**2012**
## YEAR IN REVIEW

## PUBLISHING OPERATIONS

| | |
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| **Pattie Waldt** | **Executive Editor** |
| **Jill Durfee** | **Sales Director, Editorial Assistant** |
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## AUTHORS

*Bob Baker*
*Tony Bardo*
*Michael Bristol*
*Eyal Copitt*
*Robert S. Dudney*
*Rudy Ernst*
*Karl Fuchs*
*David Gulla*
*Hartley Lesser*
*Frank Linsalata*
*Rick Lober*
*Julia MacDonough*
*Scott Prater*
*Claude Rousseau*
*Bruce Rowe*
*Staff Sgt. Christopher Ruano*
*Jim Simpson*
*Mark Valerio*
*Pattie Waldt*

## DISPATCHES

## FEATURES

## ADVERTISERS

# DISPATCHES

## AN EELV FIRST

**The United States Air Force Space and Missile Systems Center has awarded SpaceX two Evolved Expendable Launch Vehicle (EELV)-class missions: DSCOVR (Deep Space Climate Observatory) and STP-2 (Space Test Program 2).**

To be launched on SpaceX's Falcon launch vehicles in 2014 and 2015 respectively, the awards mark the first EELV-class missions awarded to the company to date.

The DSCOVR mission will be launched aboard a Falcon 9 and is currently slated for late 2014, while STP-2 will be launched aboard the Falcon Heavy and is targeted for mid-2015. Both are expected to launch from Space Launch Complex 40 at Cape Canaveral Air Force Station, Florida.

Both missions fall under Orbital/Suborbital Program-3 (OSP-3), an indefinite-delivery/indefinite-quantity contract for the U.S. Air Force Rocket Systems Launch Program. OSP-3 represents the first Air Force contract designed to provide new entrants to the EELV program an opportunity to demonstrate their vehicle capabilities.

The two missions will support the EELV certification process for the Falcon 9 and Falcon Heavy. Falcon Heavy, the most powerful rocket in the world, is expected to take its first flight in the second half of 2013.

Building on reliable flight proven architecture, the Falcon 9 and Falcon Heavy launch vehicles are designed for exceptional reliability, meeting the stringent U.S. Air Force requirements for the Evolved Expendable Launch Vehicle (EELV) program.

The Falcon Heavy is designed for extreme reliability and can tolerate the failure of several engines and still complete its mission. As on commercial airliners, protective shells surround each engine to contain a worst-case situation such as fire or a chamber rupture, and prevent it from affecting the other engines and stages.

A disabled engine is automatically shut down, and the remaining engines operate slightly longer to compensate for the loss without detriment to the mission.

Falcon Heavy will be the first rocket in history to feature propellant cross-feed from the side boosters to the center core. Propellant cross-feeding leaves the center core still carrying the majority of its propellant after the side boosters separate. This gives Falcon Heavy performance comparable to that of a three-stage rocket, even though only the single Merlin engine on the upper stage requires ignition after lift-off, further improving both reliability and payload performance. Should cross-feed not be required for lower mass missions, it can be easily turned off.

Anticipating potential astronaut transport needs, Falcon Heavy is also designed to meet NASA human rating standards. Plus, the Falcon Heavy side booster stages have a mass ratio (full vs. empty) above 30, better than any launcher in history. **#**

## INSIGHTS INTO ISR

**The second annual ISR conference will feature a line-up of key military and industry speakers delivering more than 16 presentations addressing the current issues being experienced in ISR today.**

The conference will be a fantastic opportunity for military and defence personnel within the ISR industry to talk to leading experts who are currently working on ISR projects and operations.

From across Europe and North America the diversity of speakers will give a broad spectrum of ideas and opinions.

ISR 2013 promises to be a unique platform for problem-solving, debate and networking—register today. Featured speakers include:

- *Anthony Crook, SO1 DPD Cap C4ISR, Ministry of Defence, UK*

- *Sean Midwood, CD, MSc EE, BEng, Chief Technology Office, NATO Communications and Information Agency*

- *Patrick Shortsleeve, Commander 497th ISR Group, USAF*

- *Howard Nichol, SO1 ISTAR, DPD CD Information, Intelligence Corps, Ministry of Defence, UK*

- *Barry O'Neal, Head ISR&T Systems Engineering, US NAVAL Air Weapons Engagement Office*

For further information, ***select this direct link***. **#**



Falcon Heavy can deliver 53 metric tons (117,000 lb) to Low Earth Orbit

Falcon Heavy's first stage will be made up of three nine-engine cores, which are used as the first stage of the SpaceX Falcon 9 launch vehicle.

Cross-feeding of propellant leaves core stage nearly full on booster separation

At lift-off the upgraded Merlin engines generate over 3.8 million pounds of thrust — equal to fifteen 747's at full power.

Falcon 9

Falcon Heavy

# DISPATCHES

## SAFE PASSAGE IN THE DOMAIN OF SPACE

**Members of the 1st and 7th Space Operations Squadrons took notice when an upper stage Russian rocket disintegrated in low Earth orbit October 16th, 2012.**

The break up introduced an estimated 500 pieces of debris into an area where the U.S. operates a multitude of satellites, further congesting an already crowded orbit around Earth.

The event sheds light on an ever-growing issue for the space and satellite industry, one that seemed far fetched only a few years ago.

"The idea that big space would someday become crowded was more theory than fact," said Lt. Col. Mike Manor, 1 SOPS commander. "Now, the reality is that space is growing seemingly smaller as more objects are now orbiting Earth. Few people realize there are men and women dedicated to assuring safe passage for our assets in space."

The Space Based Space Surveillance satellite and its sister, the Advanced Technology Risk Reduction satellite, were designed to provide space situational awareness of the geostationary belt, but increasingly are being tasked to support space situational awareness in other orbits as well.

A collision with something as small as a bolt, a rivet, even bits of shrapnel, traveling at a high rate of speed can render a satellite inoperable, if not totally destroy it—it's becoming even more important to accurately track such debris.

Along with radar and optical sensors on the ground, SBSS and ATRR are providing that tracking data to the Joint Space Operations Center, the organization that keeps a real-time catalog of orbiting objects.

Maj. Patrick Slaughter, 1 SOPS assistant director of operations, says demand for this tracking data will do nothing but grow in the years ahead as space gets more congested and contested.

"For the longest time, we as a nation, held on to the idea that space is a big place, but most people don't understand what's happening up there," he said. "Break ups like this add to the congestion, but we also have events like the Chinese Fengyun incident, that brought attention to the idea of contested space."

In 2007, the Chinese government demonstrated the effectiveness of an anti-satellite system by destroying one of its own weather satellites, the Fengyun-1C weather satellite, via a ground-launched missile. Besides creating a large debris field, the event showed that China possesses the capability to "kill" a satellite in LEO. Manor pointed out that it's not a big leap to assume they could do this to a U.S. satellite.

"The number of debris avoidance maneuvers required by the International Space Station has significantly increased since that incident," Slaughter said. "Then we had the Iridium-Cosmos collision in 2009, where a U.S. and Russian satellite collided over Siberia. We have to maneuver our LOE satellites around that debris field as well."

Manor said these combined events, among others, have not only helped drive international policy negotiations, but signaled that the world has recognized a need for better awareness of what's happening in space.

"We can use the evolution of air travel as a model," he said. "When the Wright brothers first took flight the skies were open. Gradually, more aircraft shared the skies and eventually we reached a point where we needed air traffic controllers and regulation to keep air travel safe. Now, we've taken the rudimentary steps for space traffic control."

When the JSPOC detects a satellite is on course to collide with something, they provide a warning to that system's operators. No doubt similar conversations happen hundreds if not thousands of times a day between air traffic controllers and pilots.

Placing this all in perspective, why does it matter what operations crews at 1 and 7 SOPS do?

"Along with the ground tracking stations and the JSPOC, our team is keeping watch over space and will remain vigilant in keeping the domain as safe as possible," Manor said. "These collective efforts not only help minimize the potential for disastrous events, but also keep the space domain in a condition for continued utilization by all nations." **#**

*Story by Scott Prater, 50th Space Wing, U.S.A.F.*

# DISPATCHES
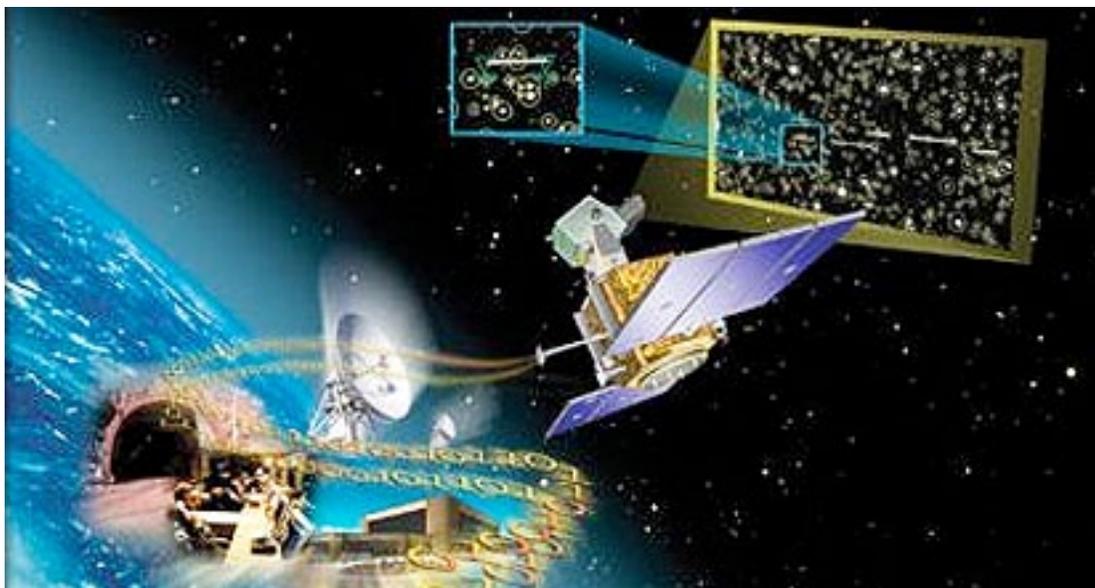
## SCALING TO FIT THE NEED

**The Space and Missile Systems Center's Space Development and Test Directorate at Kirtland AFB, New Mexico, has awarded launch service contracts to Space Exploration Technologies, Orbital Sciences Corporation and Lockheed Martin Space Systems Corporation.**

The potential $900 million, five-year contract, known as Orbital/Suborbital Program 3, provides small launch services (referred to as Lane 1) capable of lifting up to 4,000 pounds into Low-Earth Orbit (LEO), and higher capability services (referred to as Lane 2) for larger scale space lift missions in order to meet a wide range of U.S. Government requirements. Small launch services were previously procured under the Orbital/Suborbital Program 2, which expires in early 2013.

OSC and LMSSC were awarded Lane 1 contracts. OSC will use their Minotaur I and IV vehicles, while LMSSC will use



*SpaceX' Falcon 9 launch vehicle*

their Athena Ic and IIc vehicles. Lane 2 contracts were awarded to SpaceX, using their Falcon 9 Upgrade and Falcon Heavy vehicles, and to OSC using their

In addition to the basic contract, two initial task orders were awarded to SpaceX to launch the Deep Space Climate Observatory satellite and the



*Lockheed Martin's (LMC) Athena launch vehicle, LMC photo*



*Orbital Sciences (OSC) Minotaur IV launch vehicle, OSC photo*

Space Test Program 2 payload suite in 2014 and 2015, respectively. The DSCOVR mission will fly on SpaceX's Falcon 9 upgrade to deliver a NASA-built satellite to the L1 Earth-Sun La Grange point, where it will provide solar weather and Earth observation data for the National Oceanic and Atmospheric Agency.

The second mission, STP-2, will launch aboard SpaceX's Falcon Heavy. STP-2 will deliver a wide variety of experimental and prototype payloads to several orbits. These missions are designated for Evolved Expendable Launch Vehicle "New Entrants" and will facilitate the intro of new competitors into EELV's current family of medium and larger class rockets. **#**

## A MAJOR MELDING

**Astrium Americas, an EADS North America company announces a new subsidiary, Astrium Services Government, Inc. serving the U.S. government's growing need for innovative, new fixed and mobile commercial satellite solutions.**

Astrium Services Government, Inc. combines the teams and assets from the former Vizada Americas group and the U.S. satellite services provided by Astrium Services (formally Paradigm Solutions).

"Astrium Services Government, Inc.'s world-class capabilities, competitive pricing and highly experienced U.S. team have a strong track record of proven performance in the United States," said John Schumacher, President of Astrium Americas.

"Customers across the U.S. government will benefit greatly from the growing capabilities and expertise Astrium Services Government, Inc. offers, as well as the increased competition that this new space entity will bring to

satellite-based communications in the North American market."

Bob Baker, CEO of Astrium Services Government, Inc., said, "Today, our mission includes both the mobile satellite service (MSS) offerings for which we are well known, along with the customized fixed satellite services (FSS) upon

which we are building our future.

"We have the market expertise, the innovative service offerings, the contract vehicles and the ability to create

customized solutions making us a strong partner for addressing today's U.S. Government needs." **#**

# DISPATCHES

## DEMO + DATA FOR DEFENSE

**The Space Tracking and Surveillance System (STSS) demonstration satellites, built by a Northrop Grumman and Raytheon team for the U.S. Missile Defense Agency (MDA), collected data during an Aegis Ballistic Missile Defense test June 26 that will be used to create a concept of operations for future space-borne, operational missile defense sensors.**



Designated FTM-18, the combined Aegis Launch on Remote and Engage on Remote exercise involved the successful intercept of a medium-range target by the newest variant of MDA's Standard Missile-3 interceptor, the SM-3 1B.

The pair of STSS demonstration satellites collected data in infrared wave bands similar to those planned for MDA's proposed Precision Tracking Space System (PTSS), said David Bloodgood, STSS program manager for Northrop Grumman's Aerospace Systems sector in Redondo Beach, California.

Northrop Grumman is performing manufacturing and production readiness systems engineering as a member of the PTSS Integrated Systems Engineering Team (ISET). As prime contractor for STSS, the company brings extensive systems engineering and

integration experience in midcourse missile tracking to PTSS ISET, Bloodgood said.

The FTM-18 flight test supported the initial phase of MDA's Phased Adaptive Approach for missile defense in Europe that features deployments of increasingly capable sea- and land-based missile interceptors and a range of sensors to address regional ballistic missile threats to Europe and to U.S. forces deployed there.

Using sensors capable of detecting visible and infrared light, the STSS demonstration program serves as the experimental space layer of the Ballistic Missile Defense System (BMDS). The program's mission objective is to provide accurate tracks of midcourse re-entry vehicles to the shooter.

Both STSS satellites have participated in major BMDS tests since 2010. With sensor payloads capable of detecting visible and infrared light, the low-earth orbiting spacecraft have demonstrated a number of capabilities that had existed in theory or in the lab, but never in the actual environment where they would be used. They have shown, for example, that precision tracking of a missile throughout its flight can be done with satellites alone. **#**

## CULTURE CHANGE FOR ACQUISITIONS

**The evidence just keeps coming that the DoD is changing how it looks at meeting its communications needs in space.**

The latest sign is described in an excellent piece in Defense Daily published on November 29th titled "Simple Satellites with Commercial Utility Could be Onset for DoD Acquisition Change, Air Force General Says."

The story talks about starting with simple satellite sensors and building up to bigger procurements in partnership with industry.

Major General Martin Whelan, Air Force Space Command (AFSPC) Director of Requirements, says a change in culture is necessary. However, it won't happen overnight.

"We're learning how to do that, but it will be on a case-by-case basis until we get enough victories and until industry is fully developed in that mission area," Whelan said. "But, as I said, satellite communications might be an area that would be ripe for looking for the next victory."

That acknowledgement is very encouraging. The Defense Daily piece also quotes IGC President Kay Sears talking about how a culture change will free up industry to truly partner with the DoD in space.

Kay wrote in October about how the FCSA process was another step in the evolving government view on procurement.

Kay references how WGS provides the U.S. government with much needed SATCOM capacity, which is supplemented by commercial satellites to help keep up with ever-increasing ISR bandwidth needs.

Commercial has played this supporting role since the first Gulf War. She also praises leaders like Space and Missile Center (SMC) chief Lt. General Ellen Pawlikowski and AFSPC chief General William Shelton for having strong visions of where we need to go in space.

"It's getting that down to the rank and file, again down at the major and colonel level, the program level, where that vision is created," Sears said. "There has to be some change in the culture, and, to me, that is what has to be driven down by some of the leaders."

Change is never easy. But it certainly helps to have a catalyst like the current budgetary climate. That's what will continue to drive this culture change. In the process, it will forge a stronger partnership in space that delivers for the warfighter and the taxpayer. **#**

*This story is courtesy of Intelsat General's Satcom Frontier blog.*

# IN RELIEF OF SANDY VICTIMS

**Intelsat S.A. donated satellite distribution services for the "12-12-12" Hurricane Sandy relief concert in New York City.** Asia and Australia. The event occurred take at Madison Square Garden and featured Bon Jovi, Eric Clapton, Billy Joel, Alicia Keys, The

Working with AMC Networks. Intelsat provided capacity for the December 12 event via its Galaxy 17, Intelsat 11 and Intelsat 805 satellites, which enabling viewership across North America and South America.

"12-12-12" was distributed worldwide to nearly two billion people through television feeds, radio and online streaming and was available to 114 million television households in the United States as well as to more than 400 million television homes outside the country via networks and feeds in North America, South America, Europe, Africa,

Rolling Stones, Bruce Springsteen & the E Street Band, Kanye West, The Who and Paul McCartney.

The concert was produced by James Dolan, Executive Chairman of The Madison Square Garden Company; John Sykes, President of Clear Channel Entertainment Enterprises; and Harvey Weinstein, Co-Founder and Chairman of The Weinstein Company.

All proceeds from ticket purchases and donations will serve the victims of Hurricane Sandy through the Robin Hood Relief Fund. #

# DISPATCHES

## SATCOM CAPABILITY IS SUCCESSFULLY DEPLOYED

**The recent NAWAS and CWIX exercises marked the first successful deployment by French forces of the Thales solution for long-range Link 16 transmission of tactical data via satellite.**

During the exercises, the compact, readily deployable TopLink-MINT solution from Thales was used for long-range transmission of tactical situation data to NATO and allied systems, providing an opportunity to:

- Demonstrate rapid operational implementation of a Link 16 network extension capability

- Validate compliance with the JREAP standard (Joint Range Extension Application Protocol) and its interoperability with NATO and allied systems

"Thales is proud to have taken part in these exercises, which have successfully demonstrated the excellent performance of our systems and their inherent interoperability in the context of joint and coalition operations involving several nations," said Hervé Derrey, VP for Thales Communications & Security's Radio Communication Products business. "The armed forces now have the assurance that platforms equipped with our solution will deliver the rapid deployability, long-range extension and interoperability they need."

In addition to the standard Link 16 function via MIDS radio network, the TopLink-MINT station from Thales incorporates the JRE capability (Joint Range Extension) for relaying Link 16 information from the MIDS network over an infrastructure network or via satellite.

The NAWAS 2012 exercise was organised and conducted by the three branches of the French armed forces under the leadership of the Land Forces Command (CFT). Its objective was to confirm the ability of the armed forces to provide an effective air defence capability for expeditionary land forces on the move.

The Coalition Warrior Interoperability eXploration, eXperimentation, eXamination, eXercise (CWIX) is an annual exercise to test and improve the interoperability of operational information systems deployed by NATO nations.

The exercise uses a range of scenarios to demonstrate technical and operational readiness and deploy equipment and systems in live situations to test their ability to recognise each other and communicate in the theatre of operations.

It is also an opportunity for government agencies and industry to deploy prototypes and demonstrators to showcase new technologies in realistic situations. Around 150 information systems and 800 personnel were involved in this annual exercise. **#**



## PAYLOAD PROCESSING PAY

**Astrotech Corporation's Astrotech Space Operations (ASO) subsidiary has won a Not-to-Exceed $16 million Infinite-Delivery/Indefinite Quantity (IDIQ) task order contract for commercial payload processing services at Vandenberg Air Force Base ("VAFB"), California.**

Under the contract, Astrotech Space Operations will compete for future missions NASA is planning for launch from VAFB. The contract ordering period runs through December, 2017.

"We are proud to continue serving our NASA customer at Vandenberg AFB," stated ASO General Manager Don M. White, Jr.

"Astrotech VAFB is currently processing the Landsat Data Continuity Mission, the seventh, and last mission on the current IDIQ contract awarded in 2007."

In support of 2013 launches, ASO Florida will be processing NASA satellites TDRS-K and TDRS-L as part of an ongoing Eastern Range IDIQ contract, added White.

From Titusville, Florida, and Vandenberg AFB, California, Astrotech Space Operations provides all support necessary for government and commercial customers to successfully process their satellite hardware for launch, including advance planning; use of unique facilities; and spacecraft checkout, encapsulation, fueling, and transport. In its 31-year history, Astrotech has supported the successful processing of more than 300 spacecraft. **#**
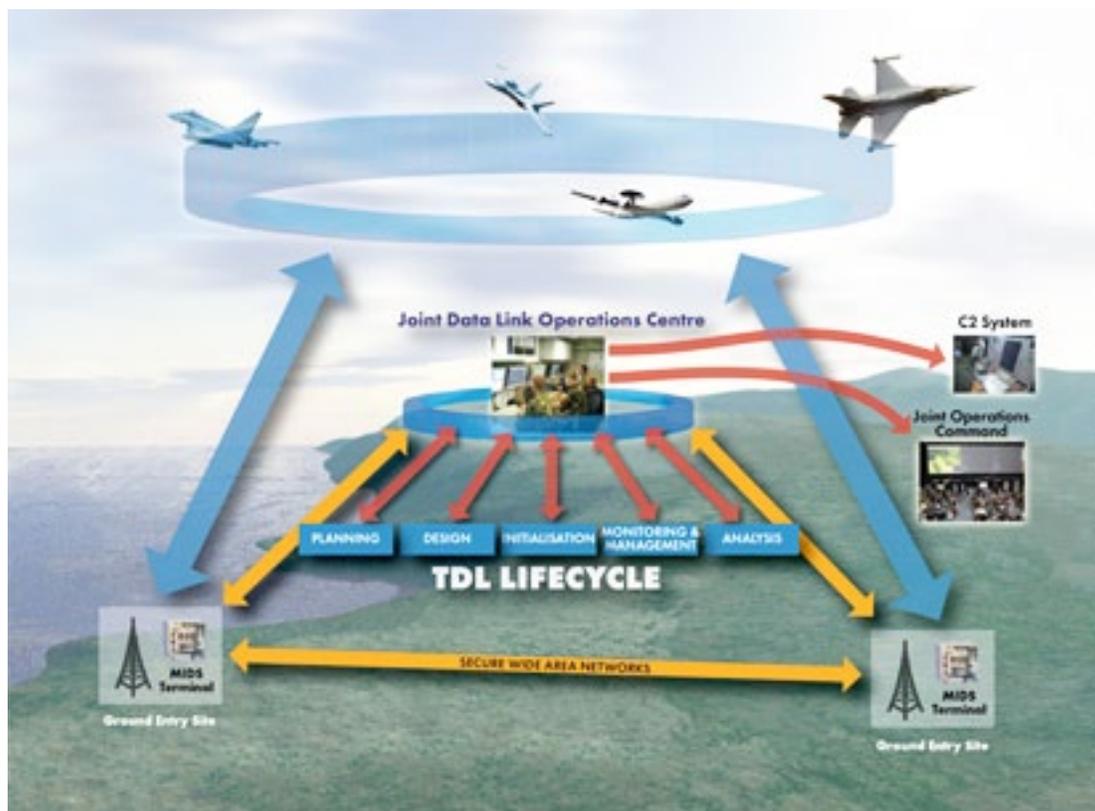
# CAPS AT THE TOP OF THE WORLD

**The U.S. Air Force Space Command's Space and Missile Systems Center has awarded a contract to Northrop Grumman Systems Corporation - Information Systems in Redondo Beach, California, for the MILSATCOM Systems Directorate's design and development of the Enhanced Polar System's Control and Planning Segment (CAPS).**

The CAPS award is the result of a full and open competition. This cost-plus-incentive-fee contract was awarded as a basic contract for all CAPS design work up to and including the segment's Critical Design Review, with a value of $66.8M and contains options for the development and delivery of the segment as well as the procurement of spares that could be worth a total of $148.3M.

SMC's MILSATCOM Systems Directorate is acquiring EPS to provide Extremely High Frequency protected satellite communications capability to forces operating in the North Polar Region.

The system plays a central role in fulfilling Department of Defense joint-communication capability requirements. The EPS system will provide the capability to carry secure teletype, voice, email, instant messaging, video, multi-media and data communications. EPS will provide continuous coverage to terminals operating in the polar region and will support secure, jam-resistant, strategic and tactical communications between forces operating above 65 degrees north latitude.

CAPS is the primary means for commanding and receiving telemetry for the two polar-orbiting payloads. CAPS provides execution of essential mission functions such as payload clock management and over-the-air-rekey of user terminals.

CAPS will receive spacecraft ephemeris data from the Payload Segment Host Control Segment and use it to generate User Ephemeris Messages that are uplinked to the EPS payload for distribution to the Terminal Segment.

Primary CAPS functionality includes EPS planning and management, in-band EPS payload system control, EPS cryptographic planning, EPS terminal image generation and support for CAPS hardware and software development and testing.

CAPS is planned to be deployed at Schriever Air Force Base, Colorado, with the telemetry tracking and command terminal and CAPS timing equipment located at the EPS Gateway site at Clear Air Force Station, Alaska. **#**

# DISPATCHES
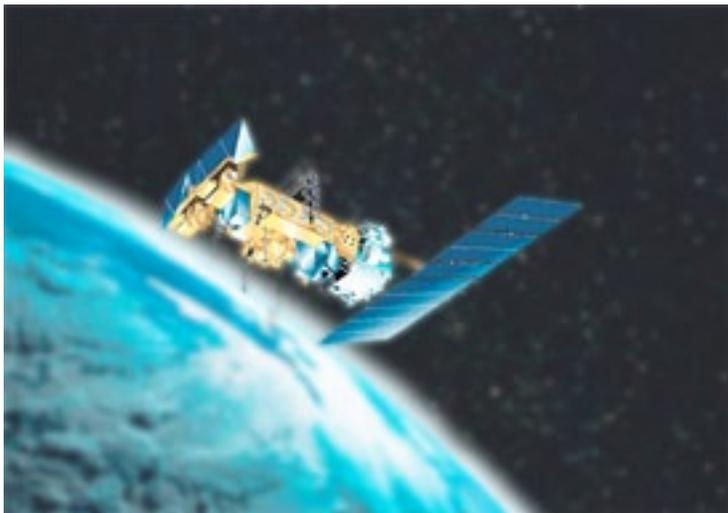
## LIFE SAVERS

**According to a new study by the European Centre for Medium-Range Weather Forecasts (ECMWF), the NOAA forecasts of Hurricane Sandy's track could have been hundreds of miles off without information from polar-orbiting satellites.**

Rather than identifying the New Jersey landfall location within 30 miles four-days before landfall, the models would have shown Sandy remaining at sea.

"This study shows the value of polar-orbiting satellites in developing life-saving forecasts with longer lead times, said Dr. Kathryn Sullivan, assistant secretary of commerce for environmental observation and prediction, and deputy NOAA administrator.

"Had we thought the brunt of the storm was going to stay out in the Atlantic, or if residents had only a day to prepare or evacuate, the results would have been even more devastating."

The ECMWF is an independent, intergovernmental organization supported by 34 European nations, providing global medium-to-extended range forecasts.

Data from polar-orbiting satellites consist of accurate, high-resolution atmospheric temperature and water vapor information, which are critical inputs to forecast models that help predict the intensity and location of severe weather events, such as Sandy—several days in advance.

These spacecraft are called polar-orbiting, because they circle the earth from pole-to-pole, providing full global coverage daily as the Earth rotates beneath them.

On October 29, Sandy made landfall just south of Atlantic City, New Jersey. It morphed into a hybrid storm, bringing strong winds, heavy snow, rain and a powerful storm surge to areas along the Eastern seaboard.

"The global observing system based on polar-orbiting satellites, along with other observation resources, numerical models and the experience and skill of our forecasters, gave NOAA an advantage in tracking Sandy— from tropical wave, to hurricane, to post-tropical cyclone," said Louis Uccellini, director of NOAA's National Centers for Environmental Prediction in College Park, Maryland.

NOAA operates two types of satellites; polar operational environmental satellites (POES), which fly 540 miles above Earth's surface, circling from pole to pole, and geostationary operational environmental satellites (GOES), which remain stationary above the equator at an altitude of 22,300 miles.

GOES spacecraft orbit at the same speed as the Earth's rotation, resulting in near continuous observations of a fixed region. As a result, GOES provides constant imaging and POES, the subject of this study, offer full global coverage—with improved spatial resolution and additional instruments to measure atmospheric temperature and water vapor.

NOAA is working with its partner NASA to develop and launch the next generation of polar-orbiting satellites, the Joint Polar Satellite System (JPSS). Last year, NASA launched the Suomi NPP satellite, which is the bridge between NOAA's current polar-orbiting satellites and NASA's current Earth Observing System satellites and JPSS. The JPSS-1 satellite is set to launch in early 2017.

"Our top priority is ensuring NOAA's National Weather Service can maintain accuracy and timeliness of its forecasts and warnings today, and into the future," Sullivan added. "The only way that can happen is with a robust satellite fleet."

NOAA's mission is to understand and predict changes in the Earth's environment, from the depths of the ocean to the surface of the sun and to conserve and manage our coastal and marine resources. **#**



*NOAA's JPSS satellite, artistic rendition is courtesy of Ball Aerospace*
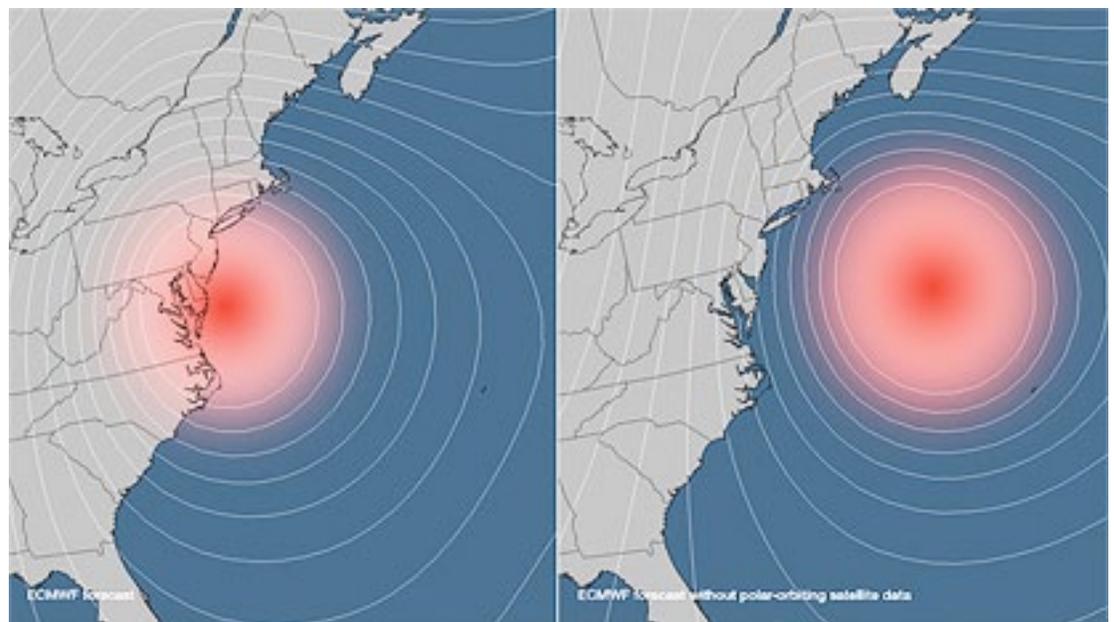


*This image uses the model output from the ECMWF experiment, showing where Sandy was predicted to be located 4 days out with the normal satellite data inputs into the model (left) and without any polar-orbiting satellite data (right). Both position and intensity forecasts were affected—Sandy stays out to sea without the polar-orbiting satellite data, and the closer isobar lines encircling the storm also imply a more organized and stronger system. (Credit: NOAA)*

# EMERGENCY OPS TRAINING

**Combined Joint Task Force-Horn of Africa service members constructed a Forward Headquarters Element with Joint Operation Center capabilities as part of contingency readiness training on Camp Lemonnier, Djibouti, December 3, 2012.**

The FHE, a soft tent, houses equipment and personnel needed for CJTF-HOA leadership to command and communicate with the local forces.

"This is our forward headquarters element where we would take our headquarters from our home station JOC and move it out in the field closer to the action, wherever we need to be," said U.S. Navy Lt. Cmdr. Chuck Hawkins, CJTF-HOA operations assistant mission commander. "This allows us to have an on-site commander with on-site eyes to relay information back and forth keeping everybody informed about the situation"

It can take three to four hours to assemble the tent and make it operational, which includes enabling power and communication. Twenty-five service members are always on standby should a real-world emergency arise, according to Cmdr. Chuck Hawkins.

Members from CJTF-HOA's operations, intelligence, and communications sections, and Camp Lemonnier's Naval Mobile Construction Battalion 1 and force protection personnel partnered to share best practices and solve any problems that arose to successfully complete the mission.

"My people did excellent today," Hawkins said. "You know you are going to find some flaws and we worked through them. Next time it's going to be even better than before." #

*Story by U.S.A.F. Staff Sgt. Christopher Ruano, Combined Joint Task Force— Horn of Africa*



*U.S. Air Force Senior Airman Chad Flannery and Staff Sgt. Derek Hudson, Combined Joint Task Force-Horn of Africa Cyber Transport System technicians, assemble a satellite communication system during contingency readiness training on Camp Lemonnier, Djibouti, December 3, 2012. The training prepares CJTF-HOA members for military and humanitarian missions throughout the region by strengthening operational capabilities. (U.S. Air Force photo by Staff Sgt. Christopher Ruano)*

# DISPATCHES

## SEEME, A SOLUTION FOR SMALL SATELLITES

**Raytheon Company was awarded a $1.5 million Defense Advanced Research Projects Agency (DARPA) contract for phase one of the agency's Space Enabled Effects for Military Engagements (SeeMe) program.**

During the next nine months, the company will complete the design for small satellites to enhance warfighter situational awareness in the battlespace. The SeeMe program will provide useful on-demand imagery information directly to the warfighter in the field from a low-cost satellite constellation launched on a schedule that conforms to Department of Defense operational tempos.

"Leveraging our state-of-the-art missile assembly lines, we can mass produce these small, lightweight satellites quickly and affordably," said Tom Bussing, Raytheon Missile Systems' vice president of Advanced Missile Systems. "As the world's only producer of exoatmospheric kill vehicles, we are already developing and building hardware to space standards."

Raytheon has teamed with Sierra Nevada Corporation, University of Arizona and SRI International to assist with design work and eventually production. Next year, in phase two of the SeeMe program, the Raytheon team would build six satellites for ground testing.

"We are pleased to be working with DARPA to solve the challenge of providing warfighters with a tactical space sensor capability at a production rate price," said Bussing.

DARPA's SeeMe program aims to give mobile individual US warfighters access to on-demand, space-based tactical information in remote and beyond-line-of-sight conditions.

If successful, SeeMe will provide small squads and individual teams the ability to receive timely imagery of their specific overseas location directly from a small satellite with the press of a button—something that's currently not possible from military or commercial satellites.

The program seeks to develop a constellation of small "disposable" satellites, at a fraction of the cost of airborne systems, enabling deployed warfighters overseas to hit 'see me' on existing handheld devices to receive a satellite image of their precise location within 90 minutes.

DARPA plans SeeMe to be an adjunct to unmanned aerial vehicle (UAV) technology, which provides local and regional very-high resolution coverage but cannot cover extended areas without frequent refueling.

SeeMe aims to support warfighters in multiple deployed overseas locations simultaneously with no logistics or maintenance costs beyond the warfighters' handheld devices.

The SeeMe constellation may consist of some two-dozen satellites, each lasting 60-90 days in a very low-Earth orbit before de-orbiting and completely burning up, leaving no space debris and causing no re-entry hazard.

The program may leverage DARPA's Airborne Launch Assist Space Access (ALASA) program, which is developing an aircraft-based satellite launch platform for payloads on the order of 100 lbs.

ALASA seeks to provide low-cost, rapid launch of small satellites into any required orbit, a capability not possible today from fixed ground launch sites. **#**

## THE NAVY'S FUTURE?

**November 27th was a big day for Naval Aviation, as the Navy hoisted the first X-47B Unmanned Combat Air System (UCAS) demonstrator on board the aircraft carrier USS Harry S. Truman (CVN 75).**

Later this month, the Navy is preparing for another first when a team from the Navy Unmanned Combat Air System program office (PMA-268) gets set to conduct tests and demonstrations with the X-47B while underway with the ship.

According to the Northrop Grumman's X-47B UCAS Fact Sheet, the X-47B is a computer-controlled unmanned aircraft system that takes off, flies a preprogrammed mission, then returns to base in response to mouse clicks from its mission operator. The mission operator monitors the X-47B air vehicle's operation, but does not actively "fly" it via remote control as is the case for other unmanned systems currently in operation.

The UCAS program is intended to reduce risks associated with developing future unmanned, carrier compatible systems, and hopes to demonstrate two "firsts" for unmanned jet-powered aviation: Autonomous carrier and aerial refueling. **#**

*Sailors assist with the onload of the X-47B Unmanned Combat Air System (UCAS) demonstrator aboard the aircraft carrier USS Harry S. Truman (CVN 75). The air vehicle arrived by barge from Naval Air Station Patuxent River, Maryland. Truman is the first aircraft carrier to host test operations for an unmanned aircraft. (U.S. Navy photo by Mass Communication Specialist 3rd Class Lorenzo J. Burleson/Released)*

# A TACTICAL DEVELOPMENT

**Rohde & Schwarz has now introduced the R&S SDTR, the first in a new generation of software defined radios (SDR), together with a family of network capable waveforms.**

This tactical radio for vehicular and semi-mobile platforms delivers 50W of output power without external amplifiers and covers the 30 to 512MHz range. It meets the military's special requirements on shock resistance, size, weight and ventilation without the need for extra mechanical shock absorbers.

Thanks to integrated high-performance filters, antennas can be spaced as close as one meter apart and the radio lines will not interfere with each other. The R&S SDTR tactical radio, with the R&S HDR waveforms, is fully IP capable and can be easily and seamlessly integrated into existing IP networks.

The R&S SDTR is an open platform based on the software communications architecture (SCA) standard. SCA based waveforms and other manufacturers' waveforms can be ported to the radio, paving the way for interoperability with allied armed forces. The R&S SDTR has the capability to handle future international standardized waveforms with data rates of up to several Mbit/s.

Rohde & Schwarz has developed a family of network capable, high data rate waveforms to handle diverse mission requirements.

The R&S HDR waveforms transmit data and up to two voice channels in parallel, at high speed and with different priorities. Users can select the waveform that best matches their requirements on range, data rate and jamming immunity.

The R&S HDR waveform family enables mobile, IP based tactical radio communications, the prerequisite for future networked operations. In vehicle based missions, the contactability of network nodes and the availability of bandwidths can change rapidly.

The R&S HDR waveforms offer MANET capability, supporting the automatic reconfiguring of radio networks.

The sophisticated security architecture of the R&S SDTR provides users with secure, reliable communications. Plain and encrypted data is strictly separated. Very fast frequency hopping rates ensure maximum immunity to jamming.

These measures, combined with high-security encryption, provide optimum protection against jamming, reconnaissance and eavesdropping. #

## ENSURING OPERATIONAL CAPABILITIES

**After offloading hundreds of pieces of communications equipment from a recent deployment at sea, the Marines must ensure their operational capabilities are maintained.**

Marines from the communications detachment of the 31st Marine Expeditionary Unit, maintain their operational readiness through constant analysis and maintenance of the unit's communications equipment.

The Marines of the 31st MEU use several types of communications equipment to maintain the operational "chatter" throughout the four major elements of the Marine Air Ground Task Force.

"The most used piece of equipment is the Support Wide Area Network (SWAN) because of its easy break-down and set-up capabilities," said Lance Cpl. James S. Gummoe, a satellite communications operator for the 31st MEU, and a native of Huncasville, Connecticut.

"It is the SWAN's extensive use and high-paced deployment rate where the wearing of the equipment happens."

The SWAN is used to provide a broad spectrum of information services in a deployed environment including video, multimedia, data and imagery. The SWAN is a communications asset that can be set up in 30 minutes or less, getting the MEU rapidly connected.

Disembarking from the ship after the 31st MEU's Fall Patrol, the Communications Detachment must transition from an operational focus to a maintenance mindset.

Once the gear has made it back to Camp Hansen, the arduous task of operational checks begins. Hundreds of hours of maintenance are required for the highly technical equipment, keeping it ready to support garrison and deployed environments.

"The communications platoon consistently maintains a high operational tempo along with



*Lance Cpl. James S. Gummoe (left), a satellite communications operator and a native of Uncasville, Connecticut, and Lance Cpl. Mark S. Howden (right), a radio technician and a native of Anaheim, California, both with the communications detachment (comdet) of the 31st Marine Expeditionary Unit, configure the operating software for a Support Wide Area Network (SWAN).*

strict and structured training programs designed to utilize our time to the greatest extent possible." said 1st Lt. Pierce J. Virag, the 31st MEU communications platoon commander and a native of Oregon, Ohio. "There is no other MEU in the Marine Corps that maintains the deployment rate or operates at the tempo we see in Okinawa."

The communications Marines of the 31st MEU recognize their importance in unit operations, keeping them dedicated to the

laborious task entrusted to them. "We are the direct path of communications among the ground elements of the MEU," said Cpl. Eduin L. Poling, a satellite communications operator with the Communications Detachment, 31st MEU, and a native of Jonesboro, Indiana. "Without our equipment up and running in a high-paced operational standard, the link from the commanding officer and his Marines is lost." **#**

***Story/photos by Lance Cpl. Codey Underwood, 31st MEU***



*(From left) Lance Cpl. James S. Gummoe, a native of Uncasville, Connecticut, Pfc. Todd E. Beverage, native of San Diego, California, and Cpl. Eduin L. Poling, native of Jonesboro, Indiana, all radio technicians with the communications detachment (comdet) for the 31st Marine Expeditionary Unit, rotate the angle of the Support Wide Area Network (SWAN) here, December 6. For the past few weeks, the Marines of the commdet conducted operations check all their equipment, ensuring all of the gear is ready for the Spring deployment. The 31st MEU is the only continuously forward-deployed MEU and is the Marine Corps' force in readiness in the Asia-Pacific region. Photo by Lance Cpl. Codey Underwood*
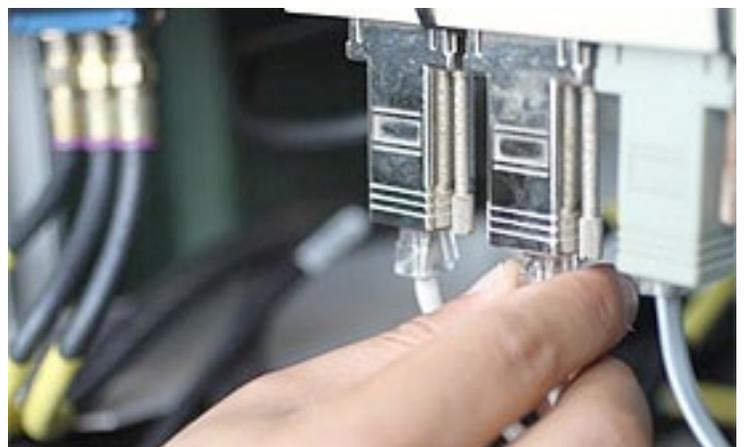


*Lance Cpl. James S. Gummoe, a satellite communications operator with the communications detachment (comdet) of the 31st Marine Expeditionary Unit, and a native of Uncasville, Conn., inserts a telephone cord into a Support Wide Area Network (SWAN) here, December 6th.*

# TECH SUPPORT FOR TOP SECRET ENTERPRISE

**General Dynamics Information Technology, a business unit of General Dynamics has been awarded a two-year, $6 million task order by the Air Force Intelligence, Surveillance and Reconnaissance Agency to provide technical support services to the Air Force Joint Worldwide Intelligence Communications System (AF JWICS) Enterprise.**

General Dynamics will help the Air Force streamline its communications networks and integrate with national-level Intelligence Community Information Technology Enterprise (IC ITE) and Desk Top Enterprise (DTE) initiatives.

Under this contract, General Dynamics will deliver a wide range of information technology (IT) services to support the continued operations of AF JWICS from numerous service centers and will assist the government in operating, maintaining and sustaining the centers that will provide core services to support the Air Force missions worldwide.

"General Dynamics has extensive experience working with defense intelligence agencies to provide joint enterprise communications, cyber security and IT services that meet military intelligence mission requirements," said Tom Kirchmaier, senior vice president and general manager of General Dynamics Information Technology's Intelligence Solutions division.

Headquartered at Lackland Air Force Base, the Air Force Intelligence, Surveillance and Reconnaissance Agency provides integrated, cross-domain ISR capabilities in concert with other service, joint, national and international partners.

The Joint Worldwide Intelligence Communications System is the Top Secret/



Sensitive Compartmented Information component of the Defense Information System Network used by the defense intelligence community to transmit classified multi-media intelligence communications worldwide. **#**
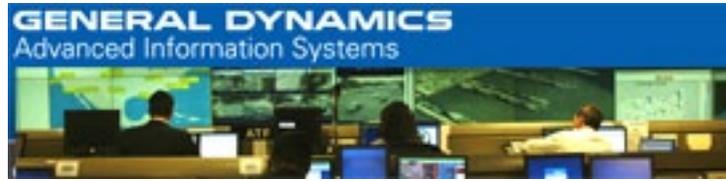
# NSR ANALYSIS—MILITARY SATCOM: PLANNING FOR THE UNKNOWN

*by Claude Rousseau, Senior Analyst, NSR France*

**P**articipants at the recent SMI Global Milsatcom Conference in London heard loud and clear how the fiscal cliff of the U.S. Government can overshadow huge bandwidth demand from UAVs, growth of on-the-move capabilities, and the continued bandwidth crunch in the historically secured and stable military satellite communications (MILSATCOM) market.

From the words of many government presenters, satellite communications is definitely an essential component of information assurance, superiority and autonomy. Smaller and more quickly deployable terminals are on the minds of many, and while the needs of military organizations center on elements such as availability, coverage, cost, redundancy and assured access, the current mix of proprietary and commercial assets has helped the latter grow over the years to generate more than $1.1 billion for the top FSS operators.

Qualifiers such as 'volatile, 'fluid, 'uncertain' were appended many times to the pair 'budget environment' to describe the situation in which government customers of satellite capacity find themselves.

Yet, the example of the UK Ministry of Defense, which signed a deal with Astrium six years ago, seems to be one of the models aligned with current concerns regarding future growth in demand for tightening wallets. The insertion of new technologies for video distribution, capacity leasing, hubs, terminals, and managed services was also highlighted as a must for longer-term commitment in particular as changes in operational requirements turn demand towards Asia and Africa.

This model is on the upswing and seems to please many governments as public-private-partnerships (PPPs) and public-financed-initiatives put the investment in expensive satellite capacity under the framework of a shared venture with the commercial sector.

As for planning full, end-to-end aggregate bandwidth, it is the ultimate dream of many operational agencies, and sharing the acquired capacity among many services to amortize costs is the direction of many planners. But its feasibility was also called in question in London given the widely differing missions ranging from simple reachback to advanced rapid COTM at the tactical edge on small manpacks. The link budgets, coverage and bandwidth speeds vary widely and represent a real challenge to this realization. Layered on top of this is the desire to have a 'one-size-fits-all' solution and buy capacity on an 'as-needed' basis, rather than spend money on bandwidth leases that remain unused.

For most government planners, adapting or adopting commercial investments in infrastructure as part of their long-term plans is not there yet, such that integration of commercial capacity in military systems is not an urgent agenda item. But it may come sooner than expected if the work undertaken to make systems interoperable, such as the new commercial Ka-band systems are able to offer, will provide end-to-end, military and commercial bandwidth at the flick of a switch.

There is still an expectation that bandwidth demand and data rates will go up, especially via high-throughput satellites (HTS) that will target an increasing number of mobile platforms. If these can offer a path to upgrade and compatibility that fill a gap and cost less than current satellite capacity, it could be a boost in confidence that government clients can have it both ways. But in the end, the industry is not detracting from the fact that all future improvements and partnership models hinge on lawmakers providing dollars and cents to avoid going 'off' the cliff. If one of the presenters is right, there should be some solace when considering that the U.S. Department of Defense budget today, if it had increased at the rate of the last years of the Clinton Administration, would be less than what is expected if and when the U.S. Government goes over the 'fiscal' cliff.



**Two examples of high throughput satellites (HTS)**

**Top: HYLAS-2**

**Bottom: Intelsat 29e**



**About the author**

Mr. Rousseau has more than 20 years of experience in the space sector in various roles, including business and program management, consulting, research, administration and communications. Mr. Rousseau started his career in Ottawa, Canada as Special Assistant for space and science in the Office of the Minister of Industry, Science and Technology of Canada. He then joined the Canadian Space Agency in 1992 in Montreal, Canada where he was Assistant to the President, then successively Analyst for Industrial and Regional Development, Administrator for the RADARSAT program and Manager for Strategic Planning in the Long Term Space Plan Task Force. In 1999, Mr. Rousseau became Manager, Professional Development Programs and Forum Activities at the International Space University (ISU) in Strasbourg, France where he was responsible for training and special events for various clients and created the University's Research Contract Service. Mr. Rousseau then co-founded Futuraspace, an international space consulting company specialized in space business and management located in California and France. While at Futuraspace, Mr. Rousseau participated in several client studies, led numerous consulting projects, and managed the European operations of the company. He has advised clients on a variety of markets and issues covering such topics as satellite applications, policy and regulation, business and management, education and training, and new space applications. He serves as regional and applications expert on satellite communications for NSR and directs both multi-client research reports and consulting projects.

# COMMAND CENTER: CHIEF MASTER SERGEANT CAROL A. DOCKERY

Chief Master Sergeant Carol A. Dockery is the Command Chief Master Sergeant, Space and Missile Systems Center, Los Angeles AFB, California. Chief Dockery supports the SMC Commander in assessing military readiness, pushing process improvements and workforce development. Her efforts support over 6,000 personnel and their families assigned to three stateside locations.

Chief Dockery entered the Air Force in November of 1983 and is a native of Columbia, South Carolina. She served in a variety of positions with increasing responsibility including two tours assigned to Headquarters Air Force as the subject matter expert for the Enlisted Retention Policy and the Chief Enlisted Promotions & Evaluation Policy. Additionally, she gained coalition and joint service experience while supporting Operations Enduring Freedom and Iraqi Freedom as the Senior Enlisted Leader at a forward deployed location. Chief Dockery served as the Command Chief Air Force Cyberspace Command Provisional and most recently completed a tour as the Senior Enlisted Leader for the National Reconnaissance Office in Chantilly, Virgina.

*Good day, Chief Dockery…how did you decide upon a career in the United States Air Force?*

**Chief Carol Dockery**
Like countless other recruits, my decision to join the military was filled with mixed emotions and a desire to follow in the footsteps of a family member. My Dad, a decorated Vietnam War veteran, returned from the battlefields larger than life. To me, he was faster than a speeding bullet, more powerful than a locomotive, able to leap tall buildings in a single bound. He was everything I secretly wished I could be. At the time, I couldn't put my finger on the origins of his undeniable prowess. Today, I'm convinced it stemmed from his willingness to take on the awesome responsibility of leadership and the character to build enthusiasm and confidence in others.

**MSM**
*What do you believe gave you the training necessary to work with commanders to ensure full enlisted support?*

**Chief Carol Dockery**
I honestly believe a leader's ability to unite people toward a common purpose (mission, process improvement, readiness, personal responsibility, or the wingman's concept) is grounded in the leader's character or lack thereof. The commanders I've had the pleasure to partner with exude positive character traits in words and deed. Gaining their support for issues impacting Airmen and their families is innate and requires very little effort on my part.

**MSM**
*What are a Chief Master Sergeant's main duties in general, and now at Space and Missile Systems Center, your new duty station?*

**Chief Carol Dockery**
Chief Master Sergeants are key enlisted leaders who partner with Air Force senior leaders from flight-level to Air Staff. They serve as commandants in our school houses; superintendents across various disciplines; program managers; command chief master sergeants responsible for unit readiness and mission effectiveness; and career field managers charged with supervising enlisted specialties throughout their careers.

As the Command Chief for the Space and Missile Systems Center, I support SMC commanders in assessing military readiness and pushing process improvement and workforce development, as well as offering perspective on issues impacting the more than 6,000 military, civilian, and contract personnel and their families assigned to SMC's three stateside locations.

In general, my role is to push the commander's priorities, help Airman break through obstacles that prevent them from reaching their objectives and goals, to make myself available to those who serve and their families, and to fill deltas identified by my commander and our Air Force.

**MSM**
*Why and how did you become involved in the space area of the USAF?*

**Chief Carol Dockery**
At the tail end of my command chief tour with Air Force Cyberspace Command (Provisional) at Barksdale AFB, Louisiana, I was nominated and subsequently selected by Lt. Gen. Ellen Pawlikowski to serve as the Senior Enlisted Leader with the National Reconnaissance Office in Chantilly, Virginia. Following my tour with the NRO, I was fortunate to once again gain her approval to partner in leading the men and women attached to SMC.


*The NRO offices in Chantilly, Virginia*

The challenge of stepping into unfamiliar territory was daunting, but I sincerely enjoyed the ride. While I continue to cut my teeth in the space business, I've yet to defeat the extremely large learning curve. My saving grace is the pride I feel when we realize successes while supporting the warfighter. Our space professionals diligently deliver resilient and affordable capabilities to the nation and I'm honored to have the opportunity to partner with the SMC leadership team as we strive for maximum effectiveness.

**MSM**
*What were your responsibilities while assigned with the Command Chief Air Force Cyberspace Command Provisional, and also when you were with the National Reconnaissance office?*

**Chief Carol Dockery**
Each assignment provided different opportunities to broaden my understanding of our contributions to the Joint team and the difficulties in resourcing critical activities and infrastructure. More specifically, the National Reconnaissance Office (NRO) is responsible to the Secretary of Defense and the Director of National Intelligence for research, development, acquisition, launch and operation of overhead reconnaissance capabilities, providing the foundation for global situational awareness and responses to the nation's toughest intelligence challenges.

As the Command chief, I was responsible to the NRO Director for the military readiness, professional development and mission effectiveness of the organization's joint enlisted personnel assigned in numerous locations across the globe.

As you might know, Air Force Cyber Command (Provisional) was a proposed United States Air Force Major Command that existed only in provisional status in 2007-08. On October 6, 2008, the Air Force announced the command would not be brought into permanent activation and the cyber mission would be transferred with the 24th Air Force to Air Force Space Command. During this historic transition, Air Force officials remained committed to providing full-spectrum cyber capabilities to include global command and control, electronic warfare and network defense. I partnered with the commander, Maj Gen William T. Lord, to steer the organization, while the Air Force completed a comprehensive assessment of the requirements and synchronized the proposed outcome with other key Air Force initiatives.



*Air Force Space Command at*
*Peterson Air Force Base, Colorado*

**MSM**
*For youngsters, what course of training do you recommend for them while in middle and high school as well as college to prepare them for a career in the space?*

**Chief Carol Dockery**
America needs to prepare students to compete in a technological workforce. Educational opportunities focused on problem solving, discovery, exploration and innovation are best realized when students are exposed to STEM (science, technology, engineering and mathematics) programs. Moving forward, knowledge workers will dominate most fields. All students, not just those interested in space, should receive a solid foundation in science, engineering, technology and mathematics.

**MSM**
*Given the current cutbacks in budgets by politicians, how will such impact your staffing efforts?*

**Chief Carol Dockery**
My job is to assist SMC's senior leaders in securing the appropriate balance of mission assurance, personnel readiness, "right-sizing," and modernization. We can't predict what lies ahead, but determining how to mitigate the risk associated with shrinking resources and mounting operational costs and demands.

**MSM**
*As you have served in forward positions during Operations Enduring Freedom and Iraqi Freedom as a senior NCO, what do you see as some of the most crucial challenges facing our nation from our warfighters?*

**Chief Carol Dockery**
Wearing SMC lenses gives you a different perspective when viewing the needs of the warfighter. Our biggest challenge is responding at the speed of need. Space systems are critical to the warfighter, from GPS targeting to surveillance to weather tracking. As we struggle with shrinking budgets, our job is to prioritize our efforts and work towards innovative solutions that allow our men and women in uniform to realize successes on the battle field and return home safely. With each success, SMC reasserts its role in delivering resilient, affordable space capabilities.

**MSM**
*Given your role, you must interface with commanders and general officers on a consistent basis…how do you manage to ensure the correct message is sifted down to your fellow Airmen and contract personnel? Is there a role for upwards communication as well?*

**Chief Carol Dockery**
Responsive communication both up and down the chain of command is essential to effective messaging and mission success. As the Center's Command Chief, my ability to listen is my most valued skill set, followed closely by my ability to establish and maintain credible relationships with senior leaders and our workforce.

I'm constantly looking for new and inventive ways to connect with the men and women of SMC. At the end of the day, nothing beats visiting folks where they live, work and play. That includes visiting individual work centers, meeting their families while attending monthly promotion ceremonies, sharing holiday meals with single Airmen in our dormitories, and attending local events hosted by our force support squadron and our community partners in the greater Los Angeles area .

**MSM**
*Looking back over your impressive career, what assignments have been the most satisfying for you?*

**Chief Carol Dockery**
Each assignment provided an opportunity to learn new things and meet great people, in particular the love of my life, my husband, who I met while assigned to the separations and retirements section of the consolidated base personnel office, Yokota AB in Japan.

I enjoyed every stop along the way and would jump at the chance to relive every moment serving this great nation alongside the men and women who proudly wear the uniform and call themselves America's Airmen.

# ANTI-JAM APPROACHES FOR SATCOM

*by Karl Fuchs, Contributing Editor*

**A**s technology advances, adversaries have increasingly sophisticated capabilities to jam transmissions over geosynchronous satellites. There are multiple deployment scenarios to consider when it comes to implementing anti-jam technology. The question then becomes, what constitutes the best way to deploy anti-jam technology for SATCOM?

To overcome jamming challenges as well as cost constraints, governments are relying more and more on *commercial off the shelf* (**COTS**) equipment to leverage commercially available technologies and adapt these technologies to mitigate the very real threat of intentional signal jamming. Fortunately, the basic technologies used for jamming mitigation are already employed in many COTS modems. The COTS technologies currently used are designed to enable *Communications on the Move* (**COTM**) and provide better transponder resource allocations.

Anti-jam radios and satellite modems rely on *spread spectrum technology* to overcome a jamming signal. Spread spectrum comes in two broad groups: *Frequency hop spread spectrum* and *direct sequence spread spectrum* (**DSSS**).

In frequency hop spread spectrum, the transmission frequency rapidly hops from one frequency to another using a pseudorandom code known to both the transmitter and the receiver. The speed at which the carriers must hop in order to appropriately mitigate jamming interference is determined by two variables—sophistication of the adversary and physical distance of the transmitter from the jamming device. Frequency hop spread spectrum works especially well as an anti-jam technique for free-to-air transmissions by moving the carrier so quickly that an adversary cannot match the frequency agility.

The challenge for COTS products is the modem's frequency agility. Although most COTS *time division multiple access* (**TDMA**) systems leverage channel hopping to evenly distribute traffic loads across multiple in-bound channels, the frequency agility of the systems is not designed to meet anti-jamming needs. In addition, the channel hopping of a TDMA system is based on traffic loads and is not designed to work with a pseudorandom code.

With DSSS, a pseudorandom binary code is at a chosen chip rate and combined with a binary data stream through digital logic. The output is then modulated and transmitted. The chip rate of the pseudorandom code is the equivalent of the spread factor of the signal. DSSS works by lowering the signal-to-noise ratio needed to de-modulate a carrier to a point where an adversary's jamming signal can be overcome.

Many commercially available TDMA systems incorporate a type of channel hopping to evenly distribute network resource over a large number of terminals. Although this channel hoping is not orthogonal, nor is its frequency agile enough to serve an anti-jam function, the base capability could potentially be modified to be part of the total solution.

Fortunately, in many COTS systems, DSSS has already been implemented, at least for satellite modems with COTM capabilities. In the case of DSSS for COTM terminals, the lower ratio of *Energy per bit* (**Eb**) to the *spectral noise density* (**N0**) characteristics of

# ANTI-JAM APPROACHES FOR SATCOM

the waveform are used to overcome adjacent satellite interference, which can be a problem in systems with ultra-small COTM antennas.

An innovative approach to introduce into the options for anti-jam technology is to deploy a hybrid solution. This approach may be the most successful implementation for a COTS product-based anti-jam solution. A hybrid solution could potentially accommodate COTS equipment in which the embedded electronics do not allow for the full frequency agility required by a pure frequency hop spread spectrum solution. Likewise, a hybrid solution could enable acceptably high data throughputs over a modem which is limited in transmission symbol rate and where the direct sequence spread spectrum chip rate required to address the threat would be prohibitive.

Regardless of the jamming mitigation strategy employed, systems operating under jammed conditions experience a greater number of errors than systems operating on clean channels. As such, the coding interleavers' depth would have to be increased, which will negatively impact voice quality because deep interleavers must take in and process a much larger block, therefore increasing the latency of communications and affecting call quality.

Regardless of the spread spectrum technology used to mitigate jamming signals, anti-jam waveforms require an enormous amount of bandwidth. The exact spreading factor required will depend primarily on the capabilities of the adversary and the jamming strategies they employ. Spreading factors required are based on an end-user's threat assessment. These classified threat assessments vary based on the adversary faced in various theaters. The classified nature of the threat poses another challenge to a COTS satellite transmission equipment manufacturer. How do you design to meet a threat which cannot be fully described to engineering?

A hybrid solution can help. The advantage of a hybrid solution is its ability to better address multiple types of jamming threats. In broad terms, an adversary may employ a frequency agile, narrowband, high-power spectral density waveform or a wideband, low-power spectral density carrier. An *orthogonal frequency hop spread spectrum system* is best suited for the former, while a DSSS system is best for the latter.

An ideal anti-jam capable system would be able to be dynamically tuned to optimally meet either threat. This capability is especially relevant when you consider different jamming threats may be encountered in different theaters of operations. Dynamic tuning may also be the solution to the classified nature of the threat as the manufacturer would no longer need to understand the full nature of the threat.

Regardless of the mitigation method implemented for anti-jam, there are a number of challenges faced by COTS manufactures of satellite modems. Purpose built anti-jam modems are designed not with mass production or reduced cost of goods sold in mind but rather with cutting-edge electronics which enable anti-jam technology. However, the basis for an anti-jam mitigation system is currently resident in many COTS satellite modem offerings.

### *About the author*
Contributing editor Karl Fuchs is vice president of technology for iDirect Government Technologies (iGT). He joined iGT in 2004 as the director of sales engineering, just as the satellite-based IP communications company was expanding its very small aperture satellite (VSAT) market presence into the federal government and international Internet Protocol (IP) networking world. He now works as the vice president of technology. With more than 20 years of experience in technology and with the federal government, Fuchs leads iGT's team of federal systems engineers and serves as chief architect for new product integration. Prior to joining iGT, Fuchs was director of systems engineering at Nortel Networks, where he oversaw the Verizon account team of systems engineers, leading the design of IP, frame relay, asynchronous transfer mode (ATM) and dense wavelength division multiplexing (DWDM) networks. Before joining Nortel, he designed IP and ATM networks for Sprint and the federal government.

Active in the satellite industry for more than 10 years, Fuchs has contributed editorial to numerous publications including *Federal Computer Week, Institute for Defense and Government Advancement, COTS Journal, Military Information Technology*, *Via Satellite, MILSATCOM* and *Satellite Evolution Global*. In addition, he has been a featured speaker at leading industry events including the DoD SATCOM User Workshop, ISCe, IBC, Pacific Telecommunications Council and Emergency Management Talks.

# GAME CHANGERS IN SPACE

*by Robert S. Dudney, former Editor-In-Chief, Air Force Magazine*

**T**he Air Force's satellite enterprise—for many decades the developer and operator of the world's most advanced military spacecraft—is under pressure to downshift.

Even staunch advocates of today's sophisticated orbital systems are questioning the practice of building a few large, exquisite, government-owned spacecraft that cost billions of dollars apiece and take many years to get into service. They say problems now confronting the U.S.s military space system require the Air Force and its industrial partners to find cheaper and faster ways to get payloads on orbit.

*Illustration by Zaur Eylanbekov*

Gen. *William L. Shelton*, head of **Air Force Space Command**, told the National Space Symposium in Colorado Springs, Colorado, earlier this year that some next generation military constellations could well feature small and relatively simple satellites. He said some defense payloads could be sent aloft on commercial spacecraft.

This recalibration, if it continues, could prove to be one of the biggest changes for USAF since it got into satellite work in the 1950s.

The movement reflects two realities. The first is the certainty of a shrinking budget. Experts say the Air Force can no longer afford sufficient numbers of the highly advanced systems and must find alternatives. The second is the undeniable and growing physical threat posed to US orbital vehicles, which are valuable, undefended—and few. Lower-cost systems could provide safety in numbers.

No one expects USAF to sharply turn away from its giant technological marvels in space. It is executing a change out of constellations that—for a while, anyway—will bring on board even more of these highly advanced, multimission spacecraft.

*Shelton* reported not long ago that, in his view, "the die is cast" on military constellations for the next 10 or 15 years.

Still, satellite developers have moved into "study mode," Shelton said, trying "to determine the validity of certain ideas [that could become] game changers from a cost and security standpoint." The awesome strengths and notable weaknesses of traditional satellite-making are seen in the constellations now in place.

## Missile Warning

The legacy **Defense Support Program** satellite, built to detect heat from missile launches and nuclear blasts and pass the data to U.S. users, has been a stalwart and will soldier on for a while longer. It will have to.

DSP has been around since 1970 though the youngest bird thought still to be in service was launched in 2007. The exact composition of the fleet in geosynchronous orbit is classified.

Technicians surround a **Wideband Global SATCOM** in the acoustic chamber at the **Boeing** satellite manufacturing facility in El Segundo, California. **WGS** satellites will serve as USAF's communications workhorses for some time forward. (Boeing photo)



*Technicians surround a Wideband Global SATCOM in the acoustic chamber at the Boeing satellite manufacturing facility in El Segundo, California. WGS satellites will serve as USAF's communications workhorses for some time forward. (Photo courtesy of Boeing)*

Its designated successor, the **Space Based Infrared System**, has had serious problems. **SBIRS** consists of two elements: Large, dedicated satellites in geosynchronous orbit, and other payloads on host satellites in highly elliptical orbits.

The first dedicated 5,600 pound SBIRS ball was launched in mid-2011, nine years behind schedule.

The program has been beset by large cost increases, too. A recent **Government Accountability Office** report put the tab for each satellite at $3 billion, though that number is certain to decline as more SBIRS are built.

Experts chalk up much of the problem to excessive requirements, immature technologies, and complex software. Up-and-down funding added to the woes.

*Shelton* said the first SBIRS GEO satellite can detect dimmer and shorter-duration heat events than is possible with DSP. The new satellite also can provide more accurate missile launch and impact point predictions, compared to DSP.

"We collectively made this program very hard," Shelton observed, "but we are seeing great data from the sensors on the spacecraft."

### Position-Navigation-Timing

The **GPS** constellation, comprising 31 orbiting satellites, provides time, location, and velocity data. GPS signals are used by all services as well as civilians, but are especially critical to the guidance of precision air weapons.

Replenishment of the constellation is an urgent need. As of June, two **Block IIA** satellites had been operating for more than 20 years. The 4,000-pound craft is expensive, so the Air Force doesn't buy spares.

The first ball of the **GPS IIF** replacement generation went aloft in May 2010; it was four years behind schedule, said the GAO. A second was launched in July of 2011. A third is being prepared for launch this fall, and a fourth for 2013.

The first GPS IIF encountered interference as a result of its transmitter construction and antenna patterns. The second was said to suffer problems with its cesium clock, a navigation device.

*An artist's conception of a Defense Meteorological Satellite Program spacecraft orbiting Earth. DMSP satellites have collected weather data since 1962 and have no approved successor program. Photo is courtesy of NASA*
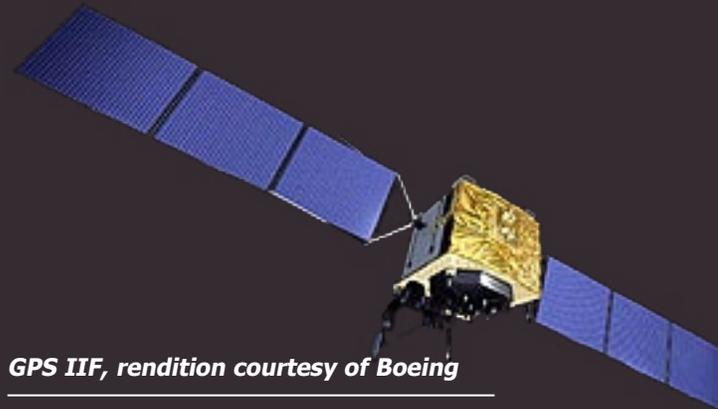
**GPS IIF, rendition courtesy of Boeing**

A **Defense Support Program** satellite and its inertial upper stage are readied for deployment. **DSP** legacy satellites have been serving for some 20 years and are expected to continue to do so for awhile yet. (NASA photo)

The Air Force foresees a smoother path with its next generation GPS III satellite, which is already far along. Plans call for the first of 32 spacecraft to launch in 2015. It will have higher power and other significant improvements.

*Shelton* believes development of GPS III has been a "model" of project cost and schedule discipline. USAF is holding to strict requirements, mature technologies, and close contractor oversight, and thus has kept GPS III on track.

It's a good thing. The Air Force needs to stay on schedule to avoid gaps in operations as old GPS spacecraft leave service. Shelton has reported that USAF will "just barely make it."

### Protected Communications

USAF's **Milstar** constellation provides secure delivery of national and nuclear command and control orders. The legacy space system consists of five balls in geosynchronous orbit.

Each Milstar is big, weighing some 10,000 pounds. It is jam-resistant, redundant, and hardened against nuclear radiation.

Milstar works well now, but it had serious start-up problems. Each one came in years late and over budget, due in large part to super-high technical requirements.

Milstar is being augmented—and will in time be supplanted—by the new **Advanced Extremely High Frequency** satellite. **AEHF** is even larger than Milstar—each satellite weighs 14,000 pounds. Two are on orbit, with more to come.

The original plan was to replace Milstar with the laser-based **Transformational Satellite Communications System**. **TSAT** was a bust, though, and was scrapped after billions were spent on its development.

AEHF is a big improvement over Milstar. Each satellite boasts a capacity 10 times that of its predecessor. AEHF's voice messages are clearer. Like Milstar, it can operate in a nuclear war.

Also like Milstar, AEHF had problems. The first ball was launched four years behind schedule and cost $1 billion. Because of a propulsion glitch, it took a year to reach final orbit.

### Weather Forecasting

**Defense Meteorological Satellite Program** spacecraft have collected weather data since 1962. They will keep at it into the 2020s because there is no proven successor.

The Air Force has launched more than 50 DMSP spacecraft, although most of these have aged out of service. Today, USAF operates two primary and as many as four backup DMSP satellites in polar orbit.

The Air Force has two fresh DMSP spacecraft "in the barn" ready for use in years ahead. This is fortunate as the USAF has struck out in its long search for a DMSP replacement.

In 1994, the Clinton Administration forced the Air Force to join hands with civilian agencies in the **National Polar-orbiting Operational Environmental Satellite System**. It was a mistake. After 16 years and many billions spent—and with no satellites to its name—**NPOESS** was terminated.

From the NPOESS wreckage emerged the USAF-only **Defense Weather Satellite System**, a stripped down spacecraft. The program lasted barely a year until it was canceled.

The recent development programs have suffered from major cost, technical, and schedule problems. Their loss raises the possibility of gaps in U.S. weather operations.

The Air Force is essentially starting over. *Shelton* has said that the service this year is seeking to define a lower-cost yet adequate follow-on effort.



*An artist's conception of a Defense Meteorological Satellite Program spacecraft orbiting Earth. DMSP satellites have collected weather data since 1962 and have no approved successor program.*

### Global Military SATCOM

**Defense Satellite Communications System III** is the backbone of global military space communications. The first **DSCS III** was orbited in 1982, the last in 2003. Eight are still operational in geosynchronous orbit, but they are reaching the end of their service life.

USAF is trading in DSCS III for the **Wideband Global SATCOM** system. Conceived as a "gap filler" between DSCS III and some more-advanced system down the road, **WGS** has, instead, become a success story and will serve as the communications workhorse for decades to come.

WGS wasn't without teething problems, but the program has managed to avoid serious schedule and cost problems.

Each 7,600-pound WGS satellite offers the same capacity as the entire DSCS constellation. Four satellites in a proposed 10-ball system are on orbit.

### New Architecture Required

In sum, USAF's approach to satellite building has delivered both enormous capabilities and some considerable problems.

*Shelton*, in his address to the symposium, called for a new mission architecture for space. Lt. Gen. *Ellen M. Pawlikowski*, commander of the Air Force's **Space and Missile Systems Center** (**SMC**), echoed that thought.

"It's time to take a step back," *Pawlikowski* noted, "and look at the architecture that we have. We don't have the money that we used to have. ... We've got to have flexibility. We've got to be affordable."

In a retreat from traditional thinking, *Shelton* told the symposium he favored more "disaggregation" of space capabilities on future satellites.

In earlier remarks to a trade group, *Shelton* explained the problem this way: "We design satellites to be redundant [and] long-lived, and we cram everything we can on a single satellite. That's ... driven largely by the cost of launch."

The service often puts several different kinds of payloads on a large spacecraft. *Shelton* wants to distribute future sensors and other systems over a larger number of smaller satellites.

His expectation is that this will reduce the complexity—and hence the risk and cost—of future spacecraft. Smaller satellites could also lead to smaller and less costly booster systems.

Moreover, say officials, there is a security dividend. For one thing, more satellites in orbit mean more resilience in case of attack, because it would be hard to target them all.

*Shelton* has noted that the new AEHF satellites contain not only secure strategic relays but also tactical communications for theater combatants. While that might be economical, it only simplifies the task of a potential attacker, he said.

No one thinks every future satellite can be small and simple. *Shelton* notes that physics intrudes with respect to a few missions. "You need large optics from geosynchronous orbit," he said. "You just do. You can't do that with smaller optics. It doesn't work."

Yet some mission areas seem ripe for disaggregation. One of these is space situational awareness, performed today by a large, **Space Based Space Surveillance** satellite, a telescope that scans the GEO belt for objects there.

*Shelton* said the U.S. needs to get on with an SBSS replacement. "It doesn't take huge optics, nor does it take sophisticated onboard

*An artist's conception of a Space Based Infrared System satellite, GEO-1. It was launched in May 2011. (Lockheed Martin illustration)*



*The Commercially Hosted Infrared Payload (CHIRP)—this sensor was integrated onto a SES commercial satellite. The data it receives is transmitted to a ground station for analysis. The sensor has a two-year design life. CHIRP was launched on September 21, 2011. Image is courtesy of SES.*

processing to provide operationally relevant data" in this mission area, said Shelton. A smaller satellite might be just the ticket.

The Air Force, by splitting up mission payloads, could replace its old DMSP weather satellites with "much smaller" spacecraft, he said. Another possible step: Relieving future GPS satellites of heavy nuclear detection payloads, which current GPS spacecraft carry. This would allow developers to simplify future positioning, navigation, and timing satellites. Certain military satellite communications systems likewise could move to lighter and simpler designs.

In short, says *Shelton*, the prospect of turning to smaller spacecraft is "looking very attractive."

Even missile warning, *Shelton* said, could see a move to smaller spacecraft. After the first group of SBIRS satellites is operational— about 2025—"you can think about disaggregation," he said, and complicate targeting.

### Hosted Payloads

Air Force officials are pursuing the goal of disaggregation and cost reduction in another novel and promising way—by putting payloads on commercial satellites.

The term *hosted payload* refers to the use of available capacity on a commercial spacecraft for military instruments and other items. It is a form of high-tech "hitchhiking."

The idea is not new, but it has come to the fore in recent years because the Air Force is under pressure to find means for faster and cheaper proliferation of payloads.

The Air Force on September 21, 2011, took its first step in this direction with **CHIRP**, an infrared missile warning payload sent aloft on an **SES** commercial satellite, launched by an **Ariane** rocket.

CHIRP (the acronym for *Commercially Hosted Infrared Payload*) went from program initiation to launch in 39 months—a virtual land speed record for a military program). It is the Air Force's first wide-field-of-view infrared staring sensor.

"It's been a great success so far," said *Shelton*. "We're seeing excellent results from it."

CHIRP, however, is experimental. "The real question for us today is: Was that a one-off, or was that the first step into the future?" asked *Pawlikowski*.
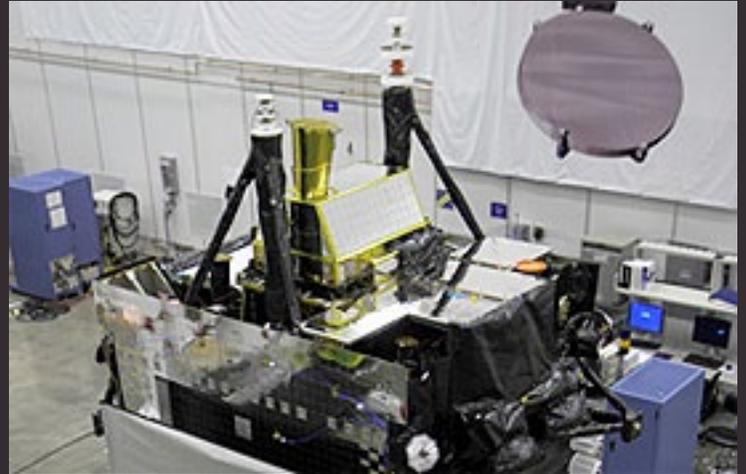
What is the holdup? Retired Lt. Gen. *Brian A. Arnold*, a former senior space acquisition official and proponent of hosted payloads, blamed "fear, habit, and inertia."

The Air Force and contractors in the space industrial base fought for years to get military space programs back on track, he said, and they resist taking new steps. "We tend to be a little risk-averse," *Arnold* said. "We don't like surprises."

Space industry officials say it certainly would not be difficult to design military payloads to fly on commercial buses. Going into the commercial world, however, will force USAF to be much more responsive, flexible, and fast on its feet.

SMC has established a hosted payload office. The aim is to find out whether the Air Force can dispense with large infrastructure, dedicated command and control systems, separate data processing systems, and the like.

"Hosted payloads provide an opportunity to streamline a lot of that out of the space system," said *Pawlikowski*.

*Arnold Friedman*, a senior executive at **Loral Space Systems**, told the Colorado symposium that, as of that event in April of 2012, there was a backlog of 75 commercial satellites headed for geosynchronous orbit in the next three years. All will be opportunities for the Air Force, he said.

*Pawlikowski* said the hosted payload concept might mesh well with the missions of missile warning, weather forecasting, space situational awareness, and certain types of communications.

"My message today is that we see hosted payloads as a key part of our future architectures, and we are this year, in 2012, moving out to have some real directed activities."

For *Shelton*, these and other steps are needed to break out of a platform-centric straitjacket afflicting military space and begin to focus on the real goal—delivery of better information for combatants.

That will mean finding ways to put together information from various sensors and expose the information to a wider group of users. That will work against the grain of traditional thought.

"We've built wonderful constellations with dedicated ground systems that are finely tuned to service just the core function of that individual constellation," said *Shelton*. "Don't get me wrong. The platforms are absolutely essential now, and will continue to be so, but the platforms aren't the end game. The eventual data products enabled by these platforms must be our ultimate focus."

**About the author**
Robert S. Dudney is a former editor in chief of Air Force Magazine (2002-2010). His most recent article was "Launchers and Lamborghinis" in the August 2012 issue.

## Current Air Force Constellations

| Satellite Program Name | Function | Orbit | Number |
|---|---|---|---|
| AEHF—Advanced Extremely High Frequency | military satellite communications | GEO | 2 |
| DSCS III—Defense Satellite Communications System | military satellite communications | GEO | 8 |
| Milstar—Military Strategic and Tactical Relay | military satellite communications | GEO | 5 |
| WGS—Wideband Global SATCOM | military satellite communications | GEO | 4 |
| GPS—Global Positioning System | position-navigation-timing | MEO | 31 |
| DSP—Defense Support Program | missile launch warning | GEO | * |
| SBIRS—Spaced Based Infrared System | missile launch warning | GEO | * |
| DMSP—Defense Meteorological Satellite Program | weather data collection | LEO | 2 |
| ORS-1—Operationally Responsive Space | intelligence-surveillance-reconnaissance | LEO | 1 |
| SBSS—Spaced Based Space Surveillance | space situational awareness | LEO | 1 |
| STSS—Space Tracking and Surveillance System | space situational awareness | LEO | 2 |

* Number of operational satellites is classified
**LEO** = low Earth orbit **MEO** = medium Earth orbit **GEO** = geosynchronous orbit

*As of June 27, 2012*

# RELIEF THROUGH EMERGENCY COMMUNICATIONS

*by Julia MacDonough, GMV USA, Director of Business Development for Defense + Intelligence*

**D**ecision makers at all levels rely on the availability of effective and efficient communications when faced with emergency or crisis situations. Military combat, terrorist activities, and natural disasters are examples of crisis situations in which availability and performance of communications systems are critical to mission success and, ultimately, preservation of human lives. Decision makers' ability to make informed, life-saving decisions depends heavily upon the capability to transmit and receive data when and where needed. From first responders to Non-Government Organizations (NGOs) to military assistance, all rely upon emergency communications to save lives and protect property.

Emergency communications requirements balance preparedness for the full scope of emergency scenarios that could occur in a single location. Emergency communication allows planners to retain the flexibility to respond to rapidly changing scenarios by shifting resources and providing solutions that allow users to operate in a dynamic environment, all while protecting sensitive information.

### The Challenges

Frequently, established policies and procedures require that resource requests be submitted a year or more in advance of any actual, anticipated need. The inherently unknown nature of emergency and crisis situations, however, prohibits detailed advanced knowledge of the specific communications requirements that will ultimately be needed to respond to such events. As a result, organizations tend to overestimate communications requirements to ensure adequate communications response in any possible scenario. One residual effect of this approach is that allocated resources, when not used to the level estimated in the planning process, may, in fact, be unused or underutilized.

Additionally, military and civilian agencies, as well as the systems they use, tend to operate in a stove-piped fashion. Independent communications systems are put in place to service a limited set of users. System design coupled with policies and concepts of operations can prohibit sharing of data and resources across platforms. Such "stove-pipes" also prevent resource sharing to provide surge communications capability when needed.

MILSATCOM users operate in an increasingly dynamic environment in which mobility factors inform user and terminal perspectives. User mobility may include user ability to change terminals and terminal types, while terminal mobility refers to terminals that change location while either offline or online. Such mobility, including *Communications-On-The-Move* (**COTM**) and *Remotely Piloted Aircraft* (**RPA**), offers unprecedented challenges.

At the same time, combat and first responder organizations are supporting a higher operations tempo than ever before, while adversary capabilities continue to evolve and mature. These factors result in ever more demanding communications requirements, while budgets across the **Department of Defense** and civil agencies are decreasing. Existing communications resources must be used more effectively and more efficiently to surpass adversary capabilities and enable successful, informed military and civil emergency and crisis response.

### Satisfactory Solutions

Technology offers a number of opportunities to enhance performance of existing satellite communications systems to support dynamic emergency and crisis communications requirements. Integration of operations across existing communications systems can enhance overall MILSATCOM system efficiency while protecting user-specific communications requirements and data integrity. Interoperability of existing technologies is necessary to accomplish a streamlined integration. Additionally, integrated, dynamic reallocation of resources enables capability to support increasing demand by mobile users and terminals.

Dynamic bandwidth allocation capabilities enable users to use what they need and to reallocate unused resources. In this manner, communications resources can be used for more efficiency and ultimately support the surge communications requirements that are typical of emergency and crisis operations.

These solutions for emergency communications can be accomplished through advanced planning and scheduling and bandwidth allocation technology that helps combat and first responder organizations navigate through the challenging landscape of emergency planning and preparedness.



### The Efficient Use Of Resources

Smart, integrated planning, management, and operations of existing and future communications systems can provide much-improved performance in a resource-constrained environment. Shared communications resources that can be dynamically allocated in near-real time, enable organizations to use only what they need and re-allocate unused or underused resources both in space and on the ground.

In this manner, overall communications system efficiency can increase, and more users get the communications support they need to successfully execute operations. In fact, trade studies implemented by GMV USA indicate performance improvements of at least 20 percent simply due to implementation of optimized, integrated planning and scheduling of space and ground resources for a satellite communications network.

### Compelling Assistance

**GMV USA** offers a customizable *Commercial Off-The-Shelf* (**COTS**) software solution for Mission Planning and Scheduling called *flexplan*, a highly configurable mission planning tool that can be easily expanded to add additional missions and resources and for efficient reuse from one mission to the next. It is specifically designed to optimize the management of multiple missions with multiple spacecraft and complex ground networks. This product covers the end-to-end planning cycle and allows users to quickly and easily adapt the system to their requirements.

*flexplan* can be customized to provide MILSATCOM users with optimized, automated, and dynamic near real-time rescheduling for the full suite of space and ground resources, including mobile users. Additionally, flexplan can be coupled with capabilities from GMV USA's **Smart** product suite to analyze bandwidth usage and enable on-the-fly bandwidth reallocation to maximize communications support to users.

### About the author

Julia MacDonough is leading GMV USA's expansion into the defense sector. Ms. MacDonough has over 15 years of experience serving the United States government as a United States Air Force officer and in industry. She holds a Master's Degree in Imaging Science from Rochester Institute of Technology and a Bachelor of Science in Physics from Duke University.

# HOSTED PAYLOADS + CAPITOL HILL: THE GOOD, THE BAD + THE UGLY

# THE GOOD

**Encouraged largely by Lt. Gen. Ellen Pawlikowski and the newly established Hosted Payload Office (HPO) under her command, the FY13 President's budget created several different funding lines in support of hosted payloads.**

This is a sign that some of the apprehension surrounding the hosting of government payloads on commercial satellites is subsiding.

The *Space Modernization Initiative* is used, in part, to fund innovative programs to ensure that space systems will meet future endeavors. The money attached to the hosted payload initiative was $12 million. While comparatively speaking this is a small portion of the budget, it does provide a funding stream that allows the government to take advantage of hosted payload opportunities. Further, the Space Modernization Initiative asks the HPO to identify relevant commercial opportunities for proof of concept to develop/integrate system concepts.

The Senate went a step further, and included several increases in the Defense Appropriations Bill, supporting hosted payloads.

- *$30 million for AEHF SMI to be used for radiation hardened manufacturing, hosted payloads, and "design for affordability"*

- *$20 million for SBIRS SMI, to be used for alternative overhead persistent infrared technologies, hosted payloads, "design for affordability", and related efforts.*

This year's budget did show positive steps forward in the support of hosted payloads even though it may be slower than the industry would like.

# THE BAD

**While the President's budget and the Senate seemed to be in full support of innovative programs such as hosted payloads, the House Appropriations Committee fought back. The House rejected the funding for the hosted payload that had been part of the Space Modernization Initiative.**

More troubling than the lost funding is the accompanying language, that states:

> *The Committee is concerned that, in a time of declining budgets, the Air Force and the Department of Defense may resort to silver-bullet acquisition concepts in an attempt to save money and accelerate immature concepts and technologies… Quick-fix substitutes for years of hard-won experience are attractive but illusory.*

To refer to programs like hosted payloads as "immature concepts", "quick fix substitutes" and "illusory" is disturbing, particularly in light of the recently successful payloads, such as the **Australian Defence Force** hosted payload and the ***Commercially Hosted Infrared Payload*** (**CHIRP**).

In many ways, this language closes the door on innovation and implies that only programs that have been acquired over decades are valid solutions. Solely protecting large programs of record is a slippery slope not only in this budget environment, but also as we look to continue our space superiority in the future through disaggregation and a greater need for resilient architectures.

# THE UGLY

**Of course, the ugly refers to the lame duck session of Congress. The passage of the C*ontinuing Resolution* has made the FY13 budget, and each of the Committee marks, irrelevant.**

A clean CR was passed in September that would fund the government at FY12 levels through March 27th. The November election will largely shape what happens next. In the new Congress, all previous bills will need to be reintroduced, and it is unclear whether they will use the existing mark ups as a baseline or will start all over again from scratch.

*"Our hope is that the government will look toward innovative solutions such as hosted payloads to deliver more cost-effective solutions in this environment of tough choices and budget cuts." (The preceding abstract was provided by Karen Yasumura, Government Affairs Manager for **Intelsat General Corporation.**)*

# HPA Insights

*Question: What can we as an industry do to further educate Appropriators and Congressional leaders on the value and cost benefits of commercially hosted government payloads?*

"Persistence and consistency pay off. We spend a great deal of time and effort educating members, committees and staffs about our programs. Let's make sure we continue to find new ways to add value in every meeting, like we do now offering hosted payload recommendations for hard problems facing national security interests and Government overall. We must always make sure members and staff hear the same messages from HPA regardless of who delivers the message*."—Robert Burke, Vice President & Deputy General Manager, Space Systems, Northrop Grumman Aerospace Systems*

"Governments around the world have been involved in hosted payloads for many years with great success.  Traditionally, these programs consisted of government payloads on government satellites, however there are even plenty of examples of success with government payloads on commercial satellites in more recent history.  The Federal Aviation Administration's (FAA) Wide Area Augmentation System (WAAS) started using hosted payloads on commercial satellites in the 1990s.  Hosted payloads are not new, nor are they 'silver bullet' initiatives. While they may not be the panacea for all capabilities, the time and cost benefits offered by commercially hosted payloads make them a viable tool in our future communications architecture."*—Tim Deaver, Vice President, Government and Institutions Development, SES*

"Boeing believes that the value and cost benefits of commercially hosted government payloads are currently being demonstrated on the UHF hosted payload aboard the Intelsat IS-22 for the Australian Defense Force (ADF) and currently being utilized by the United States Government, as well.  This satellite, built in less than 30 months, has been operational since May of 2012.  The ADF has publicly stated that this hosted payload approach saved them more than $150M.  In addition to Communications payloads, the Air Force CHIRP program demonstrated economic value of IR starer technology for missile warning.  These two examples underscore the need for the United States Government to further apply the Space Policy, which encourages the use of hosted payloads, by removing impediments to enable wider implementation of these capabilities. Appropriators and Congressional leaders need to hear that hosted payloads are a demonstrated, affordable alternative to dedicated government satellites through shorter build cycles and shared satellite, launch, and ground infrastructure."*—Jim Simpson, Vice President of Business Development, Boeing Space & Intelligence Systems*

"Hosted payloads are not meant to be the solution for inefficient space acquisition processes. However, hosted payloads can offer an alternative way to cost-effectively implement certain space missions that can coexist with commercially operated satellites. The best way for industry to educate Congress is by providing examples of hosted payload successes. There are several examples of hosted payloads that have fully achieved the mission objectives at a fraction of the cost of traditional space missions. Industry must share these approaches with Congressional leaders, including the factual analysis of the mission economics, the key factors that enabled the hosted payload success and the obstacles that were overcome to achieve this success. The Hosted Payload Alliance was formed to provide objective advice and subject matter expertise on hosted payloads. The HPA has been working with organizations like USAF SMC and NASA to fully explore these issues and should do the same with key Congressional staff."*—Don Thoma, Chairman of the Hosted Payload Alliance, President and CEO, Aireon*

"With DoD spending slated for significant cuts, cost-effective hosted payload missions will surely be increasingly attractive to both the executive and legislative branches of government, particularly if these new solutions are thought about in terms of expanding the government's current architecture of legacy systems and capabilities still in the pipeline. As an industry, we need to continue to demonstrate the value of hosted payloads as a complement to dedicated satellites, and to show that rather than a "quick fix," they represent a crucial and logical step toward developing a sustainable space architecture for the future."*—David Anhalt, Vice President, U.S. Government Solutions, Space Systems/Loral*

# RADAR TECHNOLOGIES ARE POOR TARGETS FOR BUDGET CUTS

*by David Gulla, Vice President, Global Integrated Sensors (GIS),
Raytheon Integrated Defense Systems (IDS)*

**E**arly in November of 2012, a spokesman for North Korea's National Defense Commission stated that its "strategic rocket forces" are "within the scope of strike" of the U.S. mainland. The announcement followed a new U.S.-South Korea missile agreement.

**However, the threats we face don't just come from abroad—they also come from above.**

At present, there are hundreds of thousands of pieces of debris orbiting the Earth. This debris consists of the leftovers from years of space exploration, satellite launches and other adventures in *low-earth orbit* (**LEO**). Some of these pieces—even those as small as a speck of paint—could administer serious damage or even destroy a satellite or manned space craft.

*Satellites aren't just crucial pieces of our modern era's communications infrastructure—they're also valuable military assets.*

Once again, this is an area where innovative radar technology can be immensely helpful. The existing space surveillance system—which detects some of this debris to prevent destructive collisions—needs to be updated. If our nation fails to install this cost-effective technology, the results could be disastrous."

Fortunately, the **U.S. Air Force** is set to get cracking on a new *Space Fence* in 2013. In the opinion of many, this work can't begin soon enough.

### Deterrence Is The Key

North Korea's latest bout of saber rattling serves as a reminder that the United States and its allies still have a lot of work to do to preserve peace and protect lives. Of course, America does not have unlimited financial resources to devote to this effort. Therefore, our leaders must focus on innovative deterrence technologies that can effectively guarantee our nation's security without emptying the federal treasury.

For starters, the United States *must* make targeted investments in cutting-edge radar technologies to protect against assaults in or through the air.

In example, the *Army Navy/Transportable Radar Surveillance and Control system*, or *AN/TPY-2*, is the most advanced mobile radar system in the world. AN/TPY-2 is capable of tracking ballistic missiles shortly after launch as well as serving as the fire-control radar for the *THAAD* system that destroys threatening incoming missiles with stunning accuracy.

There are reports that North Korea's long-range missiles may be capable of reaching Alaska. This means the AN/TPY-2 is precisely the kind of technology that deserves continued investment and innovation.

The same is true for the US Air Force's *Three-Dimensional Expeditionary Long-Range Radar* (3DELRR). Intended as a replacement to the *AN/TPS-75* radar that has been fielded since 1968, the 3DELRR is far more capable at detecting stealthy targets in challenging environments and is also simpler to operate and maintain. Such creates an opportunity for significant long-term cost savings.

*The 3DELRR program*

Then there's **JLENS**, which consists of a system of helium-filled aerostats that can hover as high as 10,000 feet, offering 360-degree detection, tracking, and targeting of everything from cruise missiles and low-flying aircraft to cars and boats.

JLENS can do the work of four or five fixed-wing surveillance aircraft—and represents a great example of how smart radar technology can lower the cost of protecting our country from attack.

Investments in these areas should be seen as an important part of the U.S. military's modernization efforts, which aim to create a more nimble, cost-effective and efficient fighting force through advanced affordable technology. Those efforts were a major focus of the recent annual meeting of the **Association of the United States Army** in Washington.

However, these important investments are not yet assured, particularly in the current defense budget environment. Yet, cutting-edge technologies—particularly new approaches to radar—represent a cost-effective way asset to safeguard the United States and should be at the foundation of our nation's defense strategy.

These improved radar capabilities can help ensure peace by retaining our warfighter's edge and should remain a budget priority to ensure our long-term national security.

### About the author

David Gulla is vice president of Global Integrated Sensors for Raytheon Integrated Defense





*Raytheon's AN/TYP-2 mobile radar system*

## UPDATE!

### The Disassembling Of The North Korean Launch??

### Unfortunately, NO!

*As this issue went to "press," the Xinhua China News Agency reported that satellite images reveal North Korea engaged in activity that seemed to be disassembling the long-range rocket the country was planning to use to place a satellite into orbit.* **How incorrect those assumptions were...**

*North Korea did, indeed, fire a long-range rocket in its second launch on Wednesday, December 12th, under its new leader, defying warnings from the United Nations and Washington. South Korean and Japanese officials confirmed that lift-off took place at 9:51 am (6:21 AM IST). North Korea declared the launch of a rocket and satellite a success, and state television planned a special broadcast about the launch at noon.*

*The three-stage rocket's first stage had separated as scheduled and splashed down in the sea off South Korea's southwest coast. This successful launch carries profound security implications, marking a major advance in the North's bid to mate an intercontinental ballistic missile (ICBM) capability with its nuclear weapons program. Japan had been on high alert since the 13-day lift-off window opened, despite a suggestion from Pyongyang that it could delay the much-criticised blast-off. Tokyo deployed missile defence systems to intercept and destroy the rocket if it looked set to fall on its territory, with missile batteries in and around Tokyo and in the Okinawan archipelago. Most political analysts believe the launch is designed to bolster the credentials of new leader Kim Jong-un as he cements his rule over the country of 22 million people.*

*For additional updated information on this, and other SATCOM-related news, please head over to* **SatNews.com***.*

# PIONEERING: SUSTAINING U.S. LEADERSHIP IN SPACE

**O**n December 4th, the Space Foundation released PIONEERING: Sustaining U.S. Leadership in Space, which puts forth recommendations to strengthen both NASA's focus, oversight and funding and the overall U.S. civil space program. Following a summary of that report, which can be downloaded here: *http://www.spacefoundation.org/programs/research-and-analysis/pioneering*

*NASA's Situation*

NASA is an exceptional institution in a tremendous predicament. Its accomplishments have inspired billions and have marked the transition of humanity from earthbound creatures into a spacefaring species. Yet, the last time a human set foot on the surface of another celestial body was in 1972. Many of **NASA**'s advocates and supporters wonder why, in these past 40 years, the space program has played backward in slow motion: Going from a presence on the lunar surface, to operations only in *Low-Earth-Orbit* (LEO), to the final flight of the **Space Shuttle** with no capability to send astronauts into space aboard U.S. vehicles.

When NASA was created, it was given the lion's share of responsibility for building the U.S. national civil space enterprise. NASA was built from an amalgamation of different laboratories, offices and programs, assembled in haste and immediately challenged with a high-risk, rapid-turnaround program to land an American on the Moon.

NASA rose to the challenge, marking one of humanity's greatest achievements. Dramatic changes have occurred since then. The space enterprise is now a $290 billion global endeavor, with NASA accounting for just 6 percent of the total. NASA is no longer the sole creator and manager of the entire U.S. national civil space enterprise. NASA has experienced frequent redirection and constantly shifting priorities, mixed signals from Congress and the administration, organizational conflicts and lack of a singular purpose, resulting in a space agency without a clear, stable direction. It is from this perspective that the **Space Foundation** undertook a sincere and earnest exploration of NASA's state and future.

A successful organization needs a clear, well-defined purpose to generate unity of action, coordination of strengths and focus of effort, as well as to establish a means to measure success or failure. The Space Foundation believes that NASA needs to embrace a singular, unambiguous purpose that leverages its core strengths and provides a clear direction for prioritizing tasks and assigning resources. In addition, the Space Foundation recommends measures to remove or reduce factors that hamper NASA's ability to execute a clearly defined program, including divesting activities not related to the



SPACE FOUNDATION

Measures for a Sustainable U.S. National Civil Space Enterprise

core purpose, providing for stability in senior NASA leadership and establishing a planning process. Additionally, the Space Foundation has identified other areas where NASA can improve performance and increase returns on taxpayer investment.

The Space Foundation approached its study with rigor and impartiality, studying 40 years of NASA history and a wide gamut of reports and recommendations and interviewing nearly 100 senior leaders representing a variety of perspectives on management, space exploration and public administration. The product of more than a year of research, the report's findings are presented in the spirit of engagement and constructive counsel, with a sincere desire to catalyze change for the better.

### NASA's Purpose

The Space Foundation believes that one word can embody NASA's purpose and leverage its greatest core strengths to promote, expand and develop a healthy national civil space enterprise: *PIONEERING*.

Pioneering is defined as: **1**. *being among those who first enter a region to open it for use and development by others*; and **2**. b*eing one of a group that builds and prepares infrastructure precursors, in advance of others*. The proposed *Pioneering Doctrine* has four phases:

- **Access**: developing the ability to get to and from targeted destinations.

- **Exploration**: learning about those destinations in order to plan for subsequent missions.

- **Utilization**: turning theoretical knowledge into technology that justifies continued, longer-term activity at the destinations.

- **Transition**: handing off the knowledge and capabilities NASA has developed to other government organizations or the private sector for further long-term engagement.

Defining this singular purpose provides the framework to better manage ambiguity in direction from Congress and the administration and minimize the impact of shifting political winds. In addition, requiring NASA to develop long-term plans to present to Congress for approval will result in better preparation and guidance for the agency, its contractors and the nation's space workforce. This will increase NASA's accountability to Congress and the taxpayer.

### Strategic Recommendations for
### Sustaining U.S. Civil Space Activity

NASA's budget and management must have the stability to ensure that its purpose can be fully and effectively pursued. To make this possible, the Space Foundation made the following strategic recommendations...

- *Amend the Space Act*: Congress should amend the Space Act to officially assign pioneering as NASA's primary purpose. During the amendment process, Congress should also eliminate tasks that are no longer relevant or distract NASA from the *Pioneering Doctrine*.

- *Streamline the National Civil Space Enterprise*: NASA should assess its current activities to align them with its purpose.

  ◊ Realign the National Civil Space Enterprise: NASA should divest itself of activities that do not fall within its new purpose, dispersing relevant activities to other public and private parts of the national civil space enterprise.

  ◊ Rationalize Existing Infrastructure: Decision-makers must distinguish between supporting a space program versus archiving the infrastructure that could be used to support a space program. Through an agency-wide evaluation of infrastructure, facilities and capabilities by independent auditors, NASA should consolidate its existing infrastructure and facilities and eliminate excess capacity.

  ◊ Pursue Further Commercialization: NASA should continue to pursue privatization and commercialization of activities where possible.

- *Stabilize NASA Leadership and Planning*: NASA leadership and planning should be stabilized to avoid wasteful disruption.

  ◊ Create Stability for NASA Leadership: To ensure continuity of leadership and close cooperation and singularity of purpose at the highest levels of NASA management, the NASA administrator should be appointed for a five-year renewable term and he/she should be responsible for nominating the deputy administrator.

  ◊ Require NASA to Submit a Long-Term Plan: NASA should develop both a 10-year plan with specific dates, goals and objectives and a 30-year plan that provides the broader strategic context in which the 10-year plan can be understood. These plans would be submitted for congressional approval every five years, at which point Congress would evaluate performance during the previous five years, following validation by a congressional commission (described below). This would ensure that Congress is kept apprised of NASA's direction and objectives, providing insight into planning and reducing shifts in priorities that can come with each administration or new piece of legislation.

  ◊ Create a NASA Commission: To ensure that plans are validated by qualified, trusted individuals, Congress should authorize the creation of a 12-person commission, chaired by the NASA administrator or his/her designee, comprising three presidential appointees, four members appointed jointly by the majority and minority leadership

of the relevant committees of jurisdiction in the Senate and four members appointed jointly by the majority and minority leadership of the relevant committees of jurisdiction in the House.

- *Stabilize NASA Funding*: NASA can better carry out its new purpose if it has access to more stable and reliable funding streams.

    ◇ Create a Revolving Fund for NASA Projects: To allow NASA to match program spending with real-life funding profiles rather than compressing and rearranging programs to maintain a top-line annual budget, Congress should create a revolving fund for NASA that can be supplemented through annual appropriations.

    ◇ Expand Funding Options: Congressional appropriators should make use of the full range of appropriations options available to them in law, including multi-year appropriations, no-year appropriations and advance appropriations.

    ◇ Establish Accountability and Oversight Measures: Programs that exceed predefined cost or schedule limits should be removed from special funding arrangements and returned to year-by-year funding managed under the normal appropriations and oversight rules and procedures. The Space Act should stipulate that failure to keep NASA, as a whole, on schedule and within budget would be grounds for dismissal of the NASA Administrator.

*Tactical Recommendations to Help NASA Flourish*
The Space Foundation also identified areas that NASA, Congress and the President can address to improve NASA's effectiveness:

- Set concrete goals to measure the success of the International Space Station (ISS) during the remainder of this decade to provide the most visible opportunity for NASA to demonstrate its capability to manage a large-scale space enterprise and successfully fulfill its new mandate.

- Realign space within the Executive Branch to manage and coordinate the growing national space enterprise, both civil and national security. This includes developing cross-sector infrastructure, research and development and industrial policies involving all stakeholders and lets NASA keep a narrow focus on expanding the civil space enterprise rather than addressing coordination at the highest levels.

- Clarify NASA's role in developing industrial base policy to provide the private sector with clear and consistent guidance. Stability in NASA's long-term planning will provide the outlook needed for successful long-term technology investments throughout the private sector.

- Strengthen personnel management so that best practices are exchanged and disseminated throughout the agency, the national civil space enterprise and private sector by:

    ◇ Making greater use of Intergovernmental Personnel Act assignments to host outside personnel at NASA and vice versa for extended periods.

    ◇ Overhauling regulations affecting the transition of skilled personnel to and from NASA.

- Improve relationships among the centers and headquarters to address operational dysfunction stemming from divergent cultures and goals by:

    ◇ Strengthening management across enterprises.

    ◇ Increasing promotion incentives for cross-center transfers.

    ◇ Retaining program management at headquarters and distributing project management throughout the centers.

- Create a common body of standards and best practices to eliminate center-to-center variation in technical requirements and promote interoperability between systems.

- Conduct a zero-baseline review of NASA regulations to determine which are essential and which need to be filed away, preserving the relevant institutional knowledge in both cases.

- Conduct a zero-baseline review of NASA procurement processes to shift focus to mission assurance, cost management and program management while eliminating performance-driven mission creep and reducing problems with cost estimates and cost control.

- Improve NASA's program management skills by increasing professional development opportunities for NASA's workforce to include new and innovative initiatives, resulting in wider dissemination and institutionalization of best practices and attraction and retention of top talent.

- Retain and strengthen in-house technical capabilities to more effectively promote innovation by:

    ◇ Increasing in-house work that helps maintain the technical proficiency needed to effectively manage contractors.

    ◇ Allocating time for select science, technology and engineering personnel to pursue their own areas of interest and innovation.

◇ Increasing the number and frequency of simpler, lower-cost missions.

◇ Encouraging development of small "skunkworks" teams to address challenges outside the main bureaucratic hierarchy.

### The Way Ahead

The recommendations presented in **PIONEERING: Sustaining U.S. Leadership In Space** can make NASA more successful, which will naturally accrue the benefits of scientific knowledge, inspiring the nation's youth, greater soft power and economic rewards. This is much more effective than setting any of these benefits as the ultimate goal for the U.S. space program, which would distract NASA from leveraging its core strengths.

Plus, it provides a clear and consistent means for measuring progress, while equitably distributing penalties for failure and rewards for success.

Most of all, this framework gives NASA the opportunity to apply its skills and expertise over the long timeframes required to expand the human sphere of influence.

Increased stability will help insulate NASA from shifts in political priorities and reduce the waste that results from the starts, stops, delays and cancellation of programs. NASA will have the confidence that it can pursue a project as long as it is technically viable, without worrying about capricious changes in direction from one election to the next.

*In the report, the Space Foundation expresses its sincere desire to assist NASA by providing recommendations for a sustainable, long-term trajectory pioneering our nation's place in the Solar System.*



*This new image shows the Large Magellanic Cloud galaxy in infrared light as seen by the Herschel Space Observatory, a European Space Agency-led mission with important NASA contributions, and NASA's Spitzer Space Telescope.   Image credit: ESA/NASA/JPL-Caltech/STScI*

Welcome to *MilsatMagazine's* annual YEAR IN REVIEW issue. A few, leading companies have offered their insights and an examination of their experiences regarding their operations during 2012... offered in alphabetical order, these major representatives of the MILSATCOM offer an overview of the challenges and successes for the past year. Some companies decided to follow a Q&A format, while others preferred a narrative style. In either instance, we hope the readers of *MilsatMagazine* find the following Roundtable to be of interest and, most importantly, an inspiration realizing that the MILSATCOM and related industries face a bright future. *All our best...* the editors.

# 2012
# YEAR IN REVIEW

# YEAR IN REVIEW: *Analytical Graphics, Inc. (AGI)*

*by Frank Linsalata, Chief Operating Officer*

### What successes did AGI enjoy over the past year?

**2012 is shaping up to be an exciting year for AGI. We've seen sales growth in our commercial product, our technology is being used operationally in the Space Data Center and we recently released STK 10, which we believe will make a dramatic impact on the community.**

We've seen a particular surge within the international marketplace and the DoD community. These groups are really trying to do more without more (money), and that is AGI's sweet-spot. Why build capability from scratch when our product, out of the box, meets 80 percent or more of requirements? With the economy, we are seeing that trend grow, and we look forward to helping out even more in 2013. To meet our international growth, we have sent a larger team of engineers to live overseas, particularly in Singapore, and they are complemented by a reseller network supporting our customers in Europe and Asia.

We are proud of our participation in the **Space Data Association's Space Data Center** (**SDC**), a space situational awareness system designed and operated by AGI. The SDC's current 17 member organizations provide owner-operator data to enhance the safety and integrity of space and the RF spectrum. The SDC reached full operational capability in September 2011, and now provides conjunction assessment processing for 65 percent of all operational satellites in geosynchronous Earth orbit. Recently, **NASA** and **NOAA** signed on to use the services.

Our current big news is the release of *Systems Tool Kit* (**STK**) *10* in November. This release has been years in the making, and when you see the final product, you'll understand why. First, we now include our 3D environment in our free offering. We believe that giving the marketplace access to a free virtual globe that incorporates time and dynamic motion as its foundation—leap second and all—to operate in simulated historical time, simulated future time or in real time is incredibly valuable. If you're analyzing a fixed location on the ground, time isn't so critical. But if something is moving, you need to manage time correctly so you have a basis for your coordinate system. Because AGI came from space, this is at the core of the software. This fidelity is now available to all systems—ground-, air- and space-based. This new "systems"-oriented approach is why we changed our product name with the new release from "Satellite Tool Kit" to "Systems Tool Kit."

Beyond the free product, we've repackaged our advanced modules and have added new ones specifically designed to address our shift to Systems Tool Kit and a broader market. We have incorporated new products that address the marketplace's conversion toward software tools for enterprise interoperability and web-based clients. For example, AGI's cloud-based server, the **STK Data Federate**, is hosted as a service to users. You can search and retrieve standard STK objects such as satellites, facilities and aircraft, and download scenarios of standard space systems that are ready to be customized for your particular analysis.

Another example is **STK Server**, which provides a scalable architecture for distributing user-defined analytic services over the web or an enterprise network to support desktop and browser applications. And to complete the picture we also have released Cesium, a zero footprint web-based visualization client that will tie into our web services and STK collaboration efforts.

### What challenges did AGI need to overcome over the past year, and what challenges will the satellite industry, and specifically your market segment, face over the next few months?

Our challenge has been the same since we were founded in 1989. We bring a "disruptive product" into a marketplace conditioned to "build it" instead of "buy it." Our solution is less expensive and ready now. With smaller aerospace and defense budgets, you would expect our sales to have grown much more than they have. So while mandates to look at COTS products are out there, the trend we are seeing is that A&D isn't buying much of anything. We think this will change soon.

Systems are becoming more complex, and the trend (at least in the software/tech industries) is toward technologies that leverage open source, web services and the cloud. As I mentioned, we've made and will continue to make strides to deliver our technology the way the industry needs it.

Finally, the industry has been talking for years about the engineering talent drain. While this is always a concern, our workplace helps us out. In March 2012, AGI CEO Paul Graziani took top honors in the Workforce category of Aviation Week & Space Technology's Laureate Awards. This recognition of AGI's innovative workplace, and our consistent outreach to tomorrow's engineers via STEM-focused activities, helps us retain and attract an unbelievable talent pool in a field that is otherwise being depleted.

### What upcoming projects are in the works and what may we expect to see from AGI over the next three to four quarters?

In addition to adapting our technology even further to leverage the cloud, server-based implementations and thin web-based clients, we are focusing on solution sales efforts to big programs. When we look at the market, we are underutilized. But those who use us get it. They realize the difference we bring to their missions' fidelity, efficiency and speed. And at how much less cost. We want entire organizations and/or programs to standardize on our software, and we realize for those willing to make that investment, we have to step in and provide the complete package.

# YEAR IN REVIEW: *Boeing Space & Intelligence Systems*

*by Jim Simpson, Vice President, Business Development*

**What successes did Boeing enjoy over the past year?**

**Boeing Space & Intelligence Systems was proud to announce its newest satellite design, the *702SP* for "small platform" in March, in conjunction with a four-satellite joint procurement from Asia Broadcast Satellite (ABS) and SatMex. The 702SP is an all-electric satellite that is lighter in weight and compatible for dual-launch with a wider array of launch vehicles, including the SpaceX *Falcon 9*. With the addition of the 702SP, we expanded our product portfolio to include satellites that operate in the 3 to 18 kilowatt range.**

Boeing received orders for a total of seven satellites and has several additional programs under continuing negotiation. In addition to the four ordered by **ABS/SatMex**, the **United States Air Force** ordered two additional *Wideband Global SATCOM* satellites, bringing the total of **WGS** satellites on order to 10 in number. **Societe de Europeenee des Satellites** (**SES**) ordered a Boeing 702HP "high power" satellite, which will be called *SES-9*.

Boeing was also selected by Intelsat to build *IS-29e*. Although this order is a part of the existing four-satellite contract awarded in 2009, this Boeing *702MP* "medium power" will be the first for **Intelsat**'s *EpicNG* satellites. Intelsat EpicNG is designed to address wireless and fixed telecommunications, enterprise, mobility, video and government applications that require broadband infrastructure. A complementary high-throughput overlay to the Intelsat fleet, the Intelsat EpicNG platform will use multiple frequency bands, wide beams and spot beams with a high degree of flexibility and connectivity.

Central to the ability to obtain new business is the need to execute on current programs. Satellite deliveries form the foundation of program execution. In 2012, S&IS delivered four satellites for launch, and is scheduled to support at least two additional launches by year end. **WGS-4**, *Intelsat-22*, *Intelsat-21*, and *GPS IIF-3* were delivered successfully. The first satellite in the series for MEXSAT is planned to launch in December, and that the *X-37B Orbital Test Vehicle* (OTV-1) will be launched for a second mission.

**What challenges did Boeing need to overcome this past year, and what challenges will the satellite industry—and specifically your market segment—face over the next few months?**

The most compelling challenge Boeing faced, and it's a challenge that is common throughout the satellite manufacturing industry, is to provide satellite systems that meet the mission requirements, yet maintain the flexibility and affordability demanded by today's economic environment.

Boeing captured new commercial business due largely to its ability to provide affordable low-risk, highly capable satellite systems. We did this in several ways, from reducing our indirect cost structure to fostering mutually beneficial arrangements with our suppliers. We provided adequate base to the suppliers to enable them to manage their business performance.

We also invested in our satellite design by moving to a modular design; leaning out our production processes; and designing for and instituting a production line approach. One example is the pulse line we established for the **Global Positioning System** (**GPS**). By adopting lessons learned from the **Boeing 737** production line, coupled with our own streamlining, we are able to complete a GPS satellite every four months.

The changes we made to improve our efficiency enabled us to invest in product development. For example, we invested four years in the development of the 702MP satellite, which we introduced in 2009. Learning from that activity, we were able to introduce the 702SP satellite in approximately two years.

These enhancements to the proven Boeing 702 have laid a solid competitive foundation for Boeing, and no other manufacturer has introduced a new variant of its satellite design, much less two, in the span of three years.

*What upcoming projects are in the works and what may we expect to see from Boeing over the next three to four quarters?*

We plan to win an order for at least one commercial satellite and we will launch at least four satellites in 2013.

We also plan to continue to advance the importance of hosted payloads, both as Boeing and as a member of the **Hosted Payload Alliance**. Boeing has been delivering hosted payloads since 1993, when the first was provided on a **U.S. Navy** *UHF Follow-On* satellite.

More recently, Intelsat ordered two hosted payloads in 2009. Operating in UHF, the first payload will be leased from Intelsat by the **Australian Defence Force** for supplementary MILSATCOM services. It was launched in March on the *Intelsat 22* satellite and entered service in May.

A second UHF hosted payload will launch on the *Intelsat 27* satellite in the first quarter of 2013. The hosted payloads approach has been reported by the Australian Defence Force to have saved more than $150 million.

Boeing is working with the Hosted Payload Alliance and the United States Government to further apply the *Space Policy*, which encourages the use of hosted payloads, by removing impediments to enable wider implementation of these capabilities. Hosted payloads are a demonstrated, affordable alternative to dedicated government satellites that leverage shorter build cycles and shared satellite, launch, and ground infrastructure. Boeing believes hosted payloads will play a vital role in 2013 and beyond.

# YEAR IN REVIEW: GMV USA

*by Theresa Beech, Chief Executive Officer*

**2012 has been a year of growth and opportunity for GMV USA. Global economic pressures are driving demand for the innovation, performance, and efficiency that GMV USA solutions offer to our expanding customer base worldwide.**

**GMV USA** provides low cost, customizable *Commercial-Off-The-Shelf* (**COTS**) ground systems to commercial and institutional satellite systems worldwide. We offer four basic products: *flexplan* for highly specialized planning and scheduling; *hifly* for real time command and control; *archiva* for trending, archiving, and engineering analysis of satellite telemetry data throughout the lifetime of the satellite; and *focussuite* for "flight dynamics" or space navigation of the satellites.

Our products adapt to all sizes of satellite fleets and to existing hardware and software systems. GMV's solutions are highly customizable for missions and users' needs and can be adapted for missions that are still evolving.

In 2010, GMV became the world's leading supplier of satellite ground systems in the commercial telecommunications market—45 percent of all commercial telecommunications spacecraft launched worldwide in 2011 use GMV ground systems. We are on track to have similar numbers in 2013, and we have added numerous commercial operator customers, including **MEASAT** and **Thaicom**. GMV's activities also cover the entire life cycle of the satellite control center.

MV USA is also providing the planning and scheduling for the full constellation of *Tracking and Data Relay System* (**TDRSS**) spacecraft and associate ground networks through the **NASA** *Space Network Ground Segment Sustainment* (**SGSS**) project, as well as other **National Aeronautics and Space Administration** (NASA), **National Oceanic and Atmospheric Administration** (**NOAA**), and **United States Geological Survey** (**USGS**) missions.

GMV solutions offer much-improved system performance in a resource-constrained environment. In fact, trade studies implemented by GMV USA indicate satellite system performance improvements of at least 20 percent simply due to implementation of optimized, integrated planning and scheduling of space and ground resources.

GMV USA experienced significant growth during 2012 and we fully expect to continue to grow in 2013 as we expand our product line and customer base. In 2012, we began working closely with partners and customers in the defense community to offer agile, commercial-based ground systems solutions to meet complex requirements in a resource-constrained environment.

Moving forward into 2013, GMV USA is expanding the baseline product line to offer bandwidth optimization management and modeling for planning and scheduling of bandwidth usage.

Expect GMV to continue to provide manufacturers, operators, organizations, and companies with information and communications technology solutions for their various processes. Solutions are optimally tailored to the operating reality of our customers in the space industry. Additional and crucial work during 2013 will include the design, development and implementation of ITC applications. GMV USA is also enhancing products to meet current and future Information Assurance challenges around the globe.

This is an exciting time to be involved in satellite communications. Innovation, agility, and security will be paramount and GMV USA is poised to meet these challenges.

# YEAR IN REVIEW: *Hughes Network Systems, LLC*

*by Rick Lober, V.P + G.M., Defense + Intelligence Systems and Tony Bardo, Assis't V.P., Government Solutions Group*

**For government and military satellite users, 2012 has been a year marked by transition and growth. Whether it's the migration to IPv6 Internet protocol, or the expansion into next generation technologies— such as high-throughput, Ka-band satellite systems such as JUPITER™—2012 was the beginning of a new era in communications rather than a refinement or continuation of what's come before.**

As the world's leading provider of satellite broadband technology and services, Hughes has played a major role in this positive growth.

Writing in this department one year ago, our assessment of 2011 was headlined by budget constraints and reductions. While the threat of sequestration looms large for all government and military contractors, the speed of technological advancement continues forward. This year, we've seen major milestones in our military and government divisions, including another interesting trend: The coming together of these markets in the form of shared needs and missions, and, in the case of the **Defense Information Systems Agency** (**DISA**) and the **U.S. General Services Administration** (**GSA**), a shared contract vehicle.

## Defense and Intelligence

**Coalition Growth**: Much of the dialogue in the technology community focuses on helping organizations to better communicate with internal stakeholders. However, in an increasingly global world, internal communication simply isn't enough. We are pleased that the U.S. and its Coalition partners are starting to implement interoperable network and satellite infrastructures. We've made strides, providing airborne and tactical communications for *intelligence, surveillance and reconnaissance* (**ISR**) initiatives to Allies to continue to provide communications vital to the warfighter and national security.

**New Technologies**: *Unmanned aerial vehicles* (**UAVs**) are an integral tool to obtain the ISR data to ensure our troops overseas and citizens at home are safe—they depend on robust, uninterrupted connectivity. Hughes has developed new improvements and waveforms to increase satellite bandwidth efficiency and robustness in challenging environments, such as for UAVs and rotary wing applications.

Simultaneously, it becomes increasingly important to maintain communications that are secure against disruption. This year, Hughes worked with the **U.S. Air Force Space and Missile Systems Center** (**SMC**) to develop concepts for protected tactical satellite communications. We also worked with the **U.S. Army Communications-Electronics Command** (**CECOM**) on the next generation of SATCOM architectures, focusing on cost-effective approaches today and for future satellite waveforms that will extend communications capabilities in all environments.

**New Standards:** 2012 saw the introduction of **IPv6**, the next generation protocol for Internet-based communications. Hughes introduced an innovative feature to our global **HX System** that enables simultaneous support of IPv4 and IPv6 protocols in a novel dual-stack architecture. Also packaged into the **HX System 4.0** release were other major enhancements that are currently being validated for use on the **U.S. Strategic Command**'s *Wideband Global SATCOM* (**WGS**) constellation.

**A Shared Mission***:* The **Department of Defense** (**DoD**) is taking an increased interest in commercial satellite capabilities, which helped accelerate multiple U.S. Army *Global Tactical Advanced Communications Systems* (**GTACS**) contract wins by Hughes this year. Additionally, the military and intelligence community aligned certain areas with those of the broader federal mission. This resulted in a landmark GSA and DISA satellite partnership in the form of the F*uture COMSATCOM Services Acquisition* (**FCSA**) *Custom SATCOM Solutions* (**CS2**) program.

## Civilian Government

**The Broadband Revolution***:* In 2012, federal agencies continued their move toward comprehensive satellite broadband. We were awarded a contract to support the **Environmental Protection Agency**'s (**EPA**) *RadNet* program, which is responsible for monitoring radiation levels throughout the United States. Via our high-speed satellite broadband service, Hughes will connect 50 sites with capabilities that will improve network manageability as well as enable the EPA to upgrade the sites from 3G to 4G wireless technology.

**Healthcare Applications:** One of the most innovative uses for SATCOM is the emerging government healthcare market. In 2012, Hughes was awarded a contract by the **New England Telehealth Consortium** (**NETC**) to provide mobile satellite broadband services for a regional healthcare network, which serves more than 450 health care sites and will enable video conferencing, prescription dispensing and transfer of electronic health records.

## Looking Ahead

Even as the economy slowly rebounds, defense and civilian agencies will continue to face budget shortfalls. During these times Hughes is especially well-positioned to serve our government and defense constituencies—by leveraging our many commercial innovations to deliver the most advanced and cost-effective satellite networking solutions available. This is our core strength globally and has always set us apart from the competition. In 2013 and beyond, count on Hughes to lead the drive toward a new era of high-throughput, robust and efficient satellite communications: Faster, smarter and better equipped to serve an increasingly mobile mission.

# YEAR IN REVIEW: *iDirect Government Technologies (iGT)*

*by Karl Fuchs, Vice President of Technology*

2012 has been a dynamic and exciting year for iGT and the satellite industry in general. iGT has experienced great successes from both business and technological perspectives. On the business side, iGT was honored by the U.S. Army's *Combat Service Support* (**CSS**) *Very Small Aperture Terminal* (**VSAT**) program as the Army continues to show its confidence by awarding us our third technological refresh of the CSS VSAT network. This iteration of refresh of more than 3,800 new satellite remote routers provides CSS VSAT with the latest generation of hardware, allowing CSS VSAT to take advantage of new, highly efficient waveforms and maintain the highest levels of information assurance.

Particularly impressive this year was the explosive airborne market growth. Over the past few years, **iGT** has worked diligently to help enable the airborne *Communications-On-The-Move* (**COTM**) market with the introduction of the **Global Network Management System**, which enables remotes to roam seamlessly around the world, and the development of the *OpenAMIP* standard, which enables automatic beam switching as an aircraft transitions among satellite coverage areas. This groundwork led to strong sales of the newly introduced **e8000 AR** satellite router. The e8000 AR 19-inch rack-mountable router is designed for roll-on/roll-off airborne COTM applications. The e8000 AR leverages commercial off-the-shelf technology and has been mated with a high-powered PC 104 central processing unit (CPU) for antenna integration applications all in an aircraft EMI and environmental certified enclosure.

Another growth area during 2012 was the **Department of Defense** (**DoD**) networks, which have grown dramatically over the past few years. As a result, network operators have seen an increasing need for powerful, intuitive network management tools. iGT introduced **SatManage 5.2**, which is a sophisticated suite of Web-based software tools for the automation, monitoring and integration of hybrid networks and *network operation center* (**NOC**)-based applications. A powerful extension to iDirect's **iVantage**™ **NMS**, SatManage takes a NOC operation to an even higher standard of network performance and scalability. SatManage integrates and automates nearly every aspect of a NOC, and through a rich set of monitoring features, provides an in-depth view into the network's quality performance. To meet the high customer demand for SatManage systems, iGT has dramatically increased the customization development team. This team of developers can take specific customer needs and transform them into customized software to further enhance the functionality of SatManage.

One of the greatest challenges iGT faced in 2012 was staying ahead of the power curve and helping our end-user community fight their growing cyber-attack threats. It is not surprising to anyone that the number of cyber attacks against U.S. government institutions is growing every year and that the adversary is becoming more and more sophisticated.

iGT continues to work closely with **Defense Information Systems Agency** (**DISA**) and other government agencies to ensure we are kept up to date on the most recent threats and then we work to mitigate those threats as quickly as possible. In addition, iGT regularly commissions consultants to perform independent security assessments on all our product lines. Much work still needs to be done to ensure government and industry can work together efficiently to combat these cyber threats, however, great strides have been made in 2012.

The satellite industry will face a number of challenges in the next few quarters. Many of those challenges will also bring opportunities. One challenge all of us serving the DoD and government market will face is possible sequestration and shrinking budgets. While shrinking budgets are never attractive, they can increase reliance on communications. For example, fewer boots on the ground can increase the reliance on airborne *intelligence, surveillance and reconnaissance* (**ISR**) missions.

Constrained government budgets can postpone big ticket items such as satellite launches and could certainly increase use of commercial satellites. The emerging fleet of *High Throughput Satellites* (**HTS**) is generating a great deal of interest within the DoD community. iGT and our parent company, **VT iDirect**, are doing a great deal of work to enable the HTS architecture. VT iDirect is providing the hub infrastructure and remote routers for the new **Inmarsat GX** network. iGT is developing the next-generation military satellite router, which will be capable of seamlessly moving from a government-owned, **Wideband Global Satellite**-based network to Inmarsat GX coverage, based on availability and mission needs. This next-generation satellite router will provide unparalleled security and maximum flexibility for maritime, terrestrial and airborne missions.

iGT's main focus over the next two or three quarters will be on the airborne satcom. iGT plans on introducing the second airborne router in the **e8000** family—the **e8000 AE**—in the spring of 2013. The e8000 AE will fit in an **ARINC** rack and meet all of the *DO 160* certification requirements. The e8000 AE is designed to meet the needs of the "blue and white" fleet as well as being applicable to the commercial markets.

In addition, iGT will introduce the **Airborne Inflight Management Software** (**AIMS**). The software will be resident on the PC 104 CPU of the airborne routers and will be accessible via web interface. AIMS will provide an operator with situational awareness of an aircraft as it relates to the operation of a satellite system. This will include a moving map with *Effective Isotropic Radiated Power* (**EIRP**) contours, time to beam switch, signal-to-noise ratio and antenna system health.

2012 has certainly been a dynamic and successful year—all indications point to an exciting and successful 2013.

# YEAR IN REVIEW: Lockheed Martin Space Systems Company

*by Mark Valerio, Vice President + General Manager, Military Space*

***What successes did Lockheed Martin Space Systems enjoy over the past year?***

Working closely with our customers, we achieved several key milestones and gained positive momentum across our space portfolio. In the military satellite communications mission area, we launched the U.S. Air Force's second *Advanced Extremely High Frequency* (**AEHF**) satellite and the U.S. Navy's first *Mobile User Objective System* (**MUOS**) spacecraft. Each satellite has now completed its on-orbit testing and is ready for operations. Together, the AEHF and MUOS constellations represent a quantum leap in U.S. space-based communications technology and will serve as the communications backbone for our nation's military and national security forces for decades to come.

Additionally, the first **Lockheed Martin**-built *Space Based Infrared Satellite* (**SBIRS**) satellite made tremendous strides on orbit. In September, the satellite achieved P*rogram Executive Office* (**PEO**) certification and entered its dedicated operational utility evaluation in preparation for use by the warfighter. The Air Force's SBIRS program delivers resilient and improved missile warning capabilities for the nation while simultaneously providing significant contributions to the military's missile defense, technical intelligence and battlespace awareness mission areas.

We also made outstanding progress on the Air Force's next-generation **GPS III** satellites. In 2012, we opened our brand new *GPS Processing Facility* (**GPF**), an advanced manufacturing center specifically designed to reduce the cost of building each GPS III satellite. We continued to meet milestones in the buildup of our GPS III prototype, and we remain on schedule to deliver the first satellite for launch availability in 2014. As our world becomes increasingly dependent on GPS technology, the new GPS III satellites will be a critical element of both our national and economic security, and we are committed to achieving mission success for the billions of military, commercial and civilian users worldwide.

Lastly, in July, we formed our *Military Space* line of business by combining two formerly separate organizations responsible for delivering various DoD satellites. Such will allow us to deliver a more focused voice to our customers, gain greater efficiencies among similar programs, enhance collaboration between our functional teams, strengthen our competitive posture and deliver greater value to our customers. Our Military Space LOB is responsible for delivering on several critical national security space programs such as AEHF, DMSP, GPS III, MUOS, and SBIRS, as well as sustaining operations for legacy satellite programs including the **Defense Satellite Communications System** (**DSCS**), **Milstar** satellites and others.

***What challenges did Lockheed Martin Space Systems need to overcome over the past year, and what challenges will the satellite industry face over the next few months?***

The word of the year is *affordability*—and we don't expect that to change anytime soon. Our customers are being asked to do more with less, and we are key partners in that endeavor. We understand the current fiscal environment and are laser focused on executing military space programs with a constant eye on affordability. While we target affordability, our commitment to mission success will not waiver.

Going forward, Lockheed Martin, and the industry as a whole, faces several challenges. As programs across the space portfolio transition from development to production, how can we still affordably add capability to meet new demands? How can we make our systems more resilient? How can we retain our engineering talent?

First, as we shift to production across our portfolio, we can significantly reduce our per-unit satellite costs by leveraging block buys, reducing program oversight, reducing testing, eliminating reviews, streamlining activities, sharing resources and standardizing our parts and processes. The savings realized from an efficient production program can then be reinvested back into programs to fund incremental technology insertion. With this technology innovation, we can target specific technologies to further improve affordability, to enhance capability or to build enhanced resiliency into our systems.

In an era of few new design and development efforts, stability in funding and a commitment to incremental capability insertion on production programs will also ensure our world-class engineering talent stays engaged in the vanguard technology development. These skills are a national asset, and we must maintain our technical leadership in space.

***What upcoming projects are in the works and what may we expect to see from Lockheed Martin Space Systems over the next three to four quarters?***

2013 promises to be a big year for our Military Space line of business. We are planning for the launch of the second SBIRS geosynchronous (**GEO-2**) satellite in March, the second MUOS spacecraft in July and the third AEHF satellite in September. We will also begin the final assembly, integration and test process for the nation's first GPS III satellite next year, well before our scheduled launch availability date in 2014.

Additionally, we expect to receive contracts for the fifth and sixth AEHF, GPS III and SBIRS satellites this year and next, all under fixed-price contracting terms. We will focus on our program performance, affordability initiatives and technology innovations across the portfolio to ensure we deliver the highest possible value to our customers, at the lowest possible cost, to the tax payer.

In 2012, Lockheed Martin Space Systems Company also stood up a new commercial ventures organization that will focus on commercial satellite, wind and energy markets. We will also work closely with our new Commercial Ventures organization to share resources and find ways to deliver new and innovative solutions to meet expanding customer needs.

*AEHF-2*

# YEAR IN REVIEW: PIXIA

*by Rudi Ernst, Co-Founder, Chief Executive Officer + Chief Technology Officer*

**What successes did PIXIA® enjoy over the past year?**

**In 2012, PIXIA has enjoyed enormous growth in customers, revenue, and talented professionals while adding several new patented technologies to our portfolio. We opened a new headquarters in Reston Town Center, Virginia, to service our DoD/IC customers as well as a new regional office in Denver, Colorado, to service the Pacific Rim.**

PIXIA develops high-performance scalable data access solutions for what we term **BIG data**. These are datasets that become so large they become increasingly difficult to access and work with using the standard database management tools. Some of the difficulties in working with BIG data include the capture, storage, search, sharing, analytics, and visualization of the information. Working with large datasets allows analysts to more effectively spot trends, identify problems and help to formulate solutions. Although the amounts of data being stored is on a perpetual upward swing, datasets are on the order of petabytes, exabytes and zettabytes of data. The world's per capita capacity to store this information has roughly doubled every 40 months since the 1980s (about every three years) and every day 2.5 quintillion bytes of data are created.

The fundamental problem with BIG data is that data are constantly being aggregated. Some datasets grow in size because they are increasingly being gathered by ubiquitous information gathering devices, aerial sensory technologies (remote sensing), software logs, cameras, *radio-frequency identification* (**RFID**) readers, and wireless sensor networks.

During 2012, the Company presented an integrated offering to the market—***Commercially Operated Persistent Surveillance Solution*** (**COPSS**). This was accomplished in a partnership with **PV Labs, Inc**., and offers customers a commercial turnkey solution to *Wide Area Motion Imagery* (**WAMI**) collection, processing and dissemination. Thanks to a low-cost pricing model, this technology provides rapid access within an end-to-end commercial solution for both the public and private sectors (*i.e.*, border patrol, law enforcement, federal emergency management offices, and private companies.)

PIXIA also upgraded their **Open Geospatial Consortium** membership to that of *Principal Member* and will increase participation in such areas as geospatial imagery, WAMI and *full motion video* (FMV). The Principal Members of this organization assists in the development, release and adoption of OGC® standards through their voting rights in the OGC Planning Committee.

**What challenges did PIXIA need to overcome over the past year, and what challenges will the satellite industry face over the next few months?**

The demand for instant access to BIG data from ISR platforms [by users, algorithms, and applications] is growing exponentially and as these datasets grow, they become increasingly difficult to store, access, and share. PIXIA® delivers *data-as-a-service* (**DaaS**) capabilities providing data to any clients via a standards-based *SOA* architecture.

Of concern to PIXIA are the needs of the **MAG** (*Military, Aerospace + Government*) sectors. Throughout military history, technological developments have substantially disrupted the methods of conventional warfare. In general terms, the evolution of weapons and weapon delivery systems, small arms, tanks, and aircraft, for example, have forced changes in the warfare tactics.

Speed and efficiency with which military forces can be deployed is a significant factor in determining military advantage over adversaries. Perhaps the most significant trend in the *Intelligence, Surveillance, and Reconnaissance* (**ISR**) market over the past few years has been the spectacular growth in data volumes. Innovative sensor platforms with improving optics have increased the complexity in which analysts can effectively manage *Wide Area Surveillance* (**WAS**) data—meeting growing demands for highly intelligent analytical products in a timely manner requires a disruptive approach.

A PIXIA product designed to offset this challenge is ***HiPER STARE®***, which catalogs, organizes and shares large volumes of WAS within a cloud-based architecture. This provides SaaS apps and data consumers access to WAS data via ***RESTful Web*** services.

To enable BIG data access in a complimentary manner, PIXIA implemented an end-to-end solution that is sensor and data agnostic, delivering WAMI quickly and efficiently, no matter where it is located; on the aircraft, in a ground station, in a local data center, or in archives.

**What upcoming projects are in the works and what may we expect to see from PIXIA over the next three to four quarters?**

PIXIA continues to push the traditional boundaries of BIG data access and will, in the next several quarters, be providing solutions for LIDAR and HSI sensor platforms, on-board airborne solutions, and Exabyte-scale *data-as-a-service* (**DaaS**) implementations in Cloud architectures.

Additionally, as PIXIA is the author of the *WAMI Web Services Specification*, expect further provisions for a variety of features and functionalities in handling BIG data derived from *Wide Area Surveillance* (**WAS**) sensors and platforms.

Products currently manipulating BIG data that will forge forward during 2013 include **HiPER LOOK®**, **HiPER STARE** and **HiPER WATCH®**. The latter offering enables a cloud-based architecture to catalog, organize and share large volumes of FMV.

For PIXIA, 2013 will be a year filled with promise and the realization of customer expectations.

*by Eyal Copitt, Senior Vice President, Sales, Africa & Asia, Marketing*

**What successes did Spacecom enjoy over the past year?**

**In 2012, Spacecom began in earnest its transition into becoming a global satellite operator. During the year, we expanded our management, sales, technical and service staffs and our local presence in the different countries to assume this mantle.**

The first major milestone of the year was commencement of operations of our newest satellite *AMOS-5* at 17 degrees East for the African market, with connectivity to Europe and the Middle East. AMOS-5 is a game changer as it is one of the first satellites constructed and in an orbit specifically targeted for the African market, with three regional Ku-band and a pan-African C-band beams that encompass all of Africa. This makes the satellite an exciting solution for broadcasters and other communication providers who need either a regional or total African reach. We are seeing an increasing number of clients move to the satellite. For example, French broadcasters (among them **TV5 Monde Afrique**, **ITA**, **Infrasat**, **OFIVE TV)** joined the telecos and service providers such as Infrasat, ITA, **Glo**, **PPC**, and **Infinity,** among many others.

The entrance into the Africa market has opened a wide range of new business opportunities for us in one of the fastest growing continents for SATCOM, which we believe will keep producing growth opportunities over the years to come.

*AMOS-2* and *AMOS-3* are also continuing to have almost full capacity. During the past year we have added new capacity for **Magyar Telekom**'s DTH group and have enabled Ukraine's **XtraTV DTH** to grow even stronger. In addition, we expanded our contracts for supplying services to the **U.S. Department of Defense**.

**What challenges did Spacecom need to overcome over the past year, and what challenges will the satellite industry face over the next few months?**

Spacecom, along with the entire industry, is working under the terms and conditions of a world suffering economic doldrums. Our management and teams work closely with all of our clients to enable both sides to continue to be involved in a "win–win" situation. The past 12 months have not really been much different from the year prior, as the economic situation in the world continues to struggle with financial concerns. However, as Spacecom has always dealt in emerging markets, our business model is predicated upon risk management. We understand the economic fickleness that comes from immersion in less than stable environments and we are prepared for uncertainty.

The future of the general economic malaise does not seem to be clear and we do not see an end to such, as of yet. To quote a proverb, "*We truly live in interesting times.*"

Spacecom remains committed to moving forward with our plans for new satellites and business development efforts. The *AMOS-4* and *AMOS-6* are in development and the former is close to its launch and we are maintaining our schedule, all the while as we continue to raise funds and expand our group of investors.

We have not announced plans for *AMOS-7* or other satellites. However, we are working to find and develop the next spots for our business as a multi-regional satellite operator.

***What upcoming projects are in the works and what may we expect to see from Spacecom over the next three to four quarters?***

Spacecom is now a growing multi-regional satellite operator and we will continue to fill capacity on the AMOS-5 and look forward to bringing on new DTH clients as well strengthening our broadcast bouquets and data communications services.

In mid-2013, AMOS-4 is scheduled for launch to the **65 degrees West** orbital position to satisfy growing needs in Russia and South East Asia, particularly in the Indian subcontinent. AMOS-4 will have multiple Ku- and Ka-bands to service broadcast and broadband needs. These high power transponders, with steerable beams, will create a powerful platform enabling a wide range of cross-region, cross-band and cross-beam connectivity options to reach the vast urban and rural areas of these regions.

We have already started the pre-sales process and we will make announcements, as needed. AMOS-4 will also be our first foray into Asia and will provide extensive broadcast and broadband reach for satellite services, including DTH, video distribution, VSAT communications and broadband Internet.

Spacecom is also moving forward with plans for our AMOS-6 satellite, which is scheduled for launch in 2015 to the **4 degrees West** position. AMOS-6 will expand our reach to include Western Europe, add new Ka-band spot beams, and eventually replace the *AMOS-2* satellite which is slotted over Central and Eastern Europe. We are excited to start moving forward with this project which will enhance our reputation as a multi-regional satellite operator.

As 4 degrees West is well known as the *AMOS Hot-Spot,* we are energized by the new options that AMOS-6 will offer, especially for Broadband Internet via Satellite. This is an emerging market and we are looking forward to working closely with providers in Western, Central and Eastern Europe.

*AMOS-5*
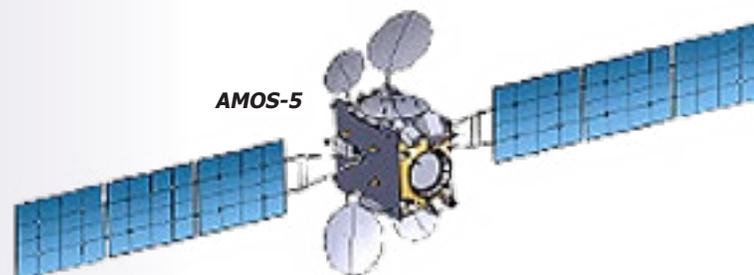
# YEAR IN REVIEW: *TeleCommunication Systems, Inc. (TCS)*

*by Michael Bristol, Senior Vice President + General Manager, Government Solutions Group*

**As the U.S. and the world struggles out of a global recession, TeleCommunication Systems, Inc. (TCS), a world leader in highly reliable and secure communications technology, continues to grow. This is due in large part to our *Government Solutions Group*, whose products and services have been optimized for best commercial practice pricing with MIL-SPEC reliability. This approach is critical in helping the U.S. government with state-of-the-art *C4ISR* solutions designed to combat increased threats from our adversaries in a shrinking budget climate.**

In 2012, we were selected as one of the prime contractor awardees for the *Custom SATCOM Solutions* (**CS2**) contract. CS2 will be the main contract vehicle for the **Department of Defense** (**DoD**) and federal civilian agencies to purchase commercial SATCOM solutions for the next five years. As a leading provider of mission-critical total communication solutions consisting of deployable SATCOM solutions, managed SATCOM network services and field support staff, this positions us very well to offer our TCS *TotalCom*™ portfolio to new federal customers.

According to **Northern Sky Research**, the global market for commercial government satellite equipment and services will grow from $3.4 billion in 2011 to $7.9 billion in 2019. Additionally, according to **Frost and Sullivan**, the DoD C4ISR market is approximately $43 billion in size. This will likely grow, as the DoD's reliance on *Commercial-Off-The-Shelf* (**COTS**) secured technology to eventually replace most embedded systems grows—the future for our offerings looks bright.

Another milestone is our partnership with **Northrop Grumman** and **Lockheed Martin** to produce highly affordable satellite terminals for protected *Communications-On-The-Move* (**COTM**) and *Communications-At-The-Halt* (**CATH**). Our **Low Cost Terminal** (**LCT**) solution enables protected and secure communications for tactical warfighters in theater.

The DoD has also asked the industry to make more of an investment in developing and using innovative technologies to ensure our troops are receiving the solutions they need to help achieve success; development of the LCT solution clearly shows that TCS, Northrop Grumman and Lockheed Martin are more than capable of meeting this challenge. No other existing or developing terminals provide **P-SATCOM** for the tactical warfighter at similar price points or timetable; the LCT solution at full production levels is priced at one-tenth the price of currently fielded extremely high-frequency terminals.

Two of our solutions also were accepted into, and successfully passed, the U.S. Army's *Network Integrated Evaluation* (**NIE**) *12.2* program this year: Our *Secret Internet Protocol Router* and *Non-secure Internet Protocol Router Access Point* (**SNAP**) *Very Small Aperture Terminal* (**VSAT**) *1.2M Lite* and *TCS IMPACT Tactical* baseband. The SNAP Lite 1.2M VSAT solution is our newest VSAT product and delivers the same battle-proven SNAP capability as our successful 2.0M SNAP VSAT, but in a 50 percent smaller physical footprint. The TCS IMPACT Tactical modular baseband system is the next-generation platform for multiple enclave NIPR/SIPR/Coalition baseband solutions, providing unprecedented modularity without additional integration requirements.

We have seen an upswing in interest and orders for our SNAP *Tactical Transportable TROPO* (*3T*) system, which provides long-haul, high-bandwidth and low-latency communications with best-in-class proven technology. As satellite bandwidth continues to be an increasingly limited and expensive commodity, the military is giving our 3T solution more scrutiny, as it is a significantly superior product to legacy Tropo systems. We currently have 28 3T systems deployed globally.

As of this writing, the outcome of the looming sequestration is unknown; this is key to what 2013 will hold for the Company. This unknown could present a "perfect storm" scenario for defense spending when you also consider the drawdown of troops in Afghanistan that is slated for 2014 and the current trend toward resets for federal entities—refurbishments of existing equipment instead of new equipment purchases. In anticipation of this trend, TCS has recently set up an 8,000 square-foot reset/repair facility to ensure we can meet the demand for re-use of the hundreds of existing systems fielded over the last few years.

TCS is taking other proactive measures to weather this potential storm. The LCT solution will make protected satellite communications a viable, cost-effective option for tactical warfighters. CS2 will allow us to expand our customer base by giving us an entry into new federal markets. We are also looking to expand our reach internationally; this is exemplified by our achievement of having our SNAP VSAT satellite systems be one of select group of systems to receive WGS certification, which opens it to trusted allies.

TCS is also well-positioned in the space services arena, where we are building Earth stations and putting high-reliability components on space launch vehicles for the U.S., as well as foreign governments. Our successful relationship with the **Japan Aerospace Exploration Agency** is also continuing, as we provide ground tracking services via our stations on *Guam* and *Christmas Island*.

# YEAR IN REVIEW: ViaSat

*by Bruce Rowe, Director, Public Relations*

**What successes did ViaSat enjoy over the past year?**

**The ultimate success was when our new high-capacity satellite system entered service in January. That included the rollout of our *Exede* Internet service at the end of March. We had planned for that to occur for many years, starting with the design of our new system, including *ViaSat-1*, the satellite construction, building all the back office facilities and infrastructure for the network, and then the launch of the satellite in 2011. Consumer and media response to Exede Internet has been overwhelmingly positive and we've added more than 100,000 subscribers in the first six months.**

Two additional commercial successes were winning satellite infrastructure contracts from **NBN Co** in Australia and **KACST** in the Middle East. Those helped solidify our position as the leader in new Ka-band technology.

**ViaSat** experienced a successful year in our defense business, in spite of the current budget environment. This happened because we're working on unconventional projects that deliver capabilities that aren't being effectively addressed by bigger-budget programs of record. Two of the areas we saw grow the fastest this year were government mobile broadband services, mostly for airborne **ISR** missions, and our new system for **U.S. Army Blue Force Tracking 2**. Our year-over-year government segment revenues increased by almost 25 percent.

**What challenges did ViaSat need to overcome this past year, and what challenges will the satellite industry—and specifically your market segment—face over the next few months?**

We broke new ground in the satellite broadband arena because our service is so different from what satellite service used to be. With that comes some uncertainty. The challenge is how will customers react? How do you market the service so they really understand just how different it is, and how do you make sure you can provide the best customer service? We had a good idea of what was going to happen, but you can never know until you launch the business.

The launch delays we encountered with ViaSat-1 also put us in a tough position as our fixed costs kicked in without the network up and running to generate revenue. That created a challenge across the company to build revenues from other sources to support that business until we could start to grow service revenues.

As we mentioned, we had to overcome the budget uncertainty created by sequestration, which delayed some government awards. But overall, I think we met all of those challenges extremely well.

As an industry, we need to continue to innovate to compete, not just within the satellite business, but within the greater communications industry. It's moving so fast that you can't rest. For example, we've had great response to our Exede service, but we're continually thinking about how to improve the service. In August, we launched the *Late Night Free Zone* so our customers can download large files in the nighttime hours without the usage counting against their volume cap. In October, we increased the data allowance on our entry-level plan from 7.5GB to 10GB.

Certainly the government budget situation—sequestration and the *fiscal cliff*—are a challenge for all businesses, particularly for those of us who derive a major part of Company revenues from government contracts. The administration is promising to resolve the problem before it takes effect and we hope they are able to get that done.

Another ongoing challenge is finding talented employees, particularly engineers, who can help us carry on with our growth as we execute on the new projects we're winning. We work hard to build the academic-corporate partnerships to foster talented students and attract them to ViaSat.

**What upcoming projects are in the works and what may we expect to see from ViaSat over the next three to four quarters?**

We've won close to $1 billion in new contract awards in the first three quarters of our current fiscal year, so we have a lot of exciting and challenging projects to work on. We've got the scale now to see that backlog continues to grow. Those projects include bringing a great broadband service to rural dwellers in Australia, keeping our troops safer with the next generation of Blue Force Tracking, delivering broadband connections to educational and research institutions in the Kingdom of Saudi Arabia, spreading high-speed Internet in Latin America, upgrading military SATCOM networks, and enabling military personnel to use smart devices on their missions with secure network technologies.

Another area where you will see continued innovation from us will be in improving and expanding our airborne broadband networks and services for private jets, commercial airlines, and the military. You may have seen the recent forecasts that Ka-band is going to see substantial growth in airborne broadband applications in the coming years. We will be at the forefront of that technology development.

*ViaSat-1*

# YEAR IN REVIEW: *Astrium Services Government, Inc. (formerly Vizada)*

*by Bob Baker, Chief Executive Officer*

**What successes did Astrium Services Government enjoy over the past year?**

**2012 was a year of major change for the company as we shifted our focus exclusively to the government market in the U.S. and Canada, following our acquisition by Astrium, an EADS company. The most visible sign of our evolution is our new name, Astrium Services Government, Inc. which is a subsidiary of the newly formed Astrium Americas and part of the EADS North America organization.**

As a testament to the role **Astrium Services Government, Inc**. is already playing in the government market, we have won several significant **FCSA** contracts this year, including a contract vehicle enabling us to compete for and develop customized solutions for the military and other agencies. Two other contracts with a potential for $25.5m in **Inmarsat BGAN** and other services were also awarded to the company. While we are known for our expertise in the MSS market, our new corporate family provides us with deep experience in the FSS market as well, making us a formidable player in a broad range of end-to-end SATCOM solutions.

In addition to offering L-band services from providers such as **Inmarsat**, **Iridium** and **Thuraya**, Astrium Services Government, Inc. will provide services from Astrium's military X-band and UHF satellites plus C-, Ku- and Ka-Band (commercial and military) from industry leading fixed satellite service providers. Astrium Services Government, Inc., will also provide supplemental services key to the US Government and DoD customers including: S*ecure Network Operations Center* (**SNOC**), *Multiprotocol Label Switching* (**MPLS**) network, *Virtual Network Operator* (**VNO**) platforms, remote field support, and *host nation agreement* (**HNA**) services.

This summer, we announced a partnership with **Harris CapRock** to provide UHF and X-band services over the entire **Skynet 5** fleet. With two new Skynet satellites joining the existing fleet of six satellites, offered will be additional X-band coverage over CONUS, the Pacific and the Atlantic, all within the next 90 days of this writing.

We have deepened our bench with the addition of many new technical and commercial staff including *Ed Spitler*, our Senior Vice President of Operations, and *Dylan Browne*, Vice President of Business and Market Development. All of our new staff are experienced SATCOM professionals with a keen understanding of the current market environment and the inner workings of US DoD customers and there requirements.

**What challenges did Astrium Services Government need to overcome this past year, and what challenges will the satellite industry—and specifically your market segment—face over the next few months?**

Our major challenge in 2012 was to work closely with our new owners and USG customers to map forward a path that will leverage the capabilities and assets of our parent company with our own expertise and strengths to meet the unique needs of our market. This required many forklift changes to our company infrastructure, partnerships and market approaches. All the while, we continued servicing our existing customers and partner relationships. This was a year of balancing many priorities through the transition, but just as we have done so many times over the past 50 years, we have emerged stronger and more energized at the end.

As the government struggles with finding its balance between building and buying capacity, companies such as ours will be needed as a strategic partner as well as a strategic supplier. This market will be called upon to help the government tackle the issues and red tape that could impede innovations like *Hosted Payloads* and customized SATCOM solutions in order to keep our military and government agencies connected, safe and productive, wherever they may be located.

Certainly our evolution as well as the changes being experienced by other major industry players are dramatically transforming the competitive market. We should expect to see reactive moves from other companies in response to new market dynamics. We anticipate that major companies and small players with unique services and expertise will form partnerships to meet the complex needs of this market with speed, reliability and security in ways that the government simply cannot accomplish on its own.

**What upcoming projects are in the works and what may we expect to see from Astrium Services Government over the next three to four quarters?**

We have several major investment activities that will take place in 2013 which we believe will position Astrium Services Government, Inc., for continued growth over the long term. With the launch of two new Skynet satellites to our existing constellation of six satellites, we will nearly double our X-band capacity in the CONUS, Pacific and Atlantic regions within the next 90 days.

At the same time, we will continue to invest in our world class infrastructure to ensure reliability and security with MAC1 compliant teleports located in North America and around the world. Throughout our company our shared goal is to deliver satcom solutions that the USG needs and can rely on to protect, connect and inform. Expect to hear news from us about our capabilities to handle the most sensitive projects for our customers.