nimble, low cost spacecraft that turn out to be very similar to the needs of Dunvegan," said DSI CEO Daniel Faber. "Partnering with DSS on the BitSat project allows DSI to ramp up production of our spacecraft avionics suite and implement several improvements. It's a perfect match all around."



*The Dragonfly concept vehicle—Deep Space Industries is developing innovative spacecraft for long-duration deep space missions, including the Firefly- and Dragonfly-class vehicles. The Dragonfly is designed to capture and transport resources of various shapes and sizes. Image Credit: Bryan Versteeg, DSI.*

The DSS constellation will be the first-ever constellation of communication satellites based on open platform principles, with a focus of providing communications, data processing, storage and broadcasting capabilities in space. The deal to build and fly the spacecraft was signed after a several months long interaction between the two firms, including a detailed constellation and spacecraft design project completed last summer by Deep Space at its Silicon Valley based NASA Ames facility.

"This is the first of a number of efforts we have planned with DSI," said Dunvegan CEO Jeff Garzik. "Dunvegan is focused on providing software and data solutions for our customers, while the partnership with DSI will provide the hardware for this and several upcoming projects. Together we believe we can help transform the ability of people around the world to benefit from space activities, be it in terms of communications or resources."

Dunvegan Space Systems is preparing to launch the first-ever constellation of communications satellites based on open platforms and computing systems, with a focus on providing data processing, storage and broadcasting capabilities in space.

Dunvegan believes that the rapidly emerging commercialization of space represents an untapped market for open-source communication and computing systems that can provide unique advantages over current terrestrial solutions.



## COMTECH XICOM TECHNOLOGIES—SUPERPOWER PRODUCTS DEBUT, CAPES NOT INCLUDED...



**Comtech Xicom Technology, Inc. HAS introduced new, highly efficient, very high power Ku-band and DBS-band SuperPower™ traveling wave tube amplifiers (TWTAs) that can double available TWTAs output power and provide direct replacement for Klystron power amplifiers (KPA) in satellite communications uplink applications.**

These TWTAs were made possible thanks to Xicom's development of new SuperPower technology that brings proven space designs down to the ground and takes established millimeter-wave designs and scales them for use at Ku- and DBS-band frequencies.

The result is the highest power helix TWT ever offered for SATCOM uplink bands as well as an extremely efficient, compact and reliable amplifier that can dramatically lower capital and operational expenses.

The SuperPower TWTAs at both frequency bands are available as rugged outdoor antenna-mount units that can withstand -40 to +60 C operating temperatures or as indoor rack-mount configurations that incorporate Xicom's LCD TouchScreen front panels for ease of use and access. Either way, the operator saves space, prime power consumption, and money by incorporating this new breakthrough technology.

Xicom Technology also introduced their new SuperPower TWT amplifiers...



*SuperPower™ Antenna-Mount TWTAs.*

The Model XTD-2000KHE Ku-band TWTAs provides the user with 750W of linear power in a compact, rugged package weighing only 92 lbs. and drawing less than 3200 watts of prime power.

The Model XTD-1500DBSHE DBS-band TWTAs provides the user with 560 watts of linear power for Direct-to-Home (DTH) applications in the same rugged 92 lb. package and draws only 2500 watts of prime power.

Both units are small enough to be mounted in the antenna hub and are designed to operate over -40 to +60C temperature range.

They have built-in predistortion linearizers, output protection circuitry, SNMP-based Ethernet monitor and control interfaces, and built-in redundancy switch control capability.

Options are also offered for extended frequency bands, internal upconversion from L-band, and liquid-cooling for low acoustic noise. Companion redundancy and phase combining systems are also available.

In addition to the new SuperPower TWT technology, these TWTAs incorporate Xicom's Life Xtension with Constant Current control mechanism for dramatically extending the useful life of the TWTAs with very low risk, while providing the operations team with valuable and accurate predictive information on end-of-life for long-term replacement planning.



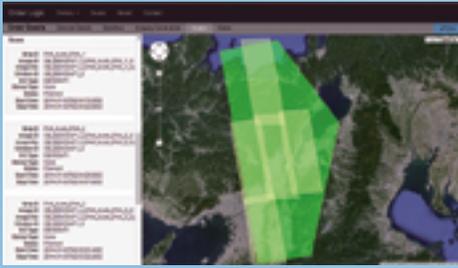
*XTD-2000KHE Antenna-Mount TWTAs, Ku-Band, 2000W*

This feature saves on reduced capital expenditures from extension of TWTAs use as well as reduces the uncertainty of replacement timing, allowing capital to be allocated more efficiently by SATCOM system operators.

"It's exciting to see our commitment to this challenging development and this incredible product line come to fruition," said John Branscum, President of Comtech Xicom Technology. "We could not be more pleased with initial customer reactions. Interest in the SuperPower products is the highest we've seen on any new development, because it really does change the business case for SATCOM uplinks. Xicom has a long history of pushing the limits of HPA technology, and we plan to continue that legacy of innovation in advancing amplifier technology to solve our customers' hardest problems."

Comtech Xicom Technologies infosite  
[www.xicomtech.com/](http://www.xicomtech.com/)

## ORBIT LOGIC'S SOLUTIONS HEADING TO U.S. GOVERNMENT CUSTOMER FOR UNDISCLOSED PROGRAM



*Orbit Logic's web application.*

**Orbit Logic has announced they will provide their Collection Planning & Analysis Workstation (CPAW) software and Order Logic software product and associated engineering services to a U.S. government customer for an undisclosed program.**

CPAW will be deployed for operational planning while Order Logic will be used for task order management and plan visualization.

Orbit Logic's Collection Planning & Analysis Workstation (CPAW) software solves the difficult problem of satellite imagery collection planning through a spacecraft simulator

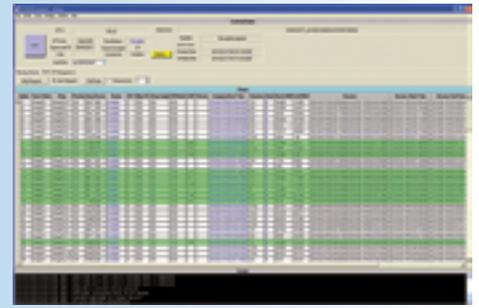
coupled with scheduling algorithms that generate valid and optimized high fidelity imagery collection plans for use in satellite operations, analysis, or imagery ordering.

CPAW covers everything from contact scheduling and recorder management to power and antenna modeling while accounting for satellite maneuverability, system availability, timing constraints, and sensor capabilities.

Planning can be completely manual, fully automated, or anywhere in between to plan for anything from a single image on a single satellite to extensive order decks collected by a constellation of multiple EO and SAR spacecraft with varying capabilities.

Order Logic is an add-on to CPAW for web-based management and tracking of imaging requests.

Order Logic provides visualization of imaging plans, allows users to understand when new images of their targets are likely to be



*Orbit Logic's CPAW Tabular Planning GUI.*

available, and tracks fulfillment status of requests for new imaging.

Logins and configurable permissions ensure that users are limited to the order management capabilities and data for which they are authorized.

Orbit Logic infosite: [www.orbitlogic.com/](http://www.orbitlogic.com/)

# INSTABILITY DRIVES MOBILITY FOR SPECIAL OPS & ARMY

By Carolyn Belle, Analyst, NSR USA

**G**eopolitical tension and instability are the ever-present reality of today's connected world: a smoldering insurgency in Nigeria and Somalia, coordinated international strikes against ISIS, conflicts in eastern Ukraine, the Ebola response in West Africa, drug and human trafficking interdiction in Central and South America, heightened hostility in the South China Sea... and, as evidenced by the January attacks in Paris, even terrorism in regions long considered stable and remote from attacks.

This range and distribution of emerging military threats is driving the evolution of U.S. defense strategy to one centered on responsive and flexible capabilities supported by comprehensive information, surveillance, and reconnaissance (ISR) activities.

As this strategy is implemented, and as other nations modernize their militaries in parallel, a growing emphasis on mobile requirements will reshape opportunities for the satellite communications industry.

First, given the mandated reduction in U.S. troop levels, addressing disparate threats in a responsive manner will require reliance on smaller troop formations and mobile units. This structure is already employed by Special Operations forces, and is a growing component of Army operating concepts.

With smaller active units and remote engagements, communications will become more critical to mission coordination and success, boosting the addressable market for portable, quickly deployable small form factor SATCOM connectivity.

A second implication of evolving defense strategy is intensifying demand for ISR activities that directly support targeted intervention and small formation operations. This will include a dual approach of manned and unmanned platforms, both of which are currently undergoing expanded procurement and outfitting with SATCOM terminals.

As coverage areas widen and data collected grows from optical imagery to SAR and video, bandwidth demand for data links will surge.

As a result of these new operational patterns, NSR's Government and Military Satellite Communications, 11th Edition, report shows that mobility in-service units will exceed one million by the end of the decade.

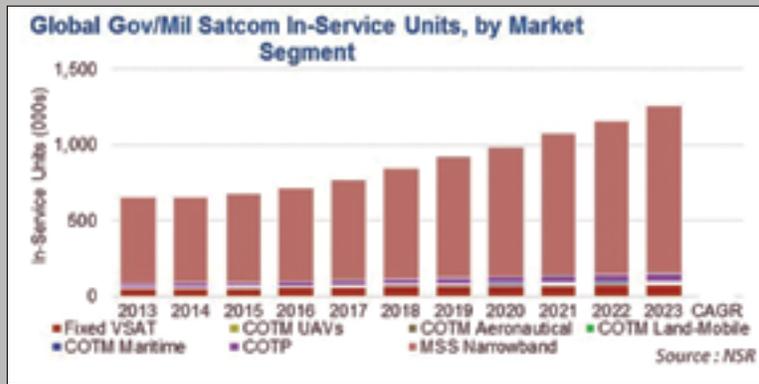
More than 500,000 will be new MSS narrowband terminals, and another 36,000 units for broadband land mobile markets (COTM, COTP) will be added, driven by higher bandwidth demands for VoIP and video conferencing.

On the ISR side, airborne manned and unmanned units will increase by 5,300 in-service units. These additional users translate to service revenue growth of over \$4 billion by 2023.

Rhetoric on the demand for increased SATCOM connectivity is plain to see, but the real concern is a steady funding source in annual budgets. For Special Operations and ISR via UAVs, the outlook is positive. The U.S. 2014 Quadrennial Defense Review highlighted both ISR and Special Operations as vital capabilities to augment, and this was reflected in the FY 2016 Defense Department budget request earlier this month.

Special Operations Command funding, provided through both the base DoD budget and Overseas Contingency Operations budgets, has consistently increased. ISR funding saw reaffirmed support in FY2016, with the budget request reversing FY2015's decreases in regional Combat Air Patrols.





NSR's report link:

<http://www.nsr.com/research-reports/satellite-communications/government-and-military-satellite-communications-11th-edition/>

Ms. Belle joined NSR as an analyst in 2014. Her main focus is satellite manufacturing and launch markets, and in particular the trends surrounding creation of diversified space architectures. She also contributes to research in government and military communications markets in addition to participating in the diverse tailored consulting projects undertaken at NSR.

Ms. Belle comes to NSR from the Research and Analysis team at the Space Foundation, where she contributed to the creation of the publication *The Space Report 2014*. Her research efforts primarily addressed new and emerging space products and services. This position was preceded by an internship with the Space Foundation during which Ms. Belle explored the policy considerations and efficacy of international space endeavors such as the International Space Station.

Ms. Belle received a Master's degree in Space Management from the International Space University in 2013. Prior to attending ISU, she coordinated programs for a science outreach non-profit in Colorado. Her Bachelor's degree was awarded from The Colorado College in 2010 with a focus in Biology and Chemistry. During her undergraduate studies, Ms. Belle completed several internships at the NASA Ames Research Center in microbiology and atmospheric chemistry.

Thus, while overall federal DoD spending will remain strained in the near term, ISR and Special Ops demonstrate preferential treatment and higher funding—enabling investment in equipment modernization and acquisition.

Despite a negative outlook for government and military SATCOM markets through 2016, demand continues to grow and funding and procurement will catch up towards the end of the decade.

Emerging trends to equip lower levels of command and small troop formations with SATCOM connectivity will drive in-service unit growth in the land mobile markets, and ISR services demand will similarly propel manned and unmanned aero connectivity.

In an environment of growing and diversifying geopolitical instability, the response will require highly mobile, well equipped troops that can both exhibit a strong global presence and effectively pursue low-intensity conflict unnoticed.

# DRIVING DOWN THE COST OF PHASED ARRAY ANTENNAS

By Josh Bruckmeyer, System Architect, Harris Corporation



**M**ilitary and consumer users demand wider bandwidth systems to support a broad range of services from higher data-rate communications to anti-jamming radars.

Phased array technology, which improves spectrum management, can increase bandwidth to help meet user demand. However, this technology comes at a budget busting price. A technology breakthrough is needed that provides sufficient bandwidth to enable mission success within budget.

Enter elemental digital beam forming (DBF), a new technology that allows cost effective deployment of phased array antennas.

Elemental DBF delivers cost-effective spectrum management for military and commercial customers. Analog systems, such as active electronically scanned array (AESA) radars, employ a costly and complex radio frequency beam former network to combine thousands of elements into just a handful of beams.

However, in a fully digital system, the thousands of elements are digitized—allowing 10 or even 100 beams to be simultaneously formed—which can dramatically increase coverage and reduce interference.

This technology enables high numbers of radio signal ‘spot beams’ to be directed towards a specific area—for example, on the Earth’s surface. To visualize this technology—imagine each of the spot beams as a flashlight, as shown in Figure 1. DBF allows you to employ as many flashlight beams as you need for coverage, with the ability to point the flashlight beams anywhere in the field of regard. As with traditional phased array technology, the antenna does not have to move as it is pointed electronically.

From a communication system mission perspective, this means a large number of agile spot beams provide better coverage. For military radars, this means

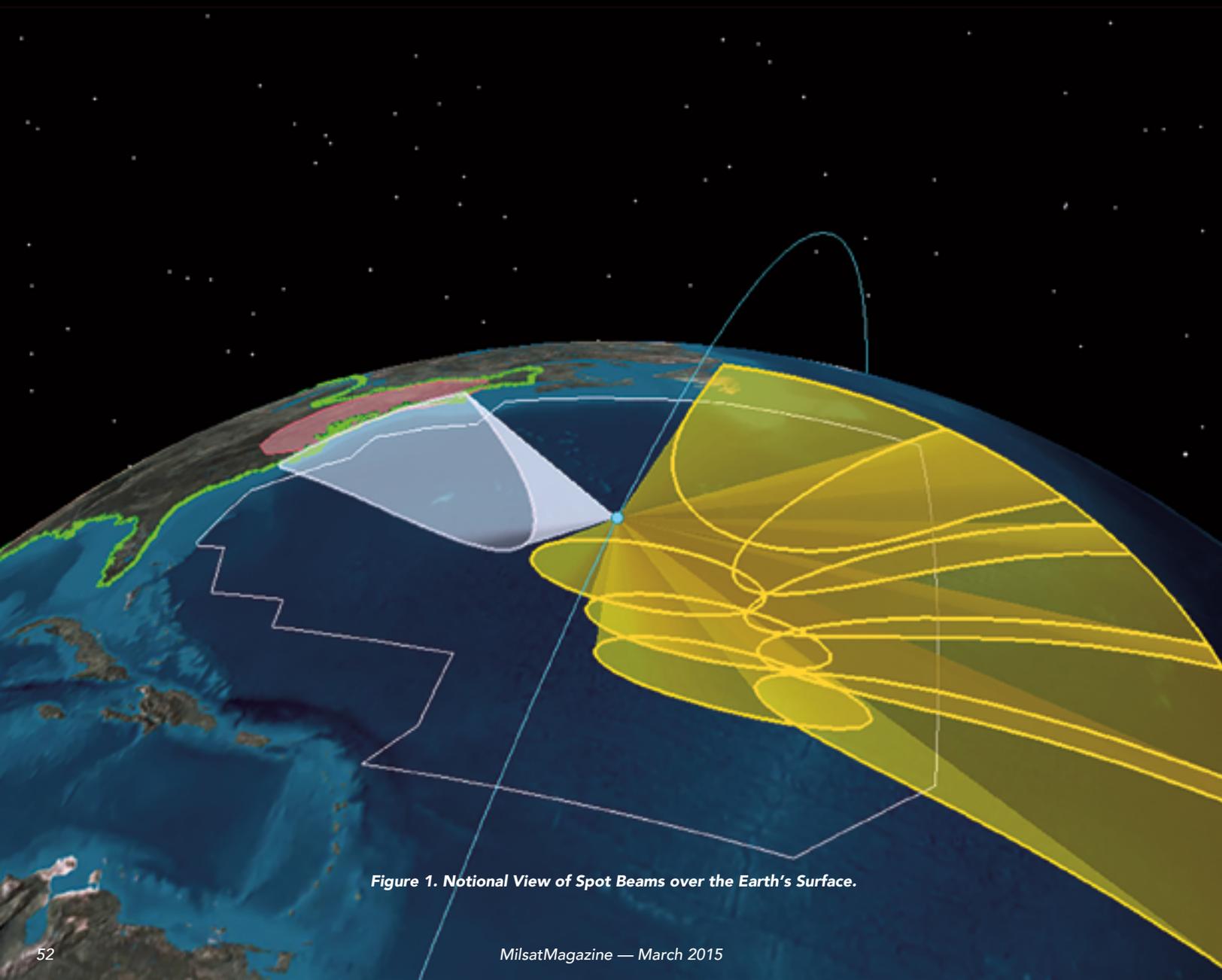


Figure 1. Notional View of Spot Beams over the Earth’s Surface.

avoiding an adversary's jamming or even jamming the adversary in return. But that's just the tip of the iceberg.

The potential is almost infinite.

### **Automatic Phased Array Calibration**

A driving barrier for extensive adoption of elemental DBF is the cost per unit. Emerging techniques, such as automatic calibration, will allow such advanced antennas to reach the market at a fraction of the cost. Automatic calibration improves system performance by correcting for age-related degradation or calibration errors. This will help reduce the recurring cost of electrical components with the ability to relax component specifications.

Harris has developed and deployed narrowband automatic calibration antenna solutions and is now expanding to wideband applications. The method uses an internal calibration network to illuminate and correct the electronic channels before forming the beam. The result is a real-time mathematical model to calibrate the beam forming network which allows accurate pointing and shaping.

This injection-based approach does not require an external signal. This application will be beneficial in instances such as use by a stealth aircraft, which will be able to calibrate its sensors without any telltale electronic signature.

### **Current Narrowband Phased Array in Operation**

Harris developed and is manufacturing Aireon, LLC's 81 space-based hosted payloads for its Automatic Dependent Surveillance–Broadcast (ADS–B) system (see Figure 2). ADS-B will revolutionize air traffic management by improving situational awareness, optimizing flight paths and altitudes, and increasing operational and fuel efficiency for airlines, while reducing infrastructure costs for air navigation service providers.



**Figure 2. Aireon Hosted Payload on the Iridium NEXT Space Vehicle.**

The Harris solution employs a narrowband elemental DBF phased array to enable efficient beam pointing, which is a critical design element to address signal interference prevalent in the air-to-space channel. To optimize performance over the ADS-B payload mission life, Harris engineers used one of their narrowband automatic calibration methods. The method is very efficient in terms of size, weight, and power for this hosted payload (shown in Figure 3). The architecture allows 1) antenna patterns to be completely software driven from the ground and 2) the system to optimize the beam pattern at any time during the mission.

### **Future Wideband Phased Arrays in Operation**

For wideband applications, such as radar and electronic warfare (EW), the applications for DBF are enormous. DBF enables a high number of beams allowing a single antenna to perform radar scanning, electronic attack, and communications simultaneously.



**Figure 3. Aireon Hosted Payload.**

Cost effective calibration is the key to bring this technology to market. Automatic injection calibration is a method to achieve this. While current systems have some of these abilities, the new architecture will optimize size, weight and power to reduce costs.

This technology will also revolutionize the satellite industry because elemental digital phased array antennas allow a satellite's coverage area to be flexible. In addition, this architecture increases the number of spot beams; providing greater coverage.

### **Revolutionary Technology to Become Commonplace**

Elemental DBF phased array antennas are the future. Harris' continued innovation and investment in auto calibration will allow the company to cost-effectively bring this technology to the wideband phased array market. It is only a matter of time before this revolutionary technology will become commonplace. This will result in satellites and radars that are lighter, cheaper and perform far better than any system operating today.

### **All that is required is innovation.**

Josh Bruckmeyer is a system architect at the Harris Corporation. He has 14 years of experience developing satellite payload and software defined radio (SDR) systems, with a specialization in signal processing and phased array antenna systems. Josh received his bachelor's degrees in electrical engineering and computer engineering from the University of Florida, his master's degree in electrical engineering from Florida Institute of Technology, and is currently pursuing a PhD in electrical engineering at the Florida Institute of Technology.

# EYES ON TARGETS: AERIAL SURVEILLANCE

By Mike Payne, Global Chief Technical Officer, VISLINK

**A**s today's security and defence threats become increasingly complex, airborne surveillance systems are critical to providing real-time, superior video over large operational areas.

Mission success depends on decisive action based on live, real-time video from the field. From border incursions to domestic uprisings, airborne platforms provide consistent and effective surveillance imagery. For public safety officials, helicopters, fixed-wing aircraft, and Unmanned Aerial Vehicles (UAVs) all deliver actionable intelligence that optimizes officer safety and improves incident detection and actionable outcomes.

In areas with established downlink infrastructure, multiple tower sites are equipped with sector antennas and one or more receivers to provide complete coverage. As the aircraft travels through the coverage area, the signal is received at multiple tower sites simultaneously and transported as IP over the customer's secure network to the Network Operating Center (NOC). These incoming IP streams are routed through a switch, which compares the streams simultaneously, selects the best available stream, and generates one seamless video output for viewing by command staff.

## Aerial Downlinks and SATCOM

When airborne surveillance operations are undertaken outside available infrastructure, transportable solutions are required. In these instances, portable SATCOM equipment, used in conjunction with digital microwave downlinks, provide an encrypted flow of visual information to the Command and Control Center, delivering seamless operation for real-time decision making benefits. SATCOM equipment can also be used to expand surveillance coverage on the fly. Helicopter crews can quickly deploy their own tactical transmission infrastructure using a "grab and go" kit that includes a compact sector pod antenna, tripod, tactical receiver case and portable SATCOM unit.

In these situations, the helicopter flies to the target area and locates a strategic point to place the downlink system. Once the portable SATCOM terminal is aligned with the satellite, the helicopter can then fly anywhere within the downlink antenna's range and transmit real-time video through the satellite to the NOC. Multiple receive systems can be set up to increase operational range, depending on the mission profile. To ensure rapid and accurate data transmission, low latency digital video compression and forward error correction (FEC) algorithms are used.

These techniques lower the total bandwidth resource allocation to the terminal and increase the reliability at which information is delivered to the end-user.

Depending on the available IP bandwidth and type of terminal, the SATCOM system may be able to provide VOIP, email, and two-way communication concurrently with video transmission. Web-based command consoles can provide remote control of the terminal and all equipment in the field. This combination of portable microwave downlinks and secure satellite equipment delivers encrypted, HD-quality video to command center personnel from any location.

## Interoperability: The Modern Approach to Surveillance

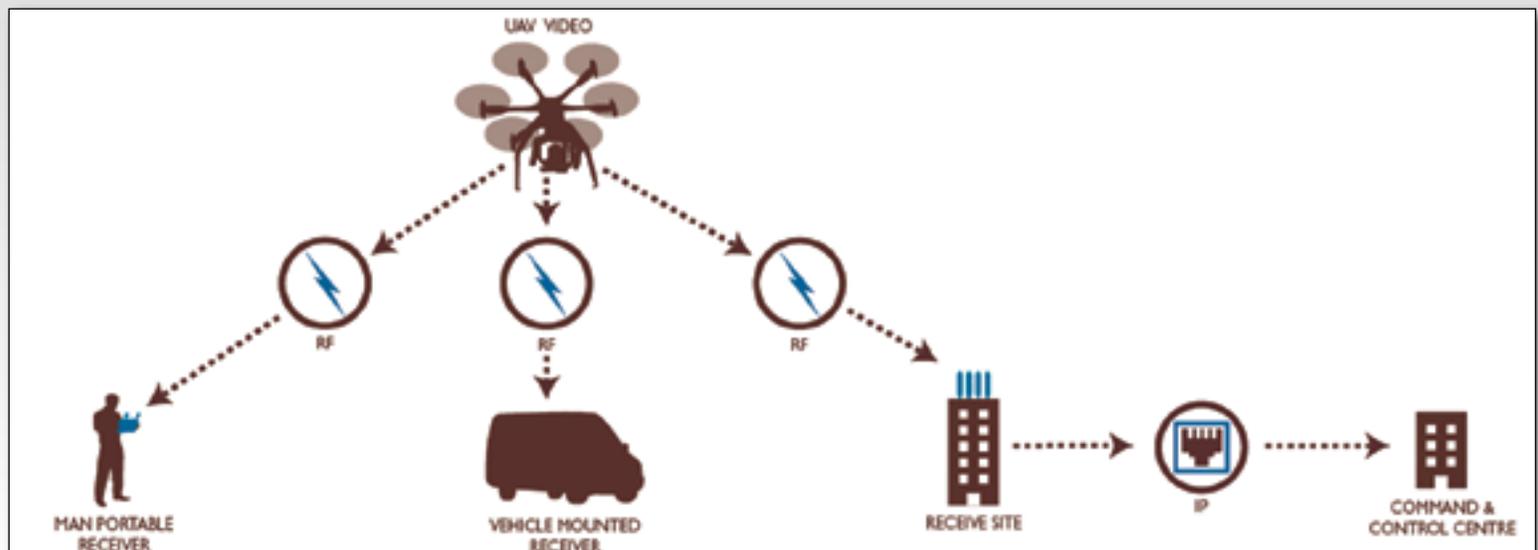
Another aspect to consider is that often more than one public safety agency is deployed to an incident scene. To ensure all agencies are deploying assets in the most effective manner, they need to be able to share video intelligence via interoperable and compatible systems. IP provides a standardized platform for seamless delivery of mission-critical video to any network user, ensuring uninterrupted video from multiple assets is transmitted to decision makers in real-time.

To ensure that key decision makers can access remote assets from afar, video media servers allow authorized personnel to login to the secure network and view the video stream from virtually anywhere with a wired or wireless connection. These systems combine the collection, management and distribution of video intelligence into a single platform that delivers video at varying data rates depending on the device and network. What is seen on a workstation at the NOC, via SATCOM, or established downlink infrastructure, is the identical video being viewed on a smartphone or tablet at the incident scene. This ensures that everyone has the necessary information, in real-time, to make informed operational decisions.

## Complete Surveillance Solutions

Surveillance teams and public safety officials rely on the seamless collection and distribution of real-time video during a crisis. Combining airborne downlinks with portable SATCOM solutions and IP video distribution provides personnel in multiple locations and jurisdictions with the intelligence they need to make mission-critical decisions.

VISLINK services: [www.vislink.com/](http://www.vislink.com/)





## A CASE IN POINT: KENCAST IS WELL-SUITED TO AID JMA'S HIMAWARICAST

By Dan Delventhal, MBA, CBCP, Director of Sales and Marketing, KenCast, Inc.

**H**imawari-8 is the world's first next-generation geostationary meteorological satellite. This year the Japan Meteorological Agency (JMA) deployed Fazzt data delivery from KenCast to use for their new HimawariCast service in order to disseminate the improved meteorological satellite data.

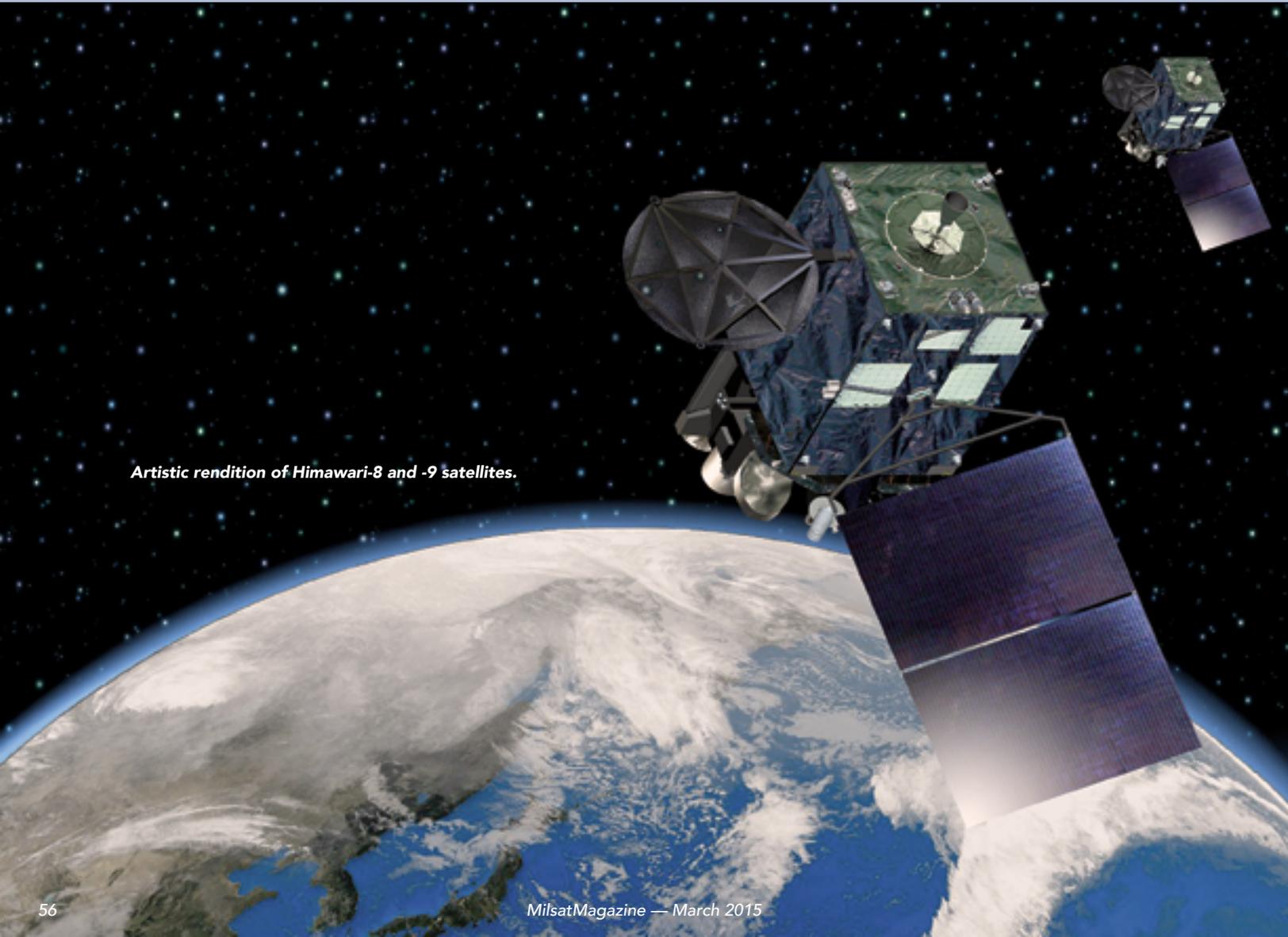
The JMA has been operating satellites and making related contributions to world meteorological "intel" since 1977 and is migrating to next generation satellites and data dissemination. Along with improved images for better weather prediction and environmental monitoring, a data delivery platform was required with attributes to support the migration and data dissemination with maximal reliability and global access:

- Data delivery packaging and sending via satellite multicast with automation features
- Data delivery reception with automation, easy acquisition and implementation

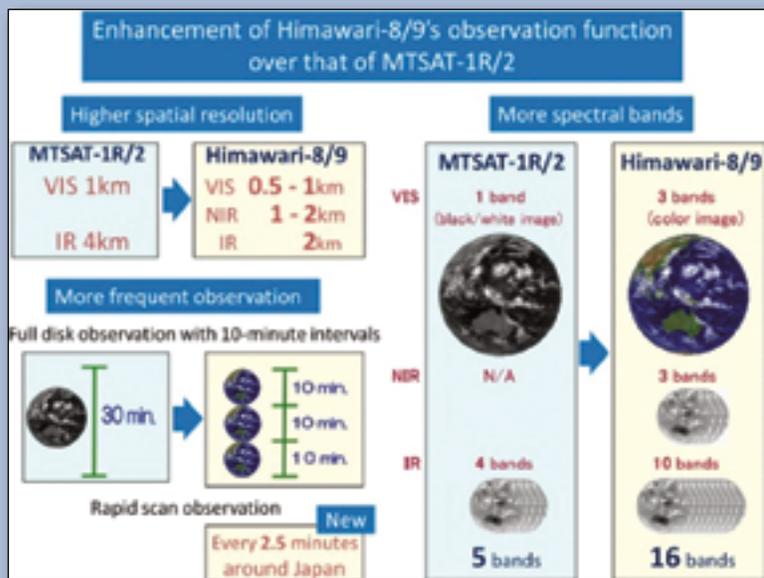
This article examines why KenCast's Fazzt delivery system was selected by the JMA, what the components of the Fazzt system are, how they were actually implemented, and then assesses the results, those being the reliable and easy distribution and consumption of the HimawariCast data. Additional details regarding the JMA's and others' meteorological services is also included in this article.

### New Satellites and Data Delivery

The new Himawari-8 and 9 satellite observations will provide more frequent and better imagery, and will do so every 10 minutes, to improve accuracy and usefulness of data. The new Himawari (which means "sunflower" in Japanese) satellites will succeed the MTSAT 1R and 2. Higher spatial resolution, more spectral bands (VIS (including color), NIR, and IR) as well as even more frequent observations around Japan (every 2.5 minutes) are features leading to better weather measurement, prediction and environmental monitoring.



Artistic rendition of Himawari-8 and -9 satellites.



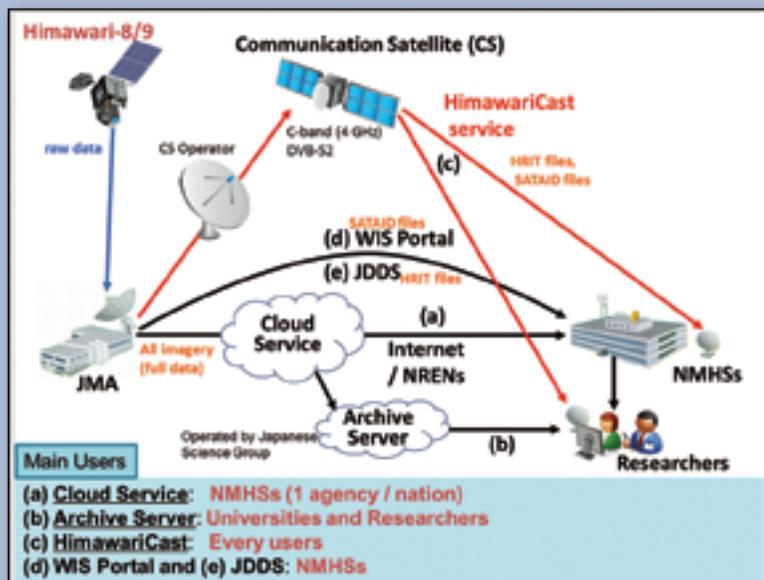
Overview of Satellite Observations.

The JMA's HimawariCast service will transmit existing MTSAT originated LRIT and HRIT files which were being provided directly through the L-band frequency and new Himawari-8 data. Rather than send this data directly, MTSAT and Himawari-8 imagery will be distributed on communications satellites, called JCSAT 2A and 2B. Additional spectral bands will be sent for Himawari-8 (14) as are now sent for MTSAT-2 (5).

### Selecting KenCast Fazzt

When planning for the HimawariCast service, packaging and datacasting of meteorological satellite imagery and related products from MTSAT2, Himawari-8 (and later Himawari-9) called for a trusted system from an established vendor with a track record in the business for reliability, flexibility and programmability to make the project efficient and effective. Having a local integrator with experience in the technology to manage the project was also preferred by the JMA.

Rikei Corporation, headquartered in Tokyo, Japan, a technology solutions company with more than 50 years in business and with 15-plus years of experience in broadcasting and satellite communications systems, had partnered with KenCast over the past 10 years on a number of satellite and other communications projects. The relationship with KenCast and product knowledge of the Fazzt Digital Data Delivery System were well established.



Overview of Himawari-8/9 data distribution/dissemination.

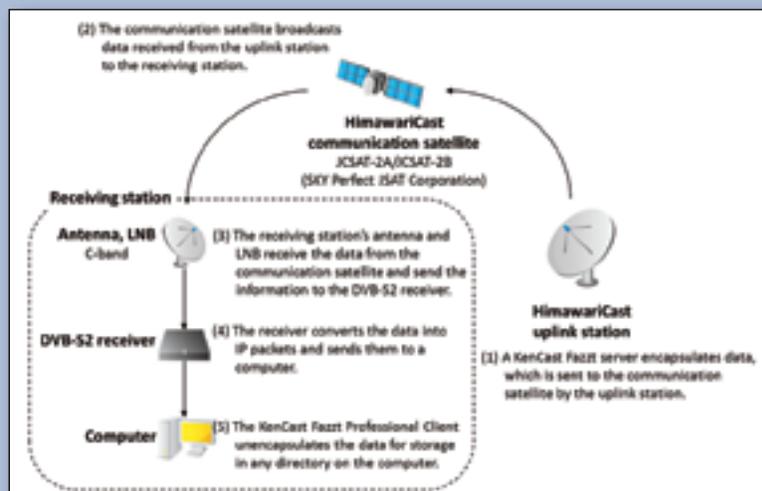
Considering that GEONETCast Americas, a service managed by NOAA (National Oceanic & Atmospheric Agency), the agency's broadcast stream that covers the Americas, already used KenCast Fazzt for their data dissemination, the company seemed to be the natural candidate for this project. NOAA is the satellite data provider for GOES, POES and NOAA-NESDIS (National Environmental Satellite, Data and Information Service) atmospheric and marine data products.

The JMA provides access to the data as a free service to users within the multicast footprint. This means that the receiving technology would need to be affordable, as well. Recipients with the correct satellite reception equipment and a Windows PC can purchase suitable Fazzt client software for a moderate price.

### Fazzt and the HimawariCast Service

The components for the solution included:

- KenCast's Fazzt Enterprise Server
- Custom Fazzt Server Scripts
- The Fazzt Professional Client
- Custom Fazzt Client scripts
- JMA's file manipulation program



Overview of HimawariCast system structure.

KenCast's Fazzt Dual Node Enterprise Server provides resilience and easy maintenance through load-balanced, self-healing, fail-over design. The Fazzt Enterprise Server™ software with Fazzt FEC® (Forward Error Correction) drives satellite multicasting with a variety of features to simplify and manage the process.

The HimawariCast solution used a hot folder-like feature in the Fazzt software, where files are dropped into a given folder automatically and are transmitted with a given set of parameters. This, together with Fazzt scripting, enabled an automatic workflow where weather data uploaded to the Fazzt Server via FTP into given folders were automatically processed and delivered without human interaction. The processing of the weather data involved multiple components, all native to Fazzt...

- Real time prioritization of data: Based on the urgency of the information to be transmitted, Fazzt was configured to pause transmissions of less important data in order to immediately send urgent data
- Fazzt FEC Protection: All files were encoded with Fazzt FEC, facilitating reliable delivery (allows for reconstructing on arrival for any loss or corruption, and validating accuracy)
- Automatic Cleanup Tasks: Any "obsolete" or old data was scheduled to be deleted using the built in Fazzt Scheduler

- **SNMP Monitoring:** While Fazzt provides full feature alarming with email and SNMP traps, JMA had requirements such that custom traps were created to allow for simpler monitoring of the server

Work on custom scripts for transmitting and receiving started in the second half of 2014, while implementation and testing began early this year. Rikei, on behalf of the JMA, has worked closely with KenCast throughout the project, providing specifications, testing and feedback.

The Fazzt Professional Client provides the following functions:

- **Fazzt FEC Decoding:** Decode received data to repair potential lost packets during transmission and validate file integrity compared to original
- **Process Image Data:** Using Fazzt scripting, incoming files are decompressed and a call is made to JMA programs that prepare the received images for display

The JMA file manipulation program and custom Fazzt scripts will be provided, at no cost, through the JMA infosite. For additional details, please refer to the JMA website links listed at the close of this story.

### HimawariCast with Fazzt: Effective and Efficient

In summary, the Fazzt solution enabled the automatic and reliable delivery of JMA satellite data, together with integration into the JMA application on the receiving end. The project, which requires management of as many as 100 files every 10 minutes, 24 hours a day, every day, would be difficult and expensive for staff to consistently perform manually. Having a delivery system with integrated scripting able to manage data and call other routines made the accurate, timely and affordable distribution of data possible.

The JMA is meeting their mission to support the improved meteorological services made possible by the output of improved sensors of Himawari-8 and -9, and make that data available and useful to those seeking coverage of the East Asia and Western Pacific regions, while continuing access to the output of their predecessor MTSAT series. As with GEONETCast Americas, no registration is required and users may simply tune in to the datacast, although registration at the website is possible in order to receive updates by email.

“We’re happy to be part of the JMA’s system to improve meteorological services in weather forecasting, climate monitoring, natural disaster prevention and safe transportation,” said KenCast CEO, Bill Steele.

“The JMA hopes the HimawariCast service will be widely used and contribute to disaster risk reduction in the Asia Pacific region,” said KUMAGAI Yukihiro, Satellite Program Division, JMA.

Links for additional information on HimawariCast, KenCast, and GEONETCast Americas

- [www.data.jma.go.jp/mscweb/en/himawari89/himawari\\_cast/himawari\\_cast.html](http://www.data.jma.go.jp/mscweb/en/himawari89/himawari_cast/himawari_cast.html)
- [www.kencast.com/solutions/geonetcast](http://www.kencast.com/solutions/geonetcast)
- [www.geonetcastamericas.noaa.gov/](http://www.geonetcastamericas.noaa.gov/)

Dan Delventhal is the Director of Sales and Marketing for KenCast, Inc. Prior to joining the company in 2013, Dan was Vice President of Business Development at RecoveryPlanner.com, a leader in business continuity planning and management software and consulting. Previously, he was CEO at CONNECTapps.net, a hosting and IT solutions company he founded and later sold to employees. You can contact Dan at [ddelventhal@kencast.com](mailto:ddelventhal@kencast.com).

Since 1994, KenCast is trusted by the Hollywood movie studios, military and government agencies, major news networks, retail businesses and financial institutions to provide fast, secure and ultra-reliable delivery of multimedia content.

## VazztPitcher - The Mobile File Broadcaster

Given the intense interest these days in the delivery of data to mobile devices, KenCast’s live streaming software—The VazztPitcher—sends and receives large data files and live streaming video across a wireless and/or wired network, all supported by maximum bandwidth.

VazztPitcher is next generation video and data streaming technology combines two of the company’s broadcast programs: the VazztCaster HD software program for streaming your live video, and the MBCaster software program that sends very large data files from the field. Both technologies have been used successfully by the military as well as by sports producers, entertainment and TV media, and by public safety agencies.

The VazztPitcher includes technology that receives the two broadcasts into a single program called the VazztHub—a transceiver that broadcasts point-to-point and/or multicasts. This combination can enable a multicast network or convert the one-way multicast network into a full two-way mesh network.



For more information VazztPitcher, contact KenCast at [www.kencast.com/contact-us/inquiries/](http://www.kencast.com/contact-us/inquiries/)

## U.S.A.F. SPACE AND MISSILE CENTER + LOCKHEED MARTIN OFFICIALS DIG DIRT...



*Officials from the U.S. Air Force Space and Missile Systems Center and Lockheed Martin's Mission Systems and Training turn over dirt at the formal groundbreaking for the Space Fence radar on Kwajalein Atoll, February 10. The ceremony kicks off a 36-month long construction effort.*

**Space Fence is designed to provide assured coverage at LEO for objects as small as 10 centimeters.**

The system will also support cued searches and uncued surveillance at MEO and above.

The increased Space Fence sensitivity, coupled with the improved computing capabilities of the JSpOC Mission System, will yield a greater understanding of the space operating environment and its associated threats.

"The Air Force is pleased to partner with Lockheed Martin in providing a system that will transform how we view the space operational environment," said David Madden, SMC's executive director.

Space Fence will significantly improve space situational awareness by more accurately detecting and tracking objects such as commercial and military satellites and space debris. "Space is becoming more congested and contested so it is critical that we deliver this system on time and on schedule," Madden said.

The Air Force Life Cycle Management Center, located at Hanscom AFB, Massachusetts, originally awarded the engineering, manufacturing and design contract valued

at \$914 million to Lockheed Martin on June 2, 2014.

Lockheed Martin and their subcontractors AMEC, GDST, Merrimac Industries, Wolf Creek and San Juan Construction will be working on Kwajalein with activities ranging from power generation, communications and radome installation and facility construction.

Approximately 250 workers will live on the island during construction.

Once the construction is complete, the Air Force will conduct system acceptance testing.

The projected date for the system's initial operational capability is January 2019.

# GPS SIGNAL SOLUTIONS: A MOOG TECHNICAL FOCUS

By Brian Giesinger, Senior Avionics Engineer, and Igor Lazbin, Senior Staff Spacecraft Guidance Navigation and Control Engineer, Moog Broad Reach

**D**etermining where you are in the world, in most cases, is simply a matter of tapping a map on your mobile device. That convenience comes courtesy of the U.S. Department of Defense Global Positioning System (GPS), a network of 24 satellites orbiting about 20,200 kilometers above Earth.

While GPS receivers have become ubiquitous on mobile phones as well as satellites occupying Low Earth Orbit (LEO), GPS receivers remain novelties for geostationary orbit (35,700 kilometers above the Earth) as GEO satellites must track weak GPS signals. The signal is weak, in part, because the GPS beams its signal toward Earth. In some cases, satellites orbiting above the GPS constellation will rely on more expensive technologies for tracking their position via Earth-based systems. However, that scenario is changing.

## Radio Occultation Sparks Commercialization

In 1998 at NASA's Jet Propulsion Laboratory (JPL), researchers began exploring the development of a new class of GPS space receivers dubbed BlackJack. The science behind BlackJack involved radio occultation, which measures the properties of a planet's atmosphere by detecting changes in a radio signal.

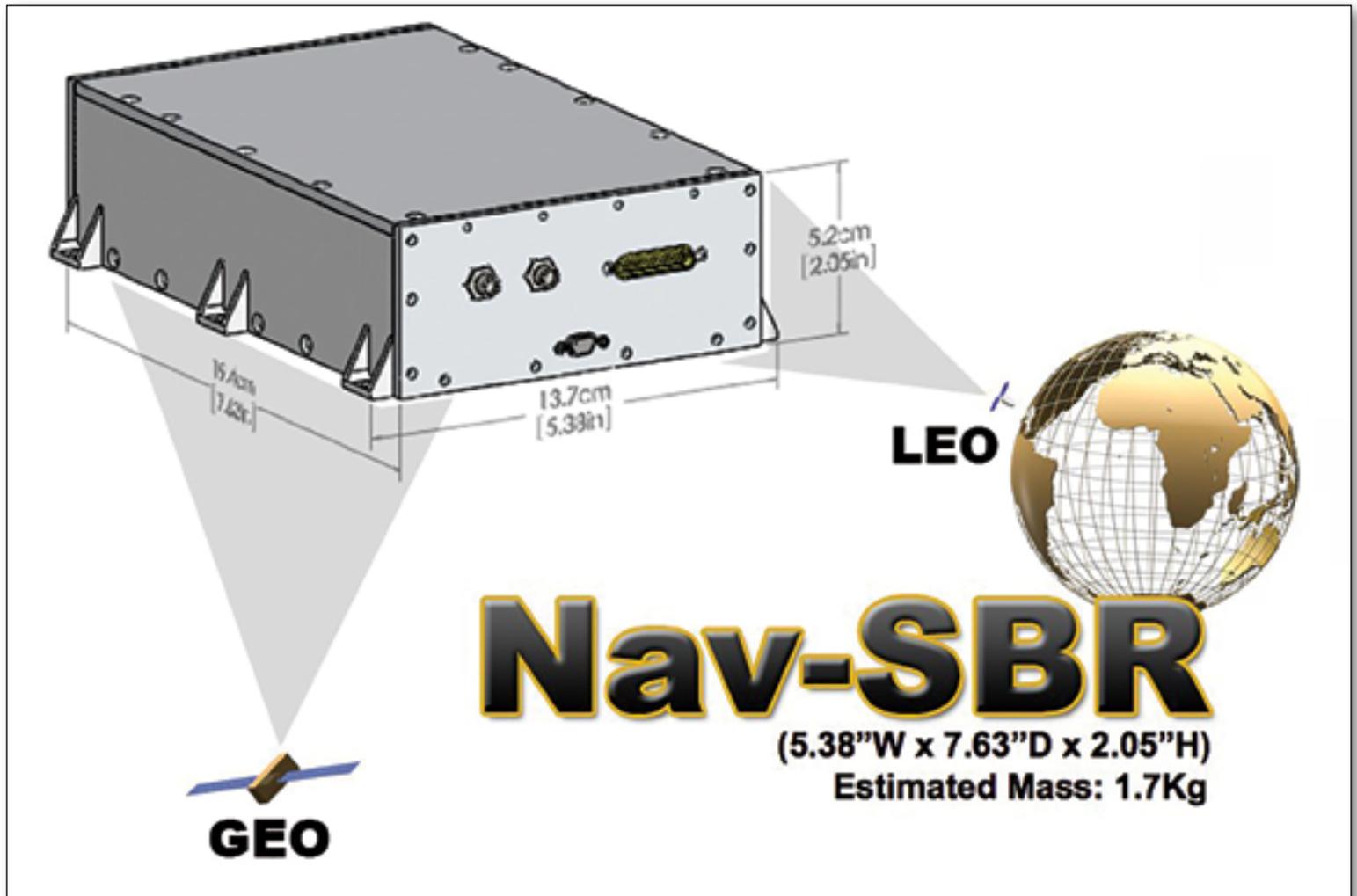
Based on its work on BlackJack, JPL produced GPS radio occultation receivers for six microsattellites named the Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC). Creating the receivers was a joint effort

between JPL and Moog Broad Reach Engineering. Moog enhanced the BlackJack technology by adding an internal redundancy feature and internal mass memory. After building the new receivers for COSMIC, Moog signed a licensing agreement with NASA that extends through 2017. The work on COSMIC and the joint agreement led Moog to commercialize a new product called the Integrated GPS Occultation Receiver, or IGOR.

Since developing the IGOR GPS receivers for COSMIC, Moog has also put the technology into orbit on: Brazil's LATTES, Germany's Tandem-X and TerraSAR-X, the U.S. Air Force Research Laboratory's TASCAT-2, and South Korea's KOMPSAT-5.

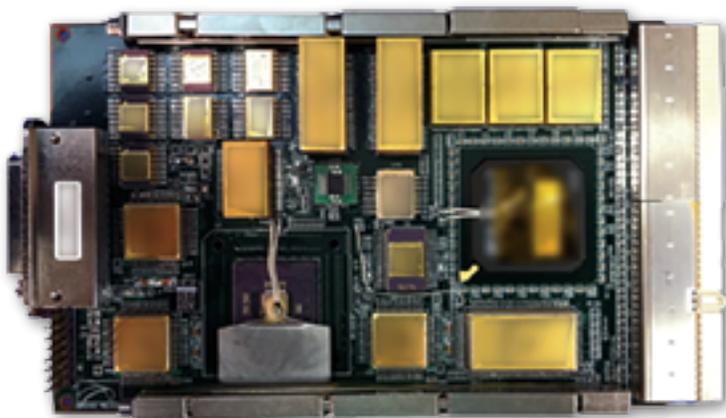
In 2009, Moog engineers were working on a U.S. government contract for a mission designed for GEO. The customer wanted GPS receiver technology. Moog, in turn, approached the NASA Goddard Space Flight Center (GSFC), where a team of engineers were developing a new GPS receiver that could acquire and track weak GPS signals projected into GEO.

Goddard named the new technology the Navigator GPS receiver. Goddard's team built the Navigator GPS receiver specifically for space missions above the GPS constellation. Through a technology transfer with GSFC, Moog then developed a product called the Navigator single-board GPS receiver (NAV-SBR).



NAV-SBR is the evolution of a partnership with NASA GSFC to commercialize the Navigator receiver technology, which is capable of operation at LEO and GEO. The NAV-SBR offers a small (i.e., the receiver is the size of a single 3U form-factor card, hence the name), compact, low-power implementation of the technology that provides military and civilian customers with a single solution for any orbit.

Moog had been working with GPS receivers for many years. The engineering know-how that came from the BlackJack GPS and IGOR GPS receivers grew into a second line of receivers through cooperation with JPL called TriG RO. The TriG RO receivers are known as science-grade technology, suitable for fields of study in which scientists employ radio occultation. Engineers based the TriG RO software on a combination of the operational COSMIC software and new software developed by JPL.



*Moog's TriG RO Processor Board.*

By building on the successful technology transfer of the Blackjack GPS, Moog was able to perform a second technology transfer, which led to the development of NAV-SBR. Moog engineers streamlined the processing and got even more power and fidelity out of the receiver by using software in a fashion that other organizations were not thinking of at the time, all with a view toward commercializing the technology.

### **A Competitive Difference in Position**

The work on the NAV-SBR has made it possible for a wider array of satellite owners to employ GPS receivers for LEO and GEO. However, an Internet search can offer any number of GPS receivers that are available to satellite builders. However, none are purposely built for operation in geostationary orbit.

Some makers of GPS receivers note an ability to track at GEO, but there are caveats. For example, some GPS receivers track only the GPS constellation's main lobes, or main beam emanating from the GPS constellation, and not the side lobes. Practically speaking, there are fewer main lobes than side lobes and a GPS receiver that captures only signals from a main lobe would have to rely on an orbit propagator.

The key difference between the NAV-SBR and other GPS receivers has to do with how adroitly the technology acquires the GPS signal. NAV-SBR employs weak signal acquisition and tracking technologies to quickly acquire strong GPS signals at LEO and GEO and capture weak side-lobe signals at GEO. With the ability to track side-lobe signals equally well, NAV-SBR can track as many as ten satellites in GEO.

The NAV-SBR also incorporates the Global Positioning System Enhanced Onboard Navigation System (GEONS) software package, which provides filtered navigation solutions and orbit propagation. While one other receiver on the market offers GEONS capability, that product relies on external processing to run the package. NAV-SBR incorporates the software package in the receiver versus relying on an external processing capability as the host.

The extremely fast acquisition of weak signals by the NAV-SBR also allows cold-start at LEO or GEO, simplifying on-orbit operations by eliminating the need for ground intervention to "seed" the receiver.

For example, the time required for the receiver to acquire satellite signals and navigation data and to calculate a position is less than one minute for LEO, and less than 10 minutes at GEO. By making use of GEONS, NAV-SBR can significantly reduce navigation errors by up to a factor of ~15 in position and a factor of ~50 in velocity, when compared to traditional unfiltered point solutions. GEONS also produces highly accurate orbit estimations even when only one GPS satellite is visible, and can accurately propagate orbits in the complete absence of GPS measurements.

The NAV-SBR has been shown in simulation to achieve LEO accuracies of 1.0 m in position and 1.0 cm/sec in velocity, while GEO accuracies are shown to be 10.0 m in position and 0.2 cm/sec in velocity (all one sigma, exclusive of user equivalent range error (UERE)). The NAV-SBR also employs radiation-tolerant design techniques and components in contrast to some of the "quantified" commercial receivers in use.

NAV-SBR's weak-signal acquisition and tracking technology owes its origin to the team at GSFC. Although GEONS is a software package that may be licensed, a GPS receiver must have the processing horsepower to provide a benefit to the solution a customer has in orbit. For instance, the NAV-SBR processor speed runs the GEONS filter once every 10 seconds; the processor used in the Goddard GPS receiver runs the same filter every 30 seconds. The difference in speed enables real-time, once-per-second position output with no need for post-processing. The fidelity of this real-time solution is comparable to the post-processed data of other receivers.

### **Lower Cost, Higher Orbit**

The NAV-SBR receiver could enable, for example, a contractor working on a government program to access the GPS reliably at GEO for less cost. Military agencies can reduce cost by relying on the NAV-SBR receiver to position satellites in GEO. And commercial enterprises can fly the NAV-SBR at GEO and find their way onto one of the bigger busses.

The NAV-SBR receiver's incorporation of GEONS is a perfect solution for station keeping, or even launching, a more scalable satellite constellation architecture that could result in the sale of more bandwidth. NAV-SBR could even be an enabling technology just like it has been for LEO satellites.

Looking ahead, Moog engineers are focusing on the next generation of GPS receivers which they've named Pyxis. Pyxis promises more capability and multi-frequencies and will leverage the lessons learned from working on the commercialization of JPL and GSFC technologies.

Moog's Broad Reach infosite: <http://www.broadreachengineering.com/>

*Brian Giesinger is a Senior Avionics Engineer at Moog Broad Reach. Brian has been with Moog Broad Reach since 2002 and has been involved with all of Moog Broad Reach's GPS receiver programs. Brian was a part of the successful technology transfers for the JPL BlackJack and TriG receivers, as well as the transfer of the Goddard Navigator receiver technology.*

*Igor Lazbin is a Senior Staff Spacecraft Guidance Navigation and Control Engineer at Moog Broad Reach. Igor has been with Moog Broad Reach since 2006 and was involved in the technology transfer of the Navigator GPS receiver technology from NASA Goddard. Igor has been involved in all aspects of spacecraft GN&C system development and worked on a number of spacecraft with civilian and military applications.*

# EXPEDITIONARY WARFARE DEMANDS EXCEPTIONAL COMMUNICATIONS

By Garr R. Stephenson, Jr., Head of the Airborne Comms-On-The-Move Division, UltiSat, Inc.

**T**oday, the Department of Defense (DoD), other Government organizations and Commercial Industries, continue to manage strict spending conditions that affect their ability to meet current and future communications requirements.

This is especially challenging for Airborne communications. We are now in an era where Commercial-Off-The-Shelf (COTS) products are created using the newest technologies and service offerings. Turning attention to these COTS solutions will not only help the economy, but also improve production and the ability to address rapid response needs.

To further compound the difficulty of today's continued budget restrictions, the demand for immediate access to critical data requirements (e.g., streaming full-motion-video) and mission capabilities are still growing at exponential rates. Specifically, there is a relevant likelihood that higher data rates requiring advancing technologies could further hinder progress in execution of operational missions if not addressed by more open-system architecture leveraging COTS systems affording the most ongoing flexibility and scalability.

The alternative is more expensive, slow-to-market, stovepipe solutions that more often than not result in one-off solutions that handicap the tactical users. The commercial solutions provide an advantage getting the most out of your Airborne Communications without limiting any future requirements and changes, which are not necessarily known today.

The recent conflicts in Afghanistan and Iraq have taught us a tremendous amount regarding the ongoing demands requiring flexible and scalable

communications. Today's engagements are predominantly grounded in multiple austere locations necessitating a continual and dominant need for secure network communications. Advancing Airborne SATCOM-On-The-Move (SOTM) capabilities are now a "must-have" for operations supporting our warfighters in these challenging areas.

Airborne networks carry high value tactical information and sensor data packages between multiple aircraft and ground deployments, while providing an extension to the region of operation for protected communications our troops operating in adversarial environments. Just as the warfighter is the difference maker for our way of life back here in the United States, the delivery of high value intelligence and tactical information is the difference maker to ensuring the security and safety of our warfighters.

While the evolution of intelligence-based Communications-On-The-Move (COTM) established itself as a dominant force in and during ongoing defense operations in Afghanistan, the application is continuing to pivot to a more global posture. Airborne Communications are also increasingly in demand, even expanding to the commercial industries in aviation, security protection and extending a corporate wide area network to the sky.

Today, open-system commercial systems and technologies are leading the way in the advancement of Airborne communications from commercial grade satellites to the mature mission systems equipment onboard our Airborne fleets. COTS equipment has more dedicated organizations and efforts being put forth to establish technology roadmaps and deliver on them in order to avoid the need for updates as soon as solutions are deployed.





*Arcturus T-20 UAV in flight.*

Just as important are the new applications and verticals embracing and deploying Airborne communications for their operations. Smaller, more agile Unmanned Aerial Vehicles (UAV) and rotary wing vehicles are now being looked to more aggressively. Expanding the number of platforms that will carry intelligence-collection and surveillance systems for both military and commercial applications.

Both air vehicle platforms have their respective complex challenges; nevertheless can provide secure network reliability via SATCOM for high data rate applications (e.g. HD FMV). Utilizing smaller, Class III UAVs for Airborne based intelligence-collection missions will deliver the similar high value

As technology rapidly advances at an expedited rate, continuing to deploy open COTS systems provides the end-user with the best ability to leverage advanced systems and network communications vs. closed and one-off custom solutions of the past that should remain in the past.

Modern technologies are primarily based on commercial open architecture. The wide array of antenna systems for Airborne communications has only grown in the last decade. Even with the complexity that is introduced by fast moving air vehicles 10's of 1,000's of feet off the ground—technology advancements within the commercial space continue to meet the increasing demands, showing no signs of slowing down. With new materials and scientific algorithms, what was once thought of as an “absolute” in the best-of breed technology a decade ago, is now seen as antiquated and surmountable.

Previous decades could rely on a small handful of options to choose from, whereas today we benefit from multiple options that introduce the highest value to the end-user through increased performance at a lower cost. However, one must concentrate on open system architecture to maintain a path within these technology advances.

Open system architecture does not preclude the network and systems themselves from being secure. Today security is also at its highest demand and the COTS solutions are meeting those demands as well. There are even the highest-level security approved COTS-for-Classified systems and architectures that have been integrated in all elements of network topology, including Airborne communications. Commercial products do not prohibit a network requiring highly secure transmission from being able to do exactly that, it has been addressed and continues to progress.

data packets as their bigger counterparts, but provides tremendous economics for the entry cost of the full air vehicle asset and longer endurance for more continual information consumption.

Additionally, rotary wing vehicles are being looked to for providing these mission capabilities and furthering the utilization of an important air vehicle asset for both the military and commercial customer. Rotary wing had always been seen as restricted from having the ability to provide high data rate applications through the rotor blades, which also has been overcome by open commercial technology. The value proposition to employ open, commercial-based systems and network protocols (e.g., Ethernet) responds to significant cost reductions that meet present business needs, but do not preclude leveraging advances in the open systems for future requirements. With the removal of complex, resource-intensive proprietary systems, the end-user can soon remove the term legacy from being adjacent to his system architecture soon after its deployment. All while not compromising on maintaining the highest levels of security.

The desires of the DoD and Commercial business for uninterrupted access while on-the-move will not diminish, where, in fact, consumption will only multiply. Just as the ability to maintain and stay on budget, while delivering solutions within the fastest timeframe will sustain as a charter of those demanding these requirements. Commercial systems provide the leverage to stay ahead of technology advances without compromise on economics, security and performance.

*Garr R. Stephenson Jr. heads up the Airborne Comms-On-The-Move business unit at UltiSat, Inc. UltiSat is a global SATCOM and network services company, providing innovative strategies for the growing demand of Airborne applications without compromise for security, scalability and flexibility. UltiSat is currently supporting Airborne COTM networks on manned Fixed Wing and UAV Programs for domestic and international customers.*



*CAT 350 ME Airborne.*

# MORE CLASSIFIED PROGRAMS & TECHNICAL TRACK EXPANSION AT THE SPACE FOUNDATION'S 31ST SPACE SYMPOSIUM

**F**or 2015, the Space Foundation's Space Symposium will offer more choices, more classified programs, more international and government participation and more networking opportunities than ever before in this important event.

The 31st Space Symposium will be held at The Broadmoor in Colorado Springs, Colorado, USA, April 13-16. Returning attendees will find many of the same compelling reasons to attend the Space Symposium as in previous years, such as the Technical Track program, plus some changes for 2015.

Changes this year include two classified events—Cyber 1.5 on Monday and Wednesday's Space Classified program—as well as the growth of the Technical Track program that was introduced last year, as well as the expansion from four to eight of Wednesday's concurrent sessions.

## Technical Track

Back by popular demand, Tech Track sessions offer registrants an opportunity to hear from some of the government and industry leaders in space technology development, and to learn about recent advances from presenters in a series of 20-minute tech talks. Tech Track industry and active military/government registration includes Tech Track panels on Monday and Tuesday and admission to the Ball Aerospace Exhibit Center and Symposium sessions on Wednesday.

Also included is a special Tech Track luncheon on Tuesday that features guest speaker Dr. Merrie Sanchez, who is the Chief Scientist, Air Force Space Command. Dr. Sanchez serves as the primary adviser to the commander on all scientific and technical matters concerning space and cyberspace research and development programs. Some of the 46 Tech Track presentations on Monday and Tuesday include:

- Eric Anderson, Chief Technologist - Space, Moog, "Extending Rideshare: Mission Case Studies Using Propulsive ESPA"
- Chuck Beames, President, Vulcan Aerospace Corporation, "Transforming Orbital Access with Flexibility: Stratolaunch"
- Dr. Bruce Chesley, Chief Architect, The Boeing Company, "Commercial Capabilities to Improve Mission Success"
- Andrea J. DiPaolo, Doctoral fellow, McGill University Institute of Air and Space Law, "Leveraging Insurance for Commercial Space: Managing Legal and Regulatory Challenges"

- Ahmad Shah Hakimyar, SEDSAT-2 Project Manager, SEDSAT-2, World Space Week, Polytechnic University of Bucharest, "The Co-Ordination Of A Distributed Educational Cubesat Project Through International Collaboration: Lessons Learnt So Far"
- Rebecca Cowen-Hirsch, Senior Vice President, Government Strategy & Policy, Inmarsat, Inc. - U.S. Government Business Unit, "Commercial Augmentation for Government Systems"
- Geoff Crowley, CEO and Chief Scientist, ASTRA, "Constellation of CubeSats for Realtime Ionospheric E-field Measurements for Global Space Weather"
- Raul J. Diaz, Chief Technology Officer, 50th Network Operations Group, "Enterprise Architecture for the Air Force Satellite Control Network"
- Shelby Oakley, Assistant Director, U.S. Government Accountability Office, "Assessing Performance, Progress, Trends, and Challenges Associated with NASA's Major Projects"
- Saulius Pavalkis, Ph.D., Product Manager, No Magic Europe, "MBSE in Telescope Modeling: European Extremely Large Telescope -- World's Biggest Eye on the Sky"
- Tom Rivers, Vice President, National Programs, Kratos Technology and Training Solutions, "Small Satellites - Evolving Innovation for the Entire Market"
- Nickolas D. Taormina, Alex R. Strom, Dr. Parris C. Neal, Cadet 1st Class, Cadet 1st Class, Professor, Dept of Electrical & Computer Engineering, Dept of Electrical & Computer Engineering, Dept. of Physics, "iMESA: An Integrated, Miniaturized, Electrostatic Analyzer"
- Dr. X.T. Vuong, Vice President and Chief Scientist, Artel, LLC, "Techniques to Optimize Usage of Satellite RF Power"
- Marit Undseth and Claire Jolly, Policy Analyst, OECD, Directorate for Science, Technology and Innovation, "Globalisation Of Space Manufacturing: Recent Trends and Public Policy Response"

Learn more about registering for the Technical Track at [www.spacesymposium.org/register](http://www.spacesymposium.org/register).

## Symposium Features Government and Military Speakers

The Space Symposium has been firmly established as the single most important event for linking government, military and industry decision makers at a single location. Top civil and military space leaders are confirmed to speak, and they include...



- Maj. Gen. Charles F. Bolden, Jr., USMC (Ret.), Administrator, National Aeronautics and Space Administration (NASA)
- Robert Cardillo, Director, National Geospatial-Intelligence Agency (NGA)
- Gen. John E. Hyten, USAF, Commander, Air Force Space Command
- The Honorable Deborah Lee James, Secretary of the Air Force
- Lt. Gen. John W. "Jay" Raymond, USAF, Commander, 14th Air Force

### Cyber 1.5 Classified

The Space Foundation's annual cyber conference has evolved dramatically over the past few years to meet changing concerns and awareness about cyberspace, but the biggest change will take place this year. For 2015, Cyber 1.5 is classified, and U.S. citizenship and a TS/SCI security clearance are required for registration. Cyber 1.5 will be held on Monday, April 13, with featured speakers:

- Congressman James Frederick "Jim" Bridenstine, (R-OK)
- Maj. Gen. Burke E. "Ed" Wilson, Commander, 24th Air Force
- Joseph M. Demarest, Jr., Assistant Director, Cyber Division, U.S. Department of Justice, Federal Bureau of Investigation
- Kristina Harrington, Director of Signals Intelligence Directorate, National Reconnaissance Office
- Jim Richberg, National Intelligence Manager for Cyber, Office of Director of National Intelligence

Additional information regarding Cyber 1.5 registration is available at [www.spacesymposium.org/register](http://www.spacesymposium.org/register).

### Space Classified Program

The 31st Space Symposium's Space Classified program on Wednesday, April 15, allows attendees to join space professionals in a classified track focused on space security. U.S. citizenship and a TS/SCI security clearance are required for registration. The featured speakers include:

- Robert Cardillo, Director, National Geospatial-Intelligence Agency (NGA)
- Gen. John E. Hyten, USAF, Commander, Air Force Space Command
- Douglas L. Loverro, Deputy Assistant Secretary of Defense, Space Policy, Office of the Under Secretary of Defense
- Betty J. Sapp, Director, National Reconnaissance Office

Information regarding Space Classified registration is available at [www.spacesymposium.org/register](http://www.spacesymposium.org/register).

### International Panel Discussions

Space Symposium panels will include more international focus than ever before, with a featured panel of world space agency leaders, plus "Country in Focus" concurrent session presentations featuring Germany, Japan, the UAE and UK. Participating on the "Space Agency Leaders" panel will be:

- Maj. Gen. Charles F. Bolden, Jr., USMC (Ret.), Administrator, National Aeronautics and Space Administration (NASA)
- Jean-Jacques Dordain, Director General, European Space Agency (ESA)
- Jean-Yves Le Gall, President, Centre National d'Études Spatiales (CNES)
- Ger Nieuwpoort, Ph.D., Director, Netherlands Space Office
- David Parker, Ph.D., Chief Executive Officer, United Kingdom Space Agency
- Dr. Marius-Ioan Piso, Chief Executive Officer, Romanian Space Agency (ROSA)
- Johann-Dietrich Wörner, Chairman of the Executive Board, German Aerospace Center (DLR)

Another panel of special interest is the "International Military Space—Global Leaders on Collective Security" panel, with participation by:

- Brig. Gen. Michel Lalumière, CD, Director General Space, Canadian Armed Forces
- Lt. Gen. John W. "Jay" Raymond, USAF, Commander, 14th Air Force
- Brig. Gen. Jean-Daniel Testé, Commander, Joint Space Command, French Ministry of Defense

### New Generation Space Leaders

The annual Space Symposium helps a new generation of space professionals gain visibility and exposure to senior leaders while getting advice and insight on career development through the Space Foundation's New Generation Space Leaders program.

For 2015, the Space Symposium will again feature the New Generation Leadership Exchange speed mentoring session and the wildly popular Space Slam.

### Ball Aerospace Exhibit Center and Pavilion

One of the main reasons to attend the 31st Space Symposium is the dynamic Ball Aerospace Exhibit Center and Pavilion, featuring 160 of the world's latest space technology, products and services.

The exhibit center is not open to the public, and the thousands of people who tour the exhibits include C-level industry executives, senior decision makers and government officials.

For a complete list of exhibitors, a map of the exhibits, complete agendas, speakers list and other details, please visit

[www.spacesymposium.org](http://www.spacesymposium.org).



## NATION 'WOULD BE LESS SECURE' UNDER SEQUESTRATION, ACCORDING TO SECDEF CARTER



**Sequestration threatens military readiness, the size of warfighting forces, the capabilities of air and naval fleets, and ultimately the lives of the nation's men and women in uniform, Defense Secretary Ash Carter told a Senate panel in DC.**

Carter, along with Chairman of the Joint Chiefs of Staff Army Gen. Martin E. Dempsey, testified before the Senate Armed Services Committee on President Barack Obama's Defense Authorization Request for fiscal year 2016 and the Future Years Defense Program.

"I am here to present the president's budget for the Department of Defense for fiscal year 2016," Carter said, "[and] ... I strongly support the president in requesting a defense budget above the artificial caps of the Budget Control Act, above so-called sequester levels, next year and in the years thereafter."

For fiscal year 2016, the secretary said in his written testimony, the president is proposing \$534 billion for DoD's base budget and \$51 billion in overseas contingency operations, totaling \$585 billion to sustain America's national security and defense strategies.

Carter said he shares Obama's desire to find a way forward that upholds the principles behind the Bipartisan Budget Act of 2013, and supports the president's commitment to vetoing any bill that locks in sequestration, calling such an action "unsafe and wasteful."

The Joint Chiefs have said the same before the committee, he added, noting that "they could not have been more clear in their assessment of the damage sequestration would do to our national security."

In his opening remarks, Carter described his first days in office as defense secretary and the commitments he made to the people of the Defense Department—military members, government civilians and contractors.

His first commitment, he said, is to look out for the safety, welfare and effectiveness of service members, government civilians, contractors, and their families, as well as to those who came before them and those who will come after.

Carter said his second commitment is to help the president as he makes hard decisions about how to defend the country in a turbulent world and to carry out the decisions that involve the use of military force.

The third commitment is to the future, Carter added, to ensure the U.S. military remains the very best in a changing world, amid fast-moving technological and commercial change, as the nation seeks to attract new generations to the mission of national security.

It was "because of those commitments," Carter said, that he traveled to Afghanistan to visit U.S. troops and commanders and Afghan government and military leaders during his first week in office as defense secretary.

Next, he traveled to Kuwait, meeting with leaders there before convening senior American diplomats and military leaders from the region—ambassadors, commanders of U.S. Central Command, U.S. European Command, U.S. Africa Command and U.S. Southern Command, and commanders involved in the campaign against the Islamic State of Iraq and the Levant.

"In these regions of the world [and others]," Carter said, "it is America's leadership and America's men and women in uniform who frequently stand between disorder and order, who stand up to malicious and destabilizing actors while standing with those who believe, with us, in a more secure, just and prosperous future for all our children." Congress, he added, will determine whether U.S. troops can continue to do so.

The administration is proposing to increase the defense budget in line with the projection submitted to Congress last year, Carter said. "By halting the decline in defense spending imposed by the Budget Control Act, the president's budget would give us the resources we need to execute our nation's defense strategy," he said. "But—and I want to be clear about this—under sequestration, which is set

to return in 212 days, our nation would be less secure," Carter added.

Carter said the department needs help from Congress to end sequestration as well as constraints hindering DoD's ability to reform. "We at the Pentagon can and must do better at getting value for the defense dollar," he said, "... [and] there are significant savings to be found through new reforms across DoD, reforms we're committed to pursuing. But sequester cuts don't help us achieve any of them."

The department also needs help from Congress on Congress's own denial of painful but necessary reforms proposed by DoD, Carter said. "I need your help with these reforms, which have been frustrated at the same time sequester looms, at the same time we make new reforms," he said. "I will work with Congress to resolve concerns and find common ground, but we must have your help."

If confronted with sequestration-level budgets and continued obstacles to reform, Carter said, the department would have to change not just the size but the shape of the military, "significantly impacting parts of our defense strategy. We cannot meet sequester with further half-measures."

Carter said he "will not send our troops into a fight with outdated equipment, inadequate readiness or ineffective doctrine. "The world in 2014 was more complicated than anyone could have predicted, the secretary said. "Given today's security environment, the president's proposed increase in defense spending over last year's budget is responsible and prudent," he added.

"I earnestly hope we can come together behind a long-term budget approach that dispels sequester and provides stability rather than doing this one year at a time," the secretary said.

*Story by Cheryl Pellerin  
DoD News, Defense Media Activity*



