SATCOM For Net-Centric Warfare June 2014

# MilsatMagazine

## Command & Control

***KRATOS' Daughtridge examines C2***

***Forrester on Google's space dreams***

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***+ a plethora of Dispatches...***

*An artistic rendition of a USAF AEHF satellite. Image courtesy of Lockheed Martin.*

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June 2014


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## DISPATCHES



## FEATURES

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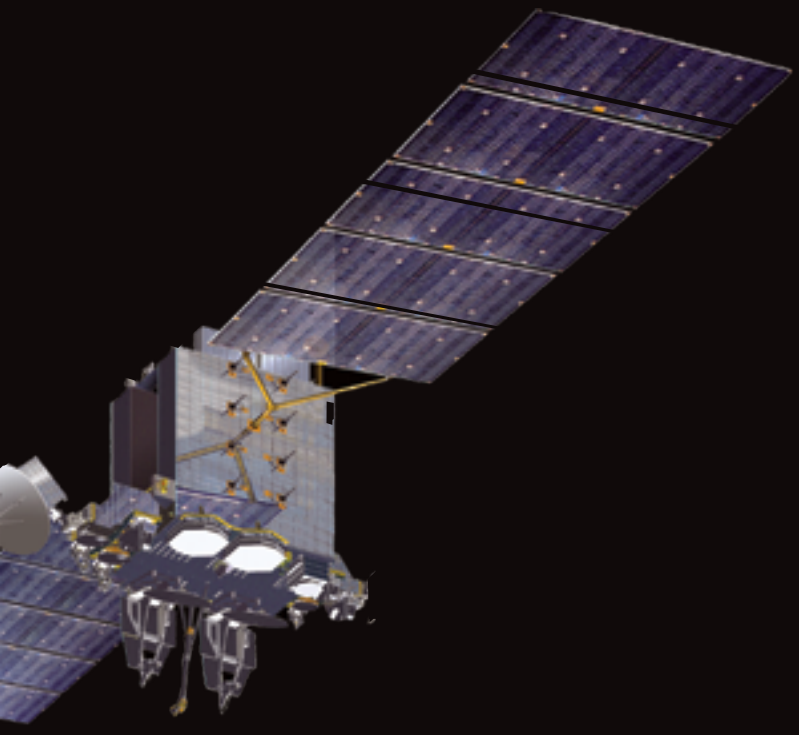


*The Advanced Extremely High Frequency (AEHF) System (pictured to the left) is a joint service satellite communications system providing global, secure, protected, and jam resistant communications for high-priority military ground, sea, and air assets. The system consists of three satellites in geosynchronous Earth orbit (GEO). These satellites provide 10 to 100 times the capacity of the 1990s-era Milstar satellites.*

*A constellation of three AEHF, augmented by a Transformational Communications Satellite (TSAT), provides continuous, 24-hour coverage. Advanced EHF allows the National Security Council and Unified Combatant Commanders to control their tactical and strategic forces at all levels of conflict through general nuclear war and support the attainment of information superiority.*

*The AEHF System is a follow-on to the Milstar system and augments and improves on the capabilities of Milstar. AEHF expands the MILSATCOM architecture to support Transformational Communications and Network-Centric Warfare. AEHF will provide connectivity across the spectrum of mission areas including land, air, and naval warfare; special operations; strategic nuclear operations; strategic defense; theater missile defense; and space operations and intelligence.*

*AEHF-1 was launched on August 14, 2010, and AEHF-2 was launched on May 4, 2012, AEHF-3 launched on September 18, 2013, while AEHF-4 is projected to launch at a date to be determined in 2017*

# DISPATCHES

## U.S.A.F.—1ST SPACE OPS TO CONTROL GSSAP

**The 1st Space Operations Squadron at Schriever AFB, Colorado, will assume command and control of the Geosynchronous Space Situational Awareness Program (GSSAP) this summer.**

The satellites are a space-based capability that will operate in the near-geosynchronous orbit regime supporting U.S. Strategic Command space surveillance operations as a dedicated Space Surveillance Network sensor.

Gen. William L. Shelton, commander of Air Force Space Command, directed the 1st SOPS to add command and control of GSSAP to the portfolio of Space Situational Awareness systems they control. Those include the Space Based Space Surveillance satellite and the Advanced Technology Risk Reduction (ATRR) satellite.

The first two GSSAP satellites are scheduled to launch July 23, aboard a United Launch Alliance Delta IV booster from Cape Canaveral Air Force Station, Florida.

The 1st SOPS will assume operation of GSSAP following launch and initial check-out. The satellites will communicate information through worldwide Air Force Satellite Control Network ground stations to the 1st SOPS where satellite operators will oversee day-to-day operation of the satellites.

"This marks a great milestone for the 1st SOPS and AFSPC," said Shelton. "With the alignment of the GSSAP mission to the 1st SOPS, we will achieve new synergies within the Space Situational Awareness mission area. Operating the new GSSAP mission alongside our other space-based SSA systems will allow personnel to collaborate across multiple, highly capable SSA systems within the same squadron."

GSSAP satellites are designed to support Joint Functional Component Command for Space tasking to collect space situational awareness data which will allow for more accurate tracking and characterization of man-made orbiting objects.

GSSAP will operate in a near-geosynchronous orbit where it will have a clear, unobstructed and distinct vantage point for viewing resident space objects in the geosynchronous orbit regime without the disruption of weather or atmosphere that can limit ground-based systems.

# DISPATCHES

## DOD—MILITARY SPACE POLICY + THE CHALLENGES...

*Douglas L. Loverro, Deputy Assistant Secretary of Defense for Space Policy.*

**If potential adversaries are to challenge the United States, they must do so in the space domain, the Defense Department's top space policy official has told Congress**

Douglas L. Loverro, deputy assistant secretary of defense for space policy, joined by Air Force Gen. William L. Shelton, commander of Air Force Space Command, testified before the Senate Armed Services Committee's strategic forces subcommittee on the department's space program posture.

"Over the last 15 years, other nations have watched us closely," he said. "They have recognized that if they are to challenge the United States, they must challenge us in space. And they are endeavoring to do so. The United States has successfully addressed such challenges before in air, sea and land domains, and now we must, likewise, respond in space."

This must be done against the backdrop of decreasing budgets that challenges both the ability and speed with which the United States can act, he said, adding that this in no way diminishes the importance of successfully sustaining the crucial advantages that space provides.

"Our strategic approach for these issues remains consistent with what we outlined in the 2011 National Security Space Strategy and reaffirmed in DOD space policy in 2012," Loverro said.

While Loverro acknowledged he is concerned about the contested nature of space, he said it remains important to national defense.

"Space remains, and will continue to remain, vital to our national security," he added. "It underpins DOD capabilities worldwide at every level of engagement, from humanitarian assistance to the highest levels of combat. It enables U.S. operations to be executed with precision on a global basis with reduced resources, fewer deployed troops, fewer casualties and decreased collateral damage."

Space empowers U.S. forces and allies to win faster and to bring more warfighters home safety, he said.

"It's a key to U.S. power projection," Loverro said, "providing a strong deterrent to our potential adversaries and a source of confidence to our allies."

But the evolving strategic environment increasingly challenges U.S. space advantages, he said, because space no longer is the sole province of world powers—it is a frontier that is now open to all.

Space has become more competitive, congested and contested, Loverro said, referring to that condition as the "so-called three C's." As an American, he said, he welcomes the competitive aspect of today's space environment.

"I'm highly confident that, with the right policies, the U.S. is well positioned to remain ahead in that environment," Loverro said.

The changes Congress authorized two years ago on export control reform, Loverro said, coupled with changes NASA and DOD have embraced on commercial launch, are just two of the many reasons he isn't concerned with the competitive nature of space.

"On the second 'C,' congestion, I am not quite so welcoming," he said. "But I am optimistic. Congestion and debris in space is a real issue, and it threatens to put our use of space at risk."

Loverro praised efforts such as the Air Force's Space Fence program that are aimed at reducing this risk, as well as the work DOD, the State Department and the United Nations are doing internationally to set "rules of the road" for outer space.

The space situational awareness sharing that U.S. Strategic Command is leading, he said, also is aimed at bringing a similar focus on this issue to the community of space-faring nations.

Shelton voiced similar concerns regarding the contested margin of U.S. advantage in space.

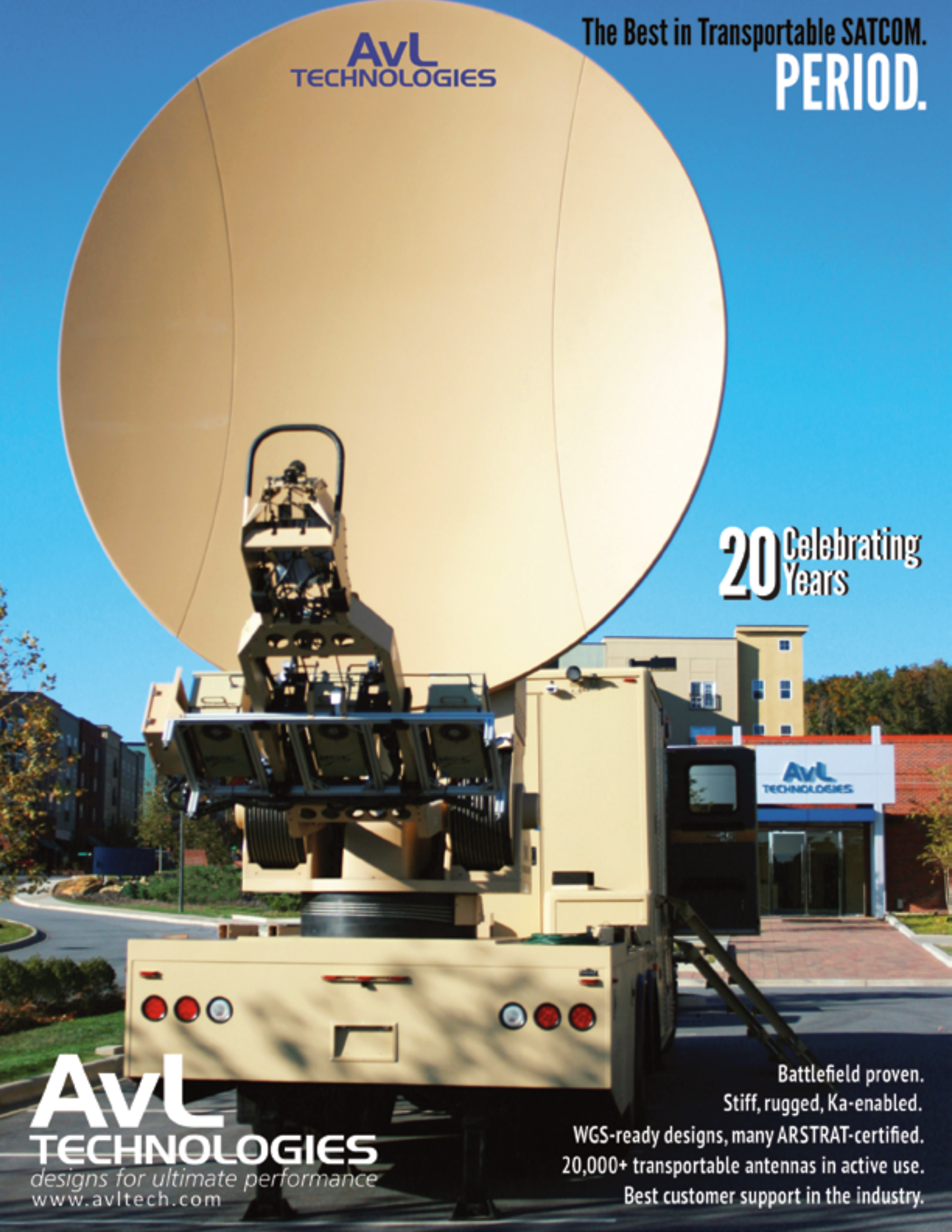
"Our nation's advantage in space is no longer a given," he said. "The ever-evolving space environment is increasingly contested, as potential adversary capabilities grow in both number and sophistication."

The general said providing budget stability and flexibility in the dynamic, strategic space environment is necessary to maintain and bolster the viability of the nation's space capabilities.

"Given this new normal for space, I believe that we are at a strategic crossroads," he said. It is a reality that requires us to address how we protect our space systems, challenge traditional acquisitions practices and consider alternative architectures that are more resilient and more affordable."

Shelton thanked the committee for supporting the military space policy program. "I look forward to working with the Congress to keep you abreast of our efforts to provide resilient, capable and affordable space capabilities for the joint force and for the nation," he added.

*Story by Army Sgt. 1st Class Tyrone C. Marshall Jr., American Forces Press Service*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# DISPATCHES

## CANADIAN ARMY—ANTI-JAMMING ANTENNA FIELD TESTED

**For Canadian soldiers in the field, accurate positioning and timing information is critical to operations.**

A few years ago Defence Research and Development Canada (DRDC) identified a requirement to develop an innovative, low cost solution to protect land vehicles in Canadian Army like the Light Armored Vehicle (LAV) III from GPS jamming.

The device has evolved from a prototype to a product undergoing testing through two separate contracts.

Under the first contract, an industrial research contract with DRDC, Calgary-based NovAtel developed the GPS Anti-Jamming Technology, or GAJT, prototype.

NovAtel continued to develop the technology and recently released a commercially available product, the GAJT-700ML.

"The Canadian Army requires accurate, secure and reliable access to Global Positioning Systems to conduct operations throughout the full spectrum of conflict in all potential theaters of operation," said Colonel Andrew Jayne, Director Land Requirements.

"With the ever-increasing demands on the electromagnetic spectrum and threat of harmful interference, technologies which contribute to the assurance of position and timing information are a critical enabler of Army and Canadian Armed Forces operations in today and tomorrow's operating environment."

"GAJT is a great example of a technology with its roots in research that has evolved through years of work into a product that the CAF can use to their advantage," said Mike Vinnins, of DRDC's Navigation Warfare Group.

The Canadian Army's Directorate of Land Requirements (DLR), the Quality Engineering Test Establishment (QETE) and the Canadian Army Trials and Evaluation Unit (CATEU) conducted field testing of GAJT from March 3 to 6, 2014, on a LAV III Observation Post Vehicle (OPV) at Canadian Forces Base Garrison Petawawa.

Public Works and Government Services Canada procured GAJT for testing through its Build in Canada Innovation Program (BCIP).

Defence Scientists from DRDC's Navigation Warfare group provided key scientific and technical support at the field test.

"We provided localized low power jamming of the LAV III OPV to test the effectiveness of the GAJT at preventing interference from GPS jamming," said Scott McLelland, a DRDC Defence Scientist who attended the test.

DRDC's data logging equipment was used to record the performance of the LAV III's navigation systems during the trial.

"The data logger integrates into the LAV III's sophisticated electronics to capture the data from its navigation systems," explained McLelland. "It allows the personnel evaluating the test data to visualize the impact of GAJT in jammed and non-jammed environments on the LAV III's recorded position as it traveled along a predefined route."

## LASER LIGHT COMMUNICATIONS + DISA—R&D AGREEMENT NOW IN PLACE

**Laser Light™ Communications, LLC) now has a Cooperative Research and Development Agreement (CRADA) with the Defense Information Systems Agency (DISA) relating to LLC's Global Hybrid Satellite-Terrestrial All Optical Network™ technology.**

LLC and DISA have entered into the agreement to establish a cooperative research and development effort to assess the potential use of an all-optical, laser-based Medium Earth Orbit (MEO) communication satellite solution that could be seamlessly integrated into the global terrestrial communications network.

An all-optical satellite communication (SATCOM) system potentially offers numerous advantages over conventional SATCOM systems: 1. It can potentially provide an enormous increase in data transfer rates; 2. It is a more secure system; 3. It will eliminate the issue of spectrum allocation; 4. It will mitigate the challenge of mutual interference as satellite spacing will no longer be an issue.

The agreement will allow DISA to evaluate the underlying technology and evaluate the long-range potential of what may be achievable with the all-optical SATCOM system.

"We are pleased to be a collaborator with DISA in this important effort," said Robert H. Brumley, Senior Managing Director of LLC.

DISA is a combat support agency of the Department of Defense (DoD).

# DISPATCHES

## BOEING + SCT—MAKE READY FOR MORELOS-3

**The Mexican Ministry of Communications and Transportation (SCT) and Boeing are a step closer to enhancing Mexico's mobile communications capabilities for government applications with the completion of the second Mexsat 702HP (high power) geomobile satellite.** The satellite, Morelos-3, will join Centenario, the first Mexsat 702HP satellite, in storage awaiting launch. Together with the two Mexsat ground stations, the satellites form the Mexsat mobile communications system.

Boeing is responsible for the design and delivery of an integrated Mexsat system, comprised of three satellites, two ground network and satellite control stations in Mexico, associated network operations systems and prototype user terminals.

Morelos-3 will be stored by Boeing until it is launched aboard an Atlas V rocket, after which it will operate from a geosynchronous orbit.

Boeing completed Centenario in November of 2013. Bicentenario, a fixed satellite system spacecraft built by Boeing subcontractor Orbital Sciences Corporation, launched in December 2012 and is being operated by Telecomm from the Mexsat ground stations in Iztapalapa and Hermosillo, Mexico.

Once fully operational, the Mexsat Satellite System will provide high-data mobile, voice and data services for government agencies. Mexsat will also improve telecommunications access in remote areas of the country.

Further information is available at ***http://www.boeing.com/boeing/defense-space/space/bss/factsheets/702/mexsat/mexsat.page***

# DISPATCHES

## LOCKHEED MARTIN—AEHF LINKS FOUR PARTNER NATIONS

**The U.S., Canada, the Netherlands and the U.K.—all are partner nations—and are now using the Advanced Extremely High Frequency (AEHF) protected communications satellite system after the United Kingdom connected earlier this year.**

These four nations will use the Lockheed Martin-produced satellites for their most important transmissions, from commanders-in-chief to troops in the field.

The U.K. connection follows Canada's first successful call in May, 2013, and The Netherlands' initial connection came two months later. Over the past year AEHF facilitated many connections between international users, and U.S.-led tests in April included all four partners.

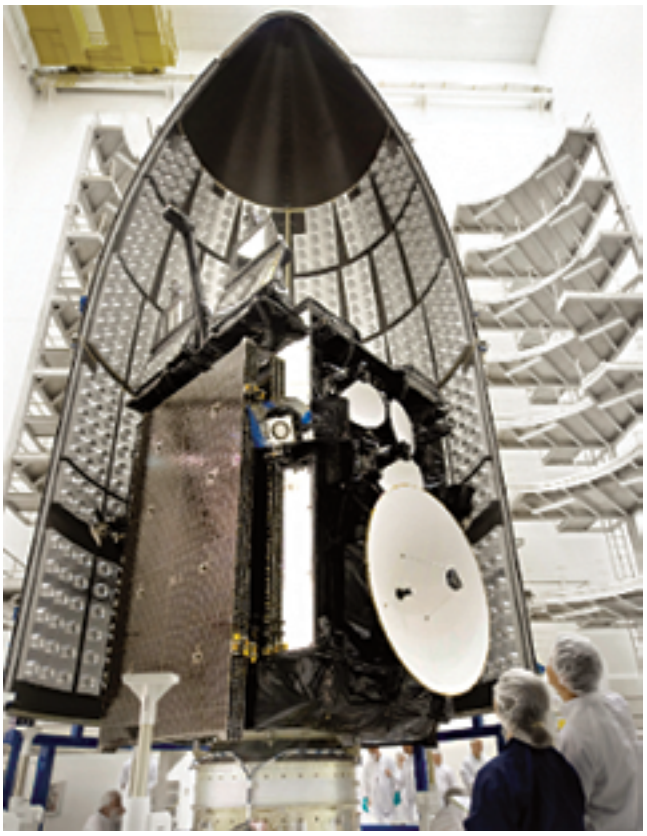
"AEHF is a keystone in global security. It is the only system that can provide highly-protected communications, circumventing our adversaries' jammers in most wartime operations," said Mark Calassa, vice president of Protected Communication Systems at Lockheed Martin.

"We are committed to driving this capability forward. All four partners are connected, and we are marching steadily toward Multi-Service Operational Test and Evaluation."

U.K. armed forces started to connect over the course of several weeks beginning February 25.

They used two terminal variants to communicate with AEHF-2: One made for connections on land and another designed for users at sea.

Service members contacted the satellite at Colerne Airfield, Wiltshire, with the shore variant of the Navy Multiband Terminal (NMT).



*AEHF, from the inside out.*
*Photo courtesy of Lockheed Martin.*

In separate tests, U.K. users connected via the NMT ship variant from Telemetry & Command Station Oakhanger, Hampshire.

"AEHF not only delivers higher-bandwidth communications for the U.K., it makes communications with allies faster and easier," Calassa said. "AEHF is showing it can handle the demands of protected coalition communications at high speeds, connecting nations with their own users and allied users across the globe."

The four-nation AEHF program is led by the U.S. Air Force Space and Missile Systems Center at Los Angeles Air Force Base, California.

Lockheed Martin is under contract to deliver the Mission Control Segment and six AEHF satellites, which are assembled at the company's Sunnyvale, California, facility.

# DISPATCHES

## U.S. ARMY—WANTED… RIFLEMAN RADIOS

*Capt. Jonathan Page uses the Rifleman Radio and Nett Warrior end-user device of the Army's Network Capability Set 13 at Nangalam Base, Afghanistan. The Army is using full and open competition to procure the next-generation Rifleman Radios. Photo Credit: Sgt. 1st Class E. L. Craig, Task Force Patriot PAO*

**The U.S. Army has released a draft Request for Proposals to procure additional Rifleman Radios using full and open competition.**

The draft Request for Proposal, which was posted May 21, 2014, to the Federal Business Opportunities website at ***http://www.fbo.gov/*** moves the Army toward Full Rate Production for the Rifleman Radio, part of the Handheld, Manpack, Small Form Fit program.

Under the full and open competition approach, the Army will award contracts to multiple vendors, creating a "radio marketplace" where vendors will compete for delivery orders as needed, after they achieve technical and operational requirements.

"The full and open competition gives all vendors the opportunity to participate as we work together to build the Army network," said Brig. Gen. Daniel P. Hughes, Program Executive Officer for Command, Control and Communications-Tactical. "The radio marketplace will support continuous innovation to deliver better radios for our Soldiers."

The five-year base, plus a five-year option indefinite delivery, indefinite contract will be awarded to multiple vendors who meet both the technical and service requirements to support the radio.

This structure enables the Army to choose from numerous technologies, and release a new contract if radio technology changes significantly after the initial five-year award.

The competitive Non-Developmental Item acquisition strategy is expected to reduce radio procurement costs as the Army continues to modernize the network amid fiscal constraints.

The acquisition strategy also includes on-ramp opportunities for vendors whose technologies mature after the initial competition and operational tests.

A contract award is expected in fiscal year 2015.

Once the contract is awarded, each radio will undergo initial laboratory tests to determine if threshold requirements have been met.

Vendors that do not meet the qualifications will be off-ramped. Vendors that do meet the qualifications will move to the next phase, an operational test to be performed at one of the Army's semi-annual Network Integration Evaluations.

The Rifleman Radio is a lightweight, rugged, hand-held radio that transmits voice and data via the Soldier Radio Waveform.

With the SRW, the Rifleman Radio acts as its own router and allows information to be transmitted up and down the chain, as well as into the network backbone provided by the Warfighter Information Network-Tactical.

The Rifleman Radio can also be linked to Nett Warrior, an Android-based, smartphone-like capability that enables Soldiers to send messages, access mission-related applications and track one another's locations with Global Positioning System technology.

Through Low Rate Initial Production, the Army has already purchased 21,379 Rifleman Radios, which are carried by Soldiers at the platoon, squad and team levels.

The radios, fielded as part of the integrated Capability Set 13 network package, are currently supporting dismounted operations in support of the advise-and-assist mission in Afghanistan.

Fielding is now underway to additional brigade combat teams, as part of Capability Set 14, with eventual fielding planned across the entire force.

The Army's total acquisition objective for the Rifleman Radio is 193,276 radios.

*Story by Sgt. 1st Class E. L. Craig, Task Force Patriot PAO*

# DISPATCHES

## NIMASA—TO CATCH A HIJACKER

**The Nigerian Maritime Administration and Safety Agency (NIMASA) has launched its satellite surveillance system, which, in conjunction with the Nigerian Navy and the Nigerian Air Force, successfully rescued Ghanaian Fishing Vessel Marine 711 from suspected hijackers on Thursday, June 5, 2014.**

The Ghanaian registered vessel was reportedly hijacked off the coast of Ghana and sailed across Togo and Benin Republic to Nigerian waters when the Embassy of the Republic of Korea contacted the Agency to help rescue the vessel.

The Ghanaian Fisheries Authority and the Operators of the Fishing Vessel joined in requesting NIMASA to bring the incident to a logical conclusion.

In a swift operation coordinated by Capt. Warredi Enisuoh, NIMASA's Director of Shipping Development, the Agency's newly built satellite surveillance system with Cloud Penetrating Radar capabilities was brought to bear and the incident was resolved within six hours.

The NIMASA team, working with the Nigerian Navy and the Nigerian Air Force, which used air and sea patrols, quickly plotted a response and reception plan, which led to the hijackers abandoning their mission and fleeing.

The new 24-hour Surveillance Center has the capability to detect boats, ships and objects of predefined cross-section floating on water. This includes any aircraft that ditches and remains on the surface during satellite over-flight.

Its abilities further includes, but are not limited to, setting range rings and restricted areas, which, when penetrated by an intruder, an alarm is activated, thereby alerting the operator.

The Director General of NIMASA, Ziakede Patrick Akpobolokemi, expressed satisfaction with the cooperation shown by all parties to the operation and noted that the Agency would continue to use cutting-edge technology and partnership with the military to secure Nigerian waters for enhanced trade activities.

This is the first regional cooperation between NIMASA, Nigerian Navy, Nigerian Air Force and the Ghanaian Authorities in the anti-piracy war in the Gulf of Guinea, which hinges on the provisions of the Bilateral Agreement on Regional cooperation on anti-piracy in the Gulf of Guinea.

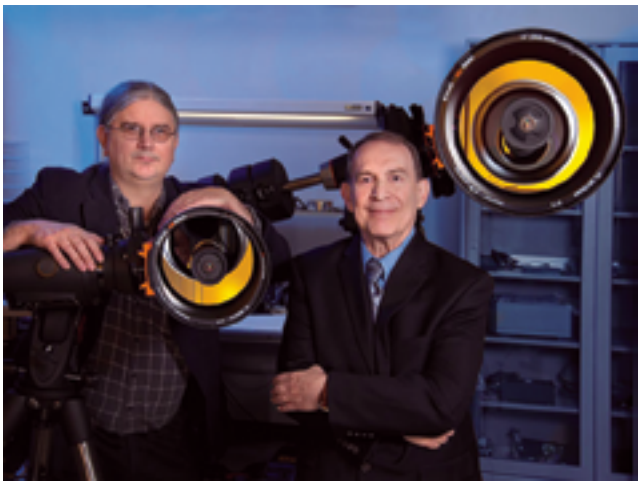
Nigeria, as signatory to the International Safety of Life and Sea (SOLAS) and Search and Rescue (SAR) Conventions, is obliged to intervene and provide coordination during Safety and Security-related incidents in her territorial waters and beyond.

The International Maritime Organization (IMO) designated Nigeria as one of the five Regional Maritime Rescue Co-ordination Centers (RMRCCs) in Africa. Nigeria, therefore, provides SAR and Security Co-ordination in the waters of Benin Republic, Cameroon, Congo, Gabon, Sao Tome & Principe and Togo, in addition to its own territorial waters.

*(Source: WorldStage News)*

# DISPATCHES

## U.S. ARMY—BEAMING DATA UP



*Pictured: Left—Keith Deacon; Right—Ronald Meyers. The photo is courtesy of the Army Research Lab.*

**Teleportation, a long-standing staple in the world of science fiction, has become a reality for scientists at the U.S. Army Research Laboratory (ARL) in terms of battlefield data and image processing.**

ARL quantum information principal investigator, Ronald Meyers, and team member Keith Deacon recently demonstrated information teleportation using entangled photons at the organization's laboratory in Adelphi, Maryland.

This achievement stems from quantum information science insight and quantum information processing technology that has been developed over the last two years by Meyers and his team.

The technology developed includes an information teleportation exfiltration testbed and a teleportation exfiltration approach to move quantum images securely, which is a significant achievement as current secure network communications are increasingly vulnerable to eavesdropping and eventual hacking with the use of ever more powerful computers.

The team has developed a prototype information teleportation network system as part of the testbed to quantify teleportation of information using eye-safe entangled photons, thus showing potential for secure teleportation over optical fiber or through free-space.

In entangled photon-based teleportation, a photon carrying potentially many bits of information interacts with one of an entangled pair of photons, and then the information is teleported to the other distant entangled photon and is read by the recipient.

In essence, teleportation in this instance can be thought of as a kind of communication, where a qubit, or unit of quantum information, can be transported from one location to another, without having to move a physical particle along with it.

Consider a special operations mission where a soldier is behind enemy lines. To exfiltrate information to his or her command post in a friendly area, the soldier operates a small handheld teleportation exfiltration device, which will allow data and images to be securely teleported back to the command post.

According to Meyers, the team believes that the teleportation exfiltration approach will be successful between mobile assets over long distances at high speeds, just as their quantum ghost-imaging achievements are leading to a new generation of battlefield imagers.

"The ARL teleportation achievements are expected to be the basis for new types of Army mobile information teleportation networks for battlefield enhanced situational awareness and security," said Meyers. "This research will benefit future soldiers by helping provide the Army with battlefield information teleportation networks that will be both cybersecure and fast."

In addition, the method is being developed to be robust for adverse military environments with turbulence and obscurants.

"The success in achieving quantum teleportation over long distances through an obscured battlefield is difficult, but future mobile ad-hoc information teleportation networks can give the future Army exponential advantages in cyber security, speed and bandwidth," Meyers said.

Meyers stated that the field of teleportation is advancing rapidly, and that despite the challenges that may lie ahead, he and his team see no significant roadblocks and expect more advances in their research that has the potential to enhance the way soldiers carry out their missions on the battlefield.

*Story by Jenna Brady, ARL Public Affairs*

# DISPATCHES

## LOCKHEED MARTIN + TARDEC—AMAS OF DRIVERLESS MILITARY TRUCKS SUCCESSFULLY TESTED

**The U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC) and Lockheed Martin have successfully completed new tests validating the ability of driverless military-truck convoys to operate successfully and safely in a variety of environments.**

The second series of demonstrations of the Autonomous Mobility Appliqué System (AMAS) Capabilities Advancement Demonstration (CAD-2) tests were conducted at the Department of Energy's Savannah River Site in South Carolina. The AMAS hardware and software are designed to automate the driving task on current tactical vehicles.

The Unmanned Mission Module part of AMAS, which includes a high performance LIDAR sensor, a second GPS receiver and additional algorithms, is installed as a kit and can be used on virtually any military vehicle.

In the CAD-2 demonstration, AMAS completed a series of fully autonomous convoy tests involving a completely unmanned leader vehicle followed by a convoy of up to six additional follower vehicles (also fully autonomous) operating at speeds as high as 40 mph. The tests doubled the length and speed of convoys previously demonstrated under the program.

Vehicles used in the CAD-2 demonstration included one Family of Medium Tactical Vehicles (FMTV) truck, one Medium Tactical Vehicle Replacement (MTVR) vehicle, two Palletized Load System trucks, two M915 Line-Haul Tractors and one Heavy Equipment Transport.

"I would describe these tests as a successful demonstration of the maturing capabilities of AMAS technology," said David Simon, AMAS program manager for Lockheed Martin Missiles and Fire Control. "We will conduct further safety testing within the next month, and the program will execute a six-week Operational Demonstration in the July-August timeframe, during which time Soldiers and Marines will assess the system benefits in realistic convoy operations."

Earlier this year at Fort Hood, Texas, AMAS completed the first CAD series of tests, simulating driverless tactical vehicles navigating hazards and obstacles such as road intersections, oncoming traffic, stalled and passing vehicles, pedestrians and traffic circles in both urban and rural test areas.

The AMAS hardware and software are designed to automate the driving task on current tactical vehicles.

The Unmanned Mission Module part of AMAS, which includes a high-performance LIDAR sensor, and additional algorithms, is installed as a kit and can be used on virtually any military vehicle.

For additional information, please visit ***http://www.lockheedmartin.com/us/products/amas1.html***

The U.S. Army's TARDEC infosite is reachable via ***http://tardec.army.mil/***

## RMIT UNIVERSITY—BIO-INSPIRED AIRCRAFT CAPABLE OF SOARING LIKE BIRDS

*Dr. Reece Clothier with a prototype of a bio-inspired unmanned aircraft, under development at RMIT University. Image courtesy of RMIT University.*

**Researchers are developing a bio-inspired unmanned aircraft capable of soaring like birds, boosting energy efficiency and endurance.**

The research team is aiming to be the first in the world to demonstrate an autonomous unmanned aircraft that can mimic birds by using updrafts around buildings to stay airborne.

The researchers are developing bio-inspired unmanned aircraft capable of soaring like birds, boosting energy efficiency and endurance. In collaboration with Australia's Defence Science and Technology *(cont.)*

Organization (DSTO), the research team is aiming to be the first in the world to demonstrate an autonomous unmanned aircraft that can mimic birds by using updrafts around buildings to stay airborne.

Lead researcher Dr. Reece Clothier said soaring birds used positive air flows generated around features such as cliffs.

"This research aims to develop the sensing and control systems that will allow a small fixed-wing unmanned aircraft to achieve the same thing," Dr. Clothier said.

"Birds make soaring look easy, but when we try to mimic what they know by instinct, we realize just how far advanced nature is in its designs."

The focus is on proving the feasibility of "urban" soaring, combining real-time sensing of wind with complex flow models to locate possible positive airflows around large buildings. Flying a small aircraft in those updrafts could significantly increase its endurance.

Dr. Jennifer Palmer, a Senior Research Scientist in the Aerospace Division of DSTO, said the long-term goal was to design an unmanned aircraft that could autonomously predict airflows in its surrounding environment and, by using this information, minimize its energy consumption, maximize its endurance and avoid areas of high turbulence.

"DSTO undertakes research in a number of areas related to autonomous unmanned aircraft, and this is a great opportunity to engage with academia on a project with both scientific challenges and real-world outcomes."

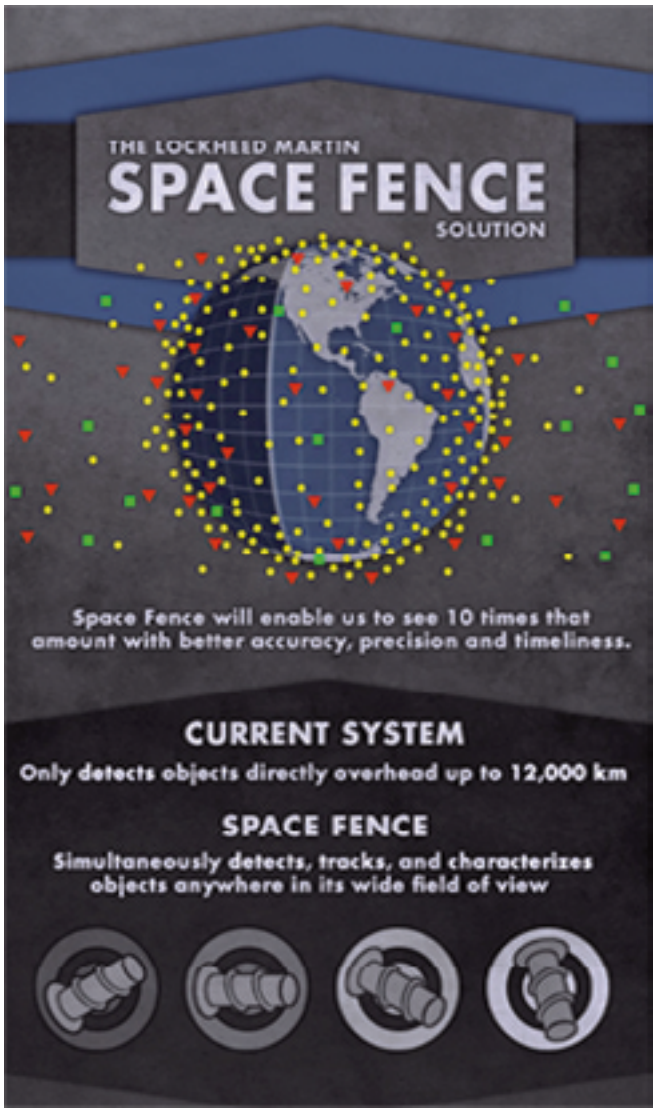
The project is supported by the Defence Science Institute.

# DISPATCHES

## LOCKHEED MARTIN—PLEASE FENCE ME IN WITH IMPROVED TRACKING

LOCKHEED MARTIN

Space Fence – USAF's Defense against Space Debris and Other Orbiting Objects




**The U.S. Air Force has awarded Lockheed Martin a $914 million contract to improve the way objects are tracked in space and increase the ability to prevent space-based collisions.**

Lockheed Martin's Space Fence solution, an advanced ground-based radar system, will enhance the way the U.S. detects, catalogs and measures more than 200,000 orbiting objects.

With better timeliness and improved surveillance coverage, the system will protect space assets against potential crashes that can intensify the debris problem in space.

"Space-based technologies enable daily conveniences such as weather forecasting, banking, global communications and GPS navigation, yet everyday these critical services are being threatened by hundreds of thousands of objects orbiting Earth," said Dale Bennett, executive vice president of Lockheed Martin's Mission Systems and Training business.

"Space Fence will locate and track these objects with more precision than ever before to help the Air Force transform space situational awareness from being reactive to predictive."

Lockheed Martin will deliver up to two advanced S-band phased array radars for the Space Fence program.

The Space Fence radar system will greatly improve Space Situational Awareness of the existing Space Surveillance Network.

Construction of the new Space Fence system on Kwajalein Atoll in the Marshall Islands is slated to begin in the early 2015 to meet the program's 2018 initial operational capability goal.

The total contract value is estimated at greater than $1.5 billion over an eight-year period of performance if all options are exercised.

With more than 400 operational S-band arrays deployed worldwide, Lockheed Martin is a leader in S-band radar development, production, operation and sustainment.

The Lockheed Martin led team, which includes General Dynamics and AMEC, has decades of collective experience in space-related programs, including sensors, mission processing, cataloging, orbital mechanics, net-centric communications and facilities.

One of Lockheed Martin's Space Fence infosites is located at ***http://www.lockheedmartin.com/us/products/space-fence.html***

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# DISPATCHES

## U.S.A.F.—SIXTY-FIFTH COMBAT AIR PATROL COMPLETED

*Airman First Class Ryder Luzadder, left, and Staff Sgt. Jose Feliciano look over technical orders for a ground control station May 28, 2014, at Creech Air Force Base, Nevada. The 432nd Aircraft Communications Maintenance Squadron is responsible for providing 24/7, 365-day maintenance support to the communication infrastructure that supports the wing's global remotely piloted aircraft operations. Ryder and Feliciano are communications technicians with the 432nd ACMS. (U.S. Air Force photo/Staff Sgt. Adawn Kelsey)*

**The Remotely Piloted Aircraft (RPA) enterprise reached new heights as the community pulled together to launch the 65th combat air patrol, or CAP, from Creech Air Force Base in Nevada on May 28th.**

Reaching 65 patrols by fiscal year 2013 was an initiative put in place by former Secretary of Defense Robert M. Gates on December 23, 2009.

The constant growth of patrols, from 33 in 2008 to 65 in 2014, is just one example of the untapped capabilities of the RPA platform and provides insight into where the future of the program can go.

"This feat illustrates the professionalism of our Airmen, and the hard work and dedication they have for the mission 24/7, 365 days a year, in order to ensure the safety of ground forces across the globe," said Col. James Cluff, the 432nd Wing and 432nd Air Expeditionary Wing commander.

Reaching this milestone means the RPA community has almost doubled the amount of assets available for intelligence gathering, while also safeguarding more deployed service members.

"This represents a series of extraordinary sacrifices by Airmen across the RPA enterprise," said Lt. Col. Cameron, the former 42nd Attack Squadron commander. "A few short years ago, many thought this goal was unattainable."

Each CAP covers a specific area of operations, requiring multiple aircraft and as many as 180 people, such as maintainers, communications experts, pilots, sensor operators, and intelligence Airmen, to operate successfully.

"I am able to provide constant vigilant support for the men and women (deployed overseas), said Capt. Andrew, an 18th Reconnaissance Squadron pilot. "We watch over them as they bed down for the night and make sure no threats are pushing them. It's a gratifying feeling."

The aircrew members who worked together to make the CAP possible were hand-picked by commanders from each unit that participated in the flight.

"I was honored to be selected for this goal-setting mission," said 1st Lt. Erick, a 62nd Expeditionary Reconnaissance Squadron pilot. "I think I speak for all 18X (Air Force Specialty Code prefix for RPA pilots) when I say that we are ready and willing to take on the responsibility of moving the RPA community forward, and this launch exemplifies that sentiment. We couldn't have accomplished our goal without the tireless work of maintainers, communications personnel, and all the other Airmen involved in this sortie, especially our 42nd Attack Squadron brothers and sisters back home."

Mission success on the communications side of the operation relies heavily on experienced, expertly trained personnel to ensure all systems are working correctly.

That capability is provided by the 432nd Aircraft Communications Maintenance Squadron, which is responsible for maintaining the ground control stations, or GCS, from which pilots and sensor operators fly RPA missions.

Airman 1st Class Ryder Luzadder, 432nd ACMS communications technician, was one of the Airmen who ensured the GCS was prepared and ready to fly the 65th patrol.

"If we don't do our job exactly, it could mean that the mission is canceled, or in a worst case scenario an aircraft could crash," Luzadder said. "It takes about one year of on-the-job training to be able to do any task that we are presented with. There are always new things that pop up all the time that you just don't expect. We're unique from other communications Airmen because we see the missions that are flying worldwide every day. We play a direct role in the effort to save lives."

Meeting the initiative was no easy task and was made possible by a whole-team effort across the board.

"This is a culmination of an Air Force-wide effort to achieve (former) Secretary of Defense (Robert M.) Gates' initiative of 65 combat air patrols," said Col. James Chittenden, 432nd Wing and 432nd AEW vice commander. "We are incredibly proud of the Airmen of the 432nd AEW and their critical service to our nation's security."

*Story by Staff Sgt. Adawn Kelsey, 432nd Wing/432nd Air Expeditionary Wing*

# DISPATCHES

## U.S. ARMY—COMMS FOR QLLEX

*A satellite transportable terminal set up by the 558th Signal Company sits behind the fuel farms (during the 2014 QLLEX), operationally controlled by 633rd Quartermaster Battalion. U.S. Army photo by Spc. Miguel Alvarez.*

**A satellite, trailers and tents all appear to be up in position, but for the 558th Signal Company the job isn't done until an Army flag is flying high.**

"We don't sleep until we're up and running," said 2nd Lt. Akilah Norman, a platoon leader for the 558th Signal Company, from Maineville, Ohio. Norman, a native of Forest City, Arkansas, said their mission is to provide functional communications equipment to the units involved in QLLEX.

The 558th SC is providing communications for the 2014 Quartermaster Liquid Logistics Exercise (QLLEX), operationally controlled by the 633rd Quartermaster Battalion here, June 5 to 19.

The work of the 558th SC makes communication between units more efficient and effective, said Norman. She said the units are equipped with radios that will allow them to communicate from one end of camp to another.

The units have SINCGARS radios that will work thanks to the satellite and computer equipment that the 558th SC has already prepared out in the field, said Norman. In addition to radio communication, the 558th SC will also provide phone and Army internal intranet access available during QLLEX.

Norman expects her unit to serve more than 1,100 service members, including Soldiers, Sailors and Marines. She said having her unit participate in this training provides other service members an opportunity to see how important the job of the 558th SC is out in the field.

QLLEX will also provide the 558th SC with valuable training, said Samuel H. Waters, a satellite and communications operator and maintainer for the 558th SC. Waters, a native of Indianapolis, Indiana, said QLLEX helps clarify what his role would be while deployed and is giving him the opportunity to become more familiar with his equipment.

Spc. Raymond Direito, a multi-channel transmission systems operator and maintainer with the 558th SC, said QLLEX gives the soldiers of the 558th SC a very relevant scenario. From his past experience deployed in Afghanistan, he said the work they are doing is the exact same type of work they will be expected to perform in an overseas setting. "We work very hard to prepare, but if you see us working after that, it usually means something needs fixing," he said.

*Story by Spc. Miguel Alvarez, 345th Mobile Public Affairs Detachment*

# DISPATCHES

## IRIDIUM—GETTING INTO THE U.S. ARMY'S NIE EVENT WITH NETT WARRIOR SYSTEM


**The "puck" like device supports Geo-fencing and allows for integration into the Nett Warrior system, facilitating global tracking of every soldier on the battlefield.**

The Iridium 9505A satellite phone is a proven work horse, significantly smaller, lighter and more resistant to water, dust and shock than the original Iridium 9500. Ideal for industrial or rugged conditions.

It is used in almost every country by government agencies, first responders, business people, and remote travelers alike. Iridium satellite phones are used by emergency personnel all over the world.

Iridium Communications Inc. has just announced the company's first-ever participation in the U.S. Army's Network Integration Evaluation (NIE) process.

Iridium is presenting a Position Location Information (PLI)-based tracking device, Enhanced Mobile Satellite System (EMSS) Beacon manufactured by NAL Research and exercised in the NIE "demo" category.

Designed to accelerate and improve the way communications technologies are delivered to soldiers, NIEs take place twice a year and are comprised of rigorous evaluations of new commercial technology.

The EMSS Beacons will be outfitted on a maneuver platoon to demonstrate the operational value and utility of near real-time position and location tracking of personnel and assets.

After years of in-service testing and operational use by other agencies, the PLI device has already demonstrated a high level of performance and reliability in similar environments.

Its small form factor and lightweight design make it ideal for the warfighter.

The "puck" like device supports Geo-fencing and allows for integration into the Nett Warrior system, facilitating global tracking of every soldier on the battlefield.

"The EMSS Beacon is designed to meet the size, weight and power requirements for the dismounted soldier and fills a need that has been around for more than 10 years," said Ngoc Hoang, President of NAL Research. "Our device provides a critical communications lifeline for soldiers on the battlefield, and only Iridium's network provides the truly global tracking capabilities that meet the military's needs."

"Our participation in the Army's Network Integration Evaluation process is with our partner, NAL Research. We're proposing to close a beyond-line-of-sight gap in the communications network by providing soldiers with a proven, affordable technology that will help keep them safe anywhere on the planet," said Ken Flowers, vice president, government solutions, Iridium.

"Iridium's longstanding relationship with the U.S. Department of Defense (DoD) makes the integration of this device extremely cost-effective, providing unlimited airtime to all users under our current EMSS contract's unlimited service terms."

In 2013, Iridium was awarded a $400 million multi-year fixed-price contract with the Defense Information Systems Agency (DISA) to provide satellite airtime services to meet the communications needs of the DoD and their federal partners.

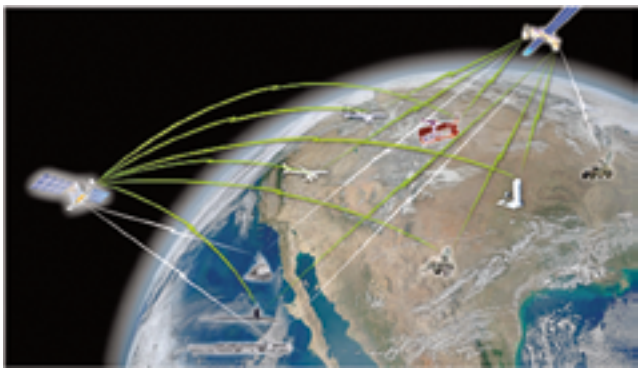
The five-year contract renewed the provision for delivering Enhanced Mobile Satellite Services (EMSS) airtime.

Iridium provides unlimited global secure and unsecure voice, low and high-speed data, paging and Distributed Tactical Communications Systems (DTCS) services for an unlimited number of DoD and other federal government subscribers.

Iridium delivers a portfolio of solutions for markets that require global communications. There is a major development program underway for its next-generation network—Iridium NEXT.

# DISPATCHES

## RAYTHEON—FIRMLY FIXED FUNDING



*The Advanced Extremely High Frequency (AEHF) satellites provide U.S. armed forces with greater bandwidth to reliably transmit battlefield data. Through the Family of Advanced Beyond Line of Sight Terminal (FAB-T) program, the Air Force is ensuring delivery of a fully functional Command Post Terminal for strategic and non-strategic nuclear command and control.*

**Raytheon Company has been awarded a $298,000,044 firm-fixed-price and cost-plus-fixed-fee modification for the Family of Advanced Beyond Line of Sight Terminals (FAB-T) Command Post Terminals (CPT) Production program.**

The Advanced Extremely High Frequency (AEHF) satellites provide U.S. armed forces with greater bandwidth to reliably transmit battlefield data.

Through the Family of Advanced Beyond Line of Sight Terminal (FAB-T) program, the Air Force is ensuring delivery of a fully functional Command Post Terminal for strategic and non-strategic nuclear command and control.

As a result of this down-select decision, low rate initial production, full rate production and interim contractor support contract options may be exercised to deliver FAB-T CPT-Only Terminals.

The Phase 2 production contract options for LRIP, FRP, and ICS may be exercised after completion of Milestone C.

Work will be performed in Marlborough, Massachusetts and Largo, Florida. Fiscal 2013 through 2019 aircraft and other procurement funds are programmed for this effort, with $31,274 being obligated at time of award.

Further information regarding Raytheon is accessible via ***http://www.raytheon.com/capabilities/c4isr/sat_comms/***

# GOOGLE'S SPACE EFFORTS: SOLID PLANS OR PIPE DREAMS?

*By Chris Forrester, Senior Contributor*

*Artistic rendition of all of the satellites currently on orbit around Earth. Image courtesy of te@chthought (http://www.teachthought.com/)*

***Editor's note***

*Chris Forrester has been, and continues to be, one of the leading senior contributors for SatNews publications. The recent rush of news from Google and industry analysts could well find this Silicon Valley company having an enormous impact on the satellite and space industries' commercial and MAG environs... should Google's efforts to enter these environs congeal successfully, that is. To that end, Chris presents his thoughts regarding Google's prospects...*

**The expectations of Google investing $1 to $3 billion in a huge constellation of LEO-orbiting broadband satellites (reported by various outlets to be between 180 or 360 in number) is definitely concerning for 'conventional' FSS and BSS satellite operators, as well as the new kids on the block, such as O3b, Inmarsat's Global Xpress® and Intelsat's Epic NG suite of satellites.**

Many—perhaps even most—of these players are looking to Ka-band to reach the 'unwired' portions of the planet which are far removed from the reach of conventional, terrestrial suppliers.

The facts are that Google sees satellites as a more reliable prospect than Helium balloons (Project Loon) or solar-powered drones. Google's boss Larry Page has hired Greg Wyler, who founded O3b, as its chief architect. Wyler has secured—says the Wall Street Journal—"between 10 to 20 engineers from Space Systems/Loral to work on the project, and these acquisitions include Brian Holz, who is currently the CTO at O3b Networks."


***Raven Aerostar has been working closely with Google in a pilot project called Project Loon that is designed to provide broadband, wireless Internet access to millions of people across the globe. This solution uses Raven Aerostar high altitude balloons. Image is courtesy of Raven Aerostar.***

Perhaps the likes of O3b, Global Xpress and Epic should be encouraged that Google's endorsement of satellite-delivered broadband is a further justification that their own business plans are sound. Certainly, those of us connected to the satellite industry should welcome this new well-funded player to 'raise all boats' in what is—as yet—still embryonic technology.

Everyone is aware that VSAT activity has a valued place in a satellite's product mix and business. While players such as ViaSat, Hughes and Paris-based Eutelsat's KA-SAT have all managed to develop decent business models, it has not been meteoric in nature.

A Google spokeswoman told the WSJ that the company is focused on bringing hundreds of millions of additional people online. "Internet connectivity significantly improves people's lives. Yet, two thirds of the world have no access at all," she said. She declined further comment to the newspaper. However, this sounds like a mirror image of the O3b mantra.

(For your contributor, it has been fun trawling back through the past, recognizing important names such as Tedesic, Craig McCaw, the old Iridium outfit, and a dozen of additional adventurous schemes). All had merit, other than the cost implications, which were truly massive.

Industry consultant and satellite watcher Roger Rusch, who runs TelAstra Inc., is typically blunt and forthright, saying Google's project will end up "costing far more than they can imagine today," he said, "perhaps as much as $20 billion. This is exactly the kind of pipe dream we have seen before."

Unsaid by Rausch is that the only difference between Google and its many predecessors are the exceptionally deep pockets available to the company for funding this project.

Indeed, other voices are more upbeat about Google's prospects. Jeremy Rose, of London-based consultancy Comsys, says it could represent a sea-change in how people obtain their broadband, and not just in the far-away, so-called, Third World jungles, but potentially in urban and suburban areas as well.

However, set against these comments there are also some hard facts to be digested. The first is that broadband-by-satellite has— to date—enjoyed only limited success. The wide open spaces of North America, and Australia have proven to be good for business, as ViaSat/Hughes and Echostar have certainly proven over North America, and Optus has demonstrated in Oz.

This is not to say that Europe cannot find satellite-based broadband success. The fact is that such simply hasn't happened yet, despite the best efforts of Eutelsat, SES and others. The likes of O3b (which in fairness is not targeting Europe) might have excellent success in its target markets, although such could be due as much from 3G cellular backhaul as from supplying broadband.

In other words, the jury remains out on Google's prospects for a Planet-encircling interweb offering. Believe me, I'd sign up in a nano-second if the service gave me an all-I-can-eat global service for a sensible price and one that was fed by a laptop-lid, receiver-transmitter.

Meanwhile, the industry will be watching to see how Google's concept translates into actual reality. O3b has stuck firmly with a B2B approach, with zero options for consumer connectivity. How will Google establish its satellite business model? Will the business depend on ISPs? Will it—goodness gracious—be 'free'?

***The next three years are going to be fun finding out what Google has up its spatial sleeves.***

***About the author***

*Senior Contributor Chris Forrester is a well-known broadcasting journalist and industry consultant. He reports on all aspects of the industry with special emphasis on content, the business of television and emerging applications. He founded Rapid TV News and has edited Interspace and its successor Inside Satellite TV since 1996. He also files for Advanced-Television.com. In November of 1998, Chris was appointed an Associate (professor) of the prestigious Adham Center for Television Journalism, part of the American University in Cairo (AUC), in recognition of his extensive coverage of the Arab media market.*

# COMMAND & CONTROL (C2): WHERE IT'S BEEN, WHERE IT'S GOING...

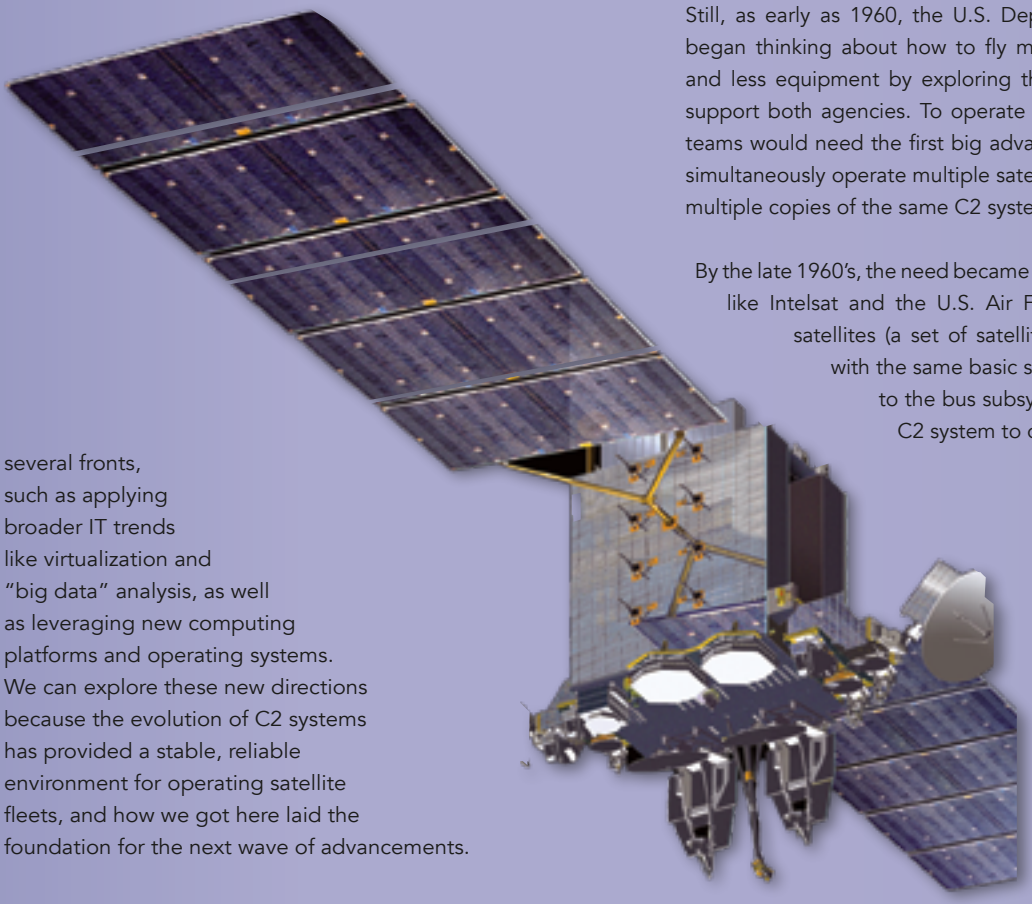
*By Stuart Daughtridge, Senior Vice President, Advanced Technology, Kratos Defense & Security Solutions*

**Few of us can watch that remarkable scene in the movie Apollo 13 and not get inspired when Gene Kranz (played by Ed Harris) declares, "Gentlemen, failure is not an option!" The drama is stirring; but while drama is great in movies, it's something nobody wants anywhere near satellites in the real world.**

Let's face it. Command & Control (C2) is not the most glamorous part of satellite missions. If it has one underlying principle, it is to avoid drama. C2's driving business question is: How can we reduce risk, while flying more satellites at lower cost? Emphasis on the reduced risk.

Satellite C2 is conservative because it is simply not worth taking chances with billions of dollars in infrastructure simply to achieve incremental benefits. However, it is also dynamic because it is the core system that unites all the ConOps elements: people, payload, vehicle, ground equipment and network.

Business and mission imperatives have driven consistent progress in C2 technology over time, and we have reached a point when significant advances are being made on several fronts, such as applying broader IT trends like virtualization and "big data" analysis, as well as leveraging new computing platforms and operating systems. We can explore these new directions because the evolution of C2 systems has provided a stable, reliable environment for operating satellite fleets, and how we got here laid the foundation for the next wave of advancements.



*C2 systems are entering a new stage in their evolution capitalizing on technologies to improve performance and reduce cost. The shift is possible because COTS-based products, like Epoch from Kratos, broke the historical chain that tied C2 to a satellite, enabling mixed fleets, such as the U.S. Air Force's CCS-C program which runs four constellations, including the AEHF (pictured left). Image courtesy of Lockheed Martin).*

### *Inventing C2: Creating A Stable Platform*

Historically, the primary challenge for C2 systems involved how to safely manage the growing number and diversity of satellites.

From the beginning, the original engineers in the 1950s were conceiving all elements of a satellite mission for the first time, and they designed the pieces together, inseparable from each other. The pattern was formed with the U.S. Air Force's policy decision to acquire a complete satellite system for the Advanced Reconnaissance System (ARS), using the name "Subsystem H" to refer to the ground segment. By the time of Discoverer 14 (the U.S.'s first successful retrieval of a satellite reconnaissance package), the Air Force Satellite Control Facility (AFSC) was supporting three military satellite programs, each "using a different combination of remote tracking stations with significantly different tracking equipment, personnel, performance quality, and methods of operation," according to David Arnold in Spying From Space.

For decades, custom C2 systems were the norm in government and commercial applications. They were usually developed by the manufacturer and delivered as a combined entity with the satellite. Still, as early as 1960, the U.S. Department of Defense and NASA began thinking about how to fly more satellites with fewer people and less equipment by exploring the possibility of a C2 system to support both agencies. To operate multiple satellites, however, ops teams would need the first big advancement in C2, the capability to simultaneously operate multiple satellites using a single C2 system or multiple copies of the same C2 system.

By the late 1960's, the need became more acute as large organizations like Intelsat and the U.S. Air Force started buying "series" of satellites (a set of satellites from the same manufacturer with the same basic specifications, particularly relating to the bus subsystems) and using the same basic C2 system to operate the entire series.

*Discoverer 14 was the first successful launch of the Corona spy satellite by the U.S. On September 20, 1960, the successful return of the satellite was managed via a mid-air capture. Photo is courtesy of the Smithsonian Institution's National Air and Space Museum.*

The next major step for C2 systems would be operating fleets of diverse satellites. In the late 1980s, NASA and Integral Systems (ISI), now Kratos ISI, worked together to build the Transportable Payload Operations Control Center (TPOCC), a system designed to simultaneously operate many satellites with different designs from different manufacturers. TPOCC was a leap forward, however, it was still a custom solution, built for and used by just one organization.

The greater impact came later, with ISI's creation of EPOCH, the first commercial off-the-shelf (COTS) satellite control product. This database-driven system broke the fixed satellite/C2 connection by accommodating each satellite's unique monitor and control requirements via common user interfaces and tools. Now, any operator could control a fleet of satellites of varying designs from different manufacturers, all from a single system or even a single workstation.

By eliminating the need for multiple C2 systems, EPOCH drove down the procurement and O&M costs by millions of dollars. It was the first of several products that would enter the market once the viability of a COTS approach had been proven. The timing could not have been better, coinciding as it did with the telecom boom of the late 1990s as both larger, established operators and smaller, new players increased the size and diversity of their fleets.

To cap it off, in 2001, the largest satellite operator at the time, the U.S. Air Force, applied the COTS model to its fleet with the Command and Control System-Consolidated (CCS-C) program. CCS-C replaced the custom system developed in the 1970s with an EPOCH-based solution that cost about half as much to operate and maintain, helped reduce staff levels by 75 percent and lowered sustainment costs by 85 percent. Today, CCS-C operates four constellations in a single consolidated system.

### *A Foundation For Future Growth*

The development of reliable, manufacturer-independent C2 systems marked the transition to a new stage in satellite C2 systems evolution by establishing a mature marketplace with core feature/function sets. As manufacturers introduce new satellites and new buses, proven C2 systems have established models for addressing each new platform they are asked to accommodate.

Similar to the evolution in cell phones, enterprise software, and other advanced technology markets, today the focus in C2 has shifted toward finding competitive differentiation that supports an operator's ability to address future business and mission drivers. Rather than one main thread of innovation, enhancements are being made along multiple paths that will help operators capitalize on the explosion of telecom and network services, advancements in communication technology and growing globalization. As always, the primary directive will be to enhance reliability, performance and efficiency while reducing cost and risk. The groundwork for most of these paths was laid during the early days of C2 development.

### *Big Data Return From A Little Integration*

From the start, the satellite industry has balanced the stovepiped technologies it employs with an overarching systems engineering approach that unified complex, specialized domains. C2 systems can be a hub for uniting these technical "spokes," especially as operators look for ways to maximize value. As a result, we'll continue to see efforts toward broader and deeper integration of key systems (or at least their data) to get a clearer picture of the internal and external forces affecting the satellite.

Satellite systems have always handled tremendous amounts of diverse kinds of information, so data integration is nothing new, however, sophisticated analytics capabilities to turn this data into actionable information are still fairly limited. For example, combining telemetry data with satellite RF behavior information can allow operators to more accurately trend the performance of a transponder and predict end of life for amplifiers and other key components.

Similarly, as teleport equipment failures can cause changes in satellite transponder telemetry data, setting up alarms in the Management and Control (M&C) system for correlation in the C2 system can save time and effort wasted chasing down false problems. And automatically applying the right analytics to information such as space weather data can help explain and predict some anomalous behaviors.

In addition, modern IT techniques can be employed to automate and increase the speed of archive data processing, applying advanced correlations to operating trends as well as detecting changes in operating parameters. Similarly, advanced analytics can be applied to telemetry data to characterize the satellite performance for diurnal

cycles, seasonal cycles and specific events. These mathematical characterizations can then be applied to identify non-nominal events faster and more accurately, allowing for immediate identification of changes in satellite performance for an early indication of a failing or impaired unit.

### *Streamlining Operations With Automation*

The potential benefits of automating operations were recognized early in satellite C2's evolution, from the time manufacturers first started addressing the challenge of flying multiple satellites simultaneously. Hughes (now Boeing), for example, developed a set of procedures early on that greatly simplified the operations of their 376 geostationary communications satellites and later models.

This seemingly small advance helped many new operators in countries around the world join the space club by enabling them to more confidently operate their first satellites. Automation features have progressed from command lists to procedure scripts to graphical procedures using flowchart-like displays.

Constantly pushed by its terrestrial competition to provide greater value, satellite C2 systems will continue to add automation facilities as one way to provide more innovative services at lower cost. This will include the automation of routine recurring operations and recovery from well known failure modes, such as closed loop operation of low thrust propulsion and rapid configuration of communications payloads, among others.

Still, automation can be viewed as the poster child for C2's risk/reward equation, so the safety and reliability of any automation improvement always has to be proven first. As noted, it's not worth risking a multi-hundred million dollar satellite for the chance at saving a few hundred thousand dollars in productivity. That's why today's automation features always allow a human in the loop who can be required to push the button before a key decision is made or command is sent.

The burgeoning small satellite market is one area paying increased attention to automation, in part because its less expensive satellites invert the risk/reward equation and make operations the more dominant cost factor. At Kratos, we are already seeing customers explore ConOps that range from partial to fully "lights out" missions as more small sats are launched.

### *Evolving IT Platforms + Architectures*

The satellite is not the only form of hardware that is driving C2 evolution, so is the ground equipment that hosts the systems. It's staggering to compare today's technology environment to that employed by the Vanguard mission in the 1950s, as described by Constance Green and Milton Lomask in *Project Vanguard: The NASA History,* in which information was sent from the tracking sites by teletype to the computing station in Washington, DC, and entered into an IBM-709 "electronic calculator," leased to the government for $900,000 for six weeks.

Since then, the satellite industry has benefited from parallel waves of computing evolution, progressing through the IT boom of the 1970s, the PC revolution of the 1980s and the Internet-enabled communications of today.

Advancements in processors, servers, ground equipment and network devices will continue to enable C2 innovation system as designers capitalize on improving power, performance and price. As always, it will be done cautiously, however.

Consider, for example, that at a time when many satellite operators have only relatively recently fully adopted the PC environment and integrated their C2 operations with applications like MS Office, a powerful new platform is taking the world by storm. Research firm BI Intelligence reports that the global per-capita rate of smart phone ownership beat that of PCs sometime in 2012 and tablets are not far behind. These devices are already being used for mobile and remote satellite monitoring and analytics applications, though using them more broadly to actually control satellites is likely some time off.

Virtualization is a related trend that is already having significant impact, not just in C2 systems, but across all of satellite operations. Here, the risk/reward balance is far clearer, with plenty of data available showing how virtual systems can reduce costs and improve reliability.

With virtual systems, all software can reside in a central processing center accessed via thin clients. This greatly reduces O&M costs by eliminating software on end user computers, lowering maintenance and support expenses and making systems upgrades far easier. Because systems can be run in the cloud on dedicated servers—whether a secure environment at the operator's facility or a third-party server farm—reliability can be increased through automated redundancy and the ability to easily add processing power as needed.

Some Kratos customers have already implemented fully virtualized facilities using VMware, Citrix and similar environments. Several use Kratos' Webic (a thin client specifically designed for satellite C2) in implementations ranging from telemetry and archive data monitoring and analysis up to a full C2 system user interface.

Beyond C2, virtualization is being applied in the satellite industry in remarkably innovative ways, from telemetry signal processing (historically a hardware-based function) to virtualizing antenna assets by separating the signal processing from the RF/antenna systems. What's more, by centralizing mission critical systems, virtualization helps address another important trend, physical security and cybersecurity.

### *Greater Emphasis On Security*

Back in 1969, the U.S. Air Force Satellite Control Facility added encryption and decryption technology in its new Space-Ground Link Subsystem (SGLS) in part to deter eavesdroppers. Today, pressure to enhance security will become an increasingly louder drumbeat, not just in the U.S., where satellites have been designated as "critical infrastructure" and are subject to new, more stringent cybersecurity requirements and government contracting regulations, but around the world as the global nature of the threat to government and commercial systems grows.


*Satellite C2 systems are capitalizing on new technologies to support anywhere access and common operational pictures (COP) across fleets, such as Kratos' Webic client.*


*The growth in small satellites is also driving new innovations in C2, including increased attention to fleet control and automation capabilities, such as those reflected in quantumCMD, the new COTS product from Kratos for small sats and small sat fleets. There's more info at* ***http://www.kratostts.com/page/quantumCMD***

Across the satellite industry, organizations have historically relied upon an "air gap" defense, assuming that walling off the satellite network kept it safe from cyber threats. Unfortunately, this approach creates a false sense of security. There have been several well-publicized examples demonstrating the weaknesses of such strategies, most notably the Stuxnet worm. More importantly, most operators must provide their engineers with external access to systems for operations and rapid response to problems, thus poking holes in their air gap.

To date there have only been a handful of publicly reported cyber attacks on satellites, such as the NASA Landsat and Terra command link hacking events. It's ironic, but in the security realm, our natural conservatism may leave us at greater risk if protection against cyber-related threats are not taken seriously enough until after the first truly calamitous event occurs. In the mean time, there is little doubt that cybersecurity and information assurance (IA) pressures will increase, affecting all systems including C2.

***Small Sats + Smart Sats: Laboratories For Experimentation***

Other exciting directions can be seen on the horizon, such as smart satellites that build more C2 functions for nominal and contingency operations directly onto the satellite. This is a trend that has been growing slowly for years as space-qualified processors have improved; and it will continue in order to reduce operating effort and in recovering from well-defined failure modes. It will also demand that operators adjust their processes and training procedures, however, to assure that the staff and the C2 system are equally ready for "***non***-well-defined" failures. An effective recovery process requires that users understand what failed (or at least what happened) on the satellite, as well as what automated onboard recovery the satellite will take.

Another fertile area that will have an impact on the industry are small sats, CubeSats and their nano, pico and related cousins. The packages may be smaller, but they demand much of the same functionality from C2 systems as their larger cousins, with some new twists and turns to go with them. Most prominently, they must provide the same level of robustness, reliability and security at much lower cost, both initial capital cost as well as supporting a much lower and more automated operations cost.

One of many reasons Kratos is investing in the small satellite community is that we believe it will become an exciting laboratory for innovation, including its ground equipment, networks, monitoring and C2 systems. While the cost of the satellites are still relatively high, they can be a fraction of those of traditional missions, and therefore carry a more balanced risk/reward equation relative to operations costs. Hopefully, this will enable more innovation and faster adoption of new techniques and technologies in areas such as automation, data analysis and virtualized operations.

Earlier this year Kratos introduced its new small satellite C2 product, quantumCMD, targeted specifically at the mission needs and price points of small satellite operators. We are also working on small satellite-friendly solutions in other areas, such as telemetry RF signal processing. The lessons learned in this space will allow the industry to perfect new techniques that can be proven with small sats, then safely migrated upstream to larger satellite operations.

***About the author***

*Stuart C. Daughtridge is Vice President of Advanced Technology at Kratos Defense & Security Solutions, where he has been instrumental in developing the company's full line of satellite communications products and services. He joined Kratos with its acquisition of Integral Systems in 2011. Previously, he held several management and engineering positions at Orion Satellite Corporation, Intelsat and Spacecom.*

# EUROCONSULT ANALYSIS: THE NEW ERA OF MILSATCOM

*By Stéphane Chenard (Senior Associate Consultant) + Richard Roithner (Director, SATCOM), Euroconsult*

**Several months of research led to the recent publication of Euroconsult's *Military Satellite Communications* report. This research allowed us to enter into an unprecedented review of the use of satellite communication services and networks by military forces, and the future drivers for satellite use.**

### *A Dramatic Increase In Satellite Use To Support Military Operations (MilOps) Over The Past Decade*

The military was relatively peripheral to the commercial satellite communications market until 2001, when the start of the war in Afghanistan promptly led to a record amount of commercial leases and to the establishment of dedicated subsidiaries by the largest operators. The first of a succession of special contracting vehicles by the U.S. Defense Information Systems Agency (DISA) was also initiated at that time.

*DoD photo by Staff Sgt. Samuel Bendet, U.S. Air Force.*

The DoD reported the total use of commercial fixed satellite capacity rose steadily from less than $100m million and 1,200MHz in 2000 to an estimated $655m million and approximately 8,500MHz in 2010.

Various statements by DoD and industry officials on the share of commercial leases in the DoD's total capacity (as opposed to that of traffic carried on its own satellites) reported that capacity increased regularly until about FY 2010, to a peak of approximately 80 percent across the entire enterprise and 96 percent of the capacity used in Iraq and Afghanistan. These figures appear to have returned to a lower level of 60 percent, due to the end of major conflicts and the launch of new DoD satellites.

### *A Transitional Phase*

Following the peak in traffic observed at the end of the last decade, several events and drivers are helping to reshape the market:

- *The withdrawal of troops from Afghanistan and the overall reduction of operations certainly represent major milestones. 2012 coincided with a reported decrease of capacity leased by several satellite operators.*

- *A new generation of military satellites reached orbit in the late 2000s. These systems do not address all demand, but having received many billions of dollars and being tailored to military needs, they tend to be preferred by military users. In the case of U.S. satellites, their high costs have encouraged the DoD to share its WGS and Advanced EHF satellites with over a half-dozen of its allies. Other countries, from Turkey to Brazil and Qatar to Japan, are finding ways to launch proprietary satellites or payloads.*

- *Overall, approximately 300,000 land terminals were owned by different military forces as of 2013. A large part of ground equipment deployed in the theaters was outdated, resulting in big inefficiencies in traffic management—large commissioning of new equipment has been reported. New equipment should have mixed effects. On one side, it should favor an optimization in transmissions and could reduce the capacity required. On the other side, new equipment should allow for higher data rate communications and bandwidth*

*hungry applications which involves a larger number of mobile units. It should also favor the use of new frequency bands, such as the Ka-band.*

While these items have tended to limit the use of commercial satellite capacity, other drivers should mitigate that trend and create opportunities in the coming years.

### *Smaller + More Centralized Ops*

While the last decade was marked by major conflicts in Iraq and Afghanistan, the last two years have seen a rise in local operations for shorter periods and in different theaters. Examples include NATO operations in Libya in 2011, French and UN operation in Mali in 2013 and EU military operation in Central African Republic in 2014. Small conflicts have multiple consequences:

- *Troop deployments of up to several thousand soldiers along with equipment can occur in a short time period, with an onsite presence of at least a year*
- *Strong focus is put on intelligence gathering, including the use of remote sensing satellites, including UAVs. The use of UAVs obviously depends on their availability for the involved troops*
- *Large mobility of deployed troops in large theaters, with operations spread across long distances. This adds pressure particularly on logistics and the autonomous decision capability of troops*

Compared to overall traffic of 5Gbps by 2017 over satellite in a peacetime situation, the advent of different, small conflicts involving the use of U.S. capabilities for at least part of them could boost global satellite usage to at least 8Gbps by 2017, or more than 10Gbps by the close of the decade.

### *UAVs—Important Drivers For Future Use*

While more than 75 countries now operate thousands of UAVs around the world, only a small fraction of the most sophisticated and expensive UAVs are relevant to satellite communications. The rest use line-of-sight radio links when the range of 200 to 500km is considered sufficient, or relay aircraft. Overall, a review of all known satellite-linked UAV systems leads to an aggregate of approximately 450 aircraft, including approximately 410 belonging to the U.S. DoD and other U.S. government agencies.

First used in combat over Bosnia in 1995, satellite-linked UAV operations became routine in Iraq in 2003. U.S. Air Force statistics indicate that ISR flights over Southwest Asia and the Middle East tripled during the 2010 to 2011 timeframe, during the "surge" of U.S. troops into Afghanistan. Their use peaked in late 2011 at an average of around 120 sorties per day, and then declined by approximately 40 percent through early 2013, stabilizing at around 85 sorties per day.

Deployments have clearly multiplied and diversified well beyond Iraq and Afghanistan, though without coming anywhere near the same scale as in those theaters. Assuming that patrols have not increased, the growth reported by the U.S. Air Force for total flight hours over FY 2012, set

against the decrease in total sorties in the Central Command area, suggests that only about 10 percent of its UAV missions occurred at that time in other parts of the world, such as Africa or East Asia.

UAVs have been the primary users of Ku-band capacity in recent years, essentially on commercial satellite systems. Several trends should have an impact on related use in the coming years.

The number of UAVs owned by the different military forces in the HALE (high altitude, long endurance) and MALE (medium altitude, long endurance) categories should increase. However, the level of use ( i.e., the number of flight hours that largely condition capacity needs) will depend on the intensity of military operations.

The further spread of UAVs across different theaters could follow the end of large scale operations in Afghanistan. This will remain partly conditioned by the availability of ground bases, as the management and maintenance of UAVs require significant personnel and infrastructure.

Along with continued growth in UAV inventories and sustained deployments, the key driver in their future satellite usage is expected to be more bandwidth-intensive payloads, primarily for wide-area surveillance and full motion video (FMV). The availability of sensors precision has initiated different upgrade programs and requirements. More accurate sensors should contribute to an improved efficiency of operations. A counterpart is that those sensors require higher data rates to transmit their imagery.

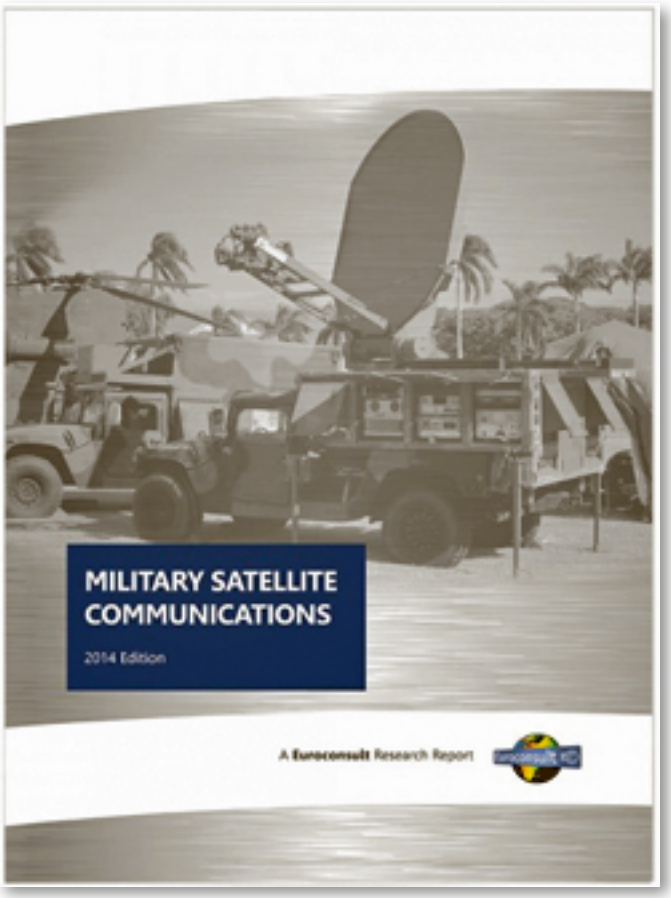
Limitations in future use are still significant. Beyond the cost of programs, the efficiency of UAVs and/or their relevance for different types of conflicts could partly limit investments as opposed to other types of military equipment.

### *Future Capacity Planning Requirements Remains The Challenge*

The planning of future satellite resources required for armed forces remains a challenge, largely dependent upon assumptions on the size and locations of potential future conflicts that remain largely unpredictable. Still, the review of usage patterns, and of equipment and troop capabilities, allows one to derive different scenarios and related satellite requirements.

We anticipate that the advent of multiple small conflicts could progressively drive use in the second part of the decade to 10Gbps, relatively close to the 2010-2012 usage levels. However, in the advent of a medium-sized conflict in the second part of the current decade, we estimate that total traffic over satellite could reach over 15Gbps—such could even stand at more than 30Gbps in case of a major conflict, which is up to three times the traffic of 2013. Such a case could, nevertheless, create tensions on the availability of satellite capacity, depending on the actual location of the conflict.

*Beyond Line of Sight solutions deployed worldwide for the military, disaster relief operations and intelligence agencies. Photo courtesy of Rockwell Collins*




### *About The Report*

*Military Satellite Communications is the essential planning and forecast tool for future military satellite requirements. The report provides a comprehensive bottom-up assessment of all relevant military satcom user markets, including land forces, naval forces, UAVs and manned aircraft. The report also includes a forecasting tool that allows users to instantaneously measure possible demand requirements and impacts of any future conflict scenario over the next ten years, while taking into account all key trends, drivers and limitations of military satellite communications. The direct link for additional information regarding this report is:* ***http://www.euroconsult-ec.com/shop/home/49-military-satellite-communications.html***

# SatFinder

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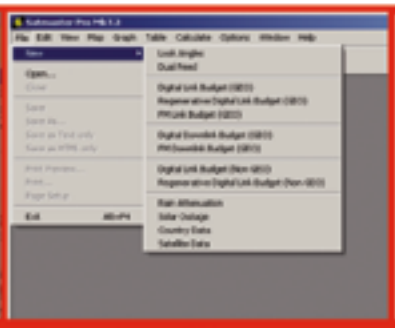


**http://www.satnews.com/satfinder**

# POV: A COMMERCIAL VIEW OF MISSION SUCCESS

*By Kay Sears, President, Intelsat General Corporation*

**Mission success is often defined as things going smoothly as planned, with no major upsets in achieving the desired outcome. For our customers, mission success is about the availability and reliability of the service they receive from Intelsat General.**

Across industry and government, we all strive for this kind of mission success. But in many ways, we in the commercial arena plan for it differently than our government counterparts.

Not unlike the U.S. Air Force or the National Reconnaissance Office (NRO), Intelsat is a major satellite system operator where affordability and mission success are critical to its viability as a commercial entity. Without affordability and mission success, our business would ultimately fail, either financially or technically. As with any enterprise, the competitive marketplace is our harshest critic, so we are constantly balancing affordability and mission success as we acquire, launch and operate our network.

Our 51 satellites, more than 140 gateways and teleports, and 36,000 miles of fiber give us diversity and resiliency. However, space is still a risky business and so we accept a small amount risk in our satellite and launch programs. Costs quickly become prohibitive in trying to retire that risk. Therefore, we anticipate failure scenarios and develop recovery plans. We have designed a network that can support anomalies through fleet planning, overlapping capabilities and acquisition tempo.

An example of the risk we take occurred in January 2013, when Intelsat had its first satellite launch failure in 15 years, after a Sea Launch rocket carrying the Intelsat-27 satellite veered off course and was destroyed. Within three weeks, we were able to reposition bandwidth and customers on neighboring satellites. We issued a new satellite contract within four months and that satellite will be launched in mid-2015. We did forego additional revenue for a few years, but no customers lost service. For Intelsat, mission success was defined as providing a highly reliable service to our customers, not the specific launch of IS-27.

In contrast, the U.S. government seeks more of a zero-risk strategy toward mission success. U.S. government space programs often involve complex satellites supporting multiple missions, all using just one type of launch vehicle, where failure would place unacceptable pressure on already fragile constellations.


*Coverage map of the Intelsat array of satellites.*

To prevent this, risk is often "bought down" on certain programs to a minuscule level by spending more on redundant designs, double- and triple-checking assemblies, and multiple back-up systems. This creates billion-dollar satellites and extremely expensive launch programs.

The cycle repeats itself. The push to eliminate risk drives costs up exponentially, yet risk is never completely eliminated. Mission assurance is often achieved by trading in on affordability. Is this a sustainable model in the current fiscal environment? And does this ultimately make the government satellite fleet more resilient?

Beyond the launch phase of a mission, Intelsat and other commercial companies look for other ways to reduce risk and maintain affordability. One key way that we increase mission and information assurance is the automation of our satellite operations. Over time, automation can create a more affordable process, but this has not been the reason for Intelsat to automate certain functions. Rather, we have automated operations to correct for human error and reduce time to resolve anomalies.

Currently, our flight operations are fully automated so that by using specific tools, we can fly 76 satellites with eight flight controllers because commands are planned, created and uploaded into a master scheduling system, and our controllers are there to monitor the fleet and to handle anomalies. Even our TT&C network has automation for "sensing" certain maneuvers and automatically commanding the spacecraft.

Many of our command-and-control (C2) stations are operated with no personnel and are "remoted" back to the operations center using a highly reliable, diverse network. Access to these assets and other operational capabilities are available to our controllers via the press of button.

Any measurement of "mission success" must include planning for failures and developing best practices over time that enable those plans to be affordable, responsive, and resilient to the risks associated with being a space operator.

There are lessons to draw from the commercial approach to mission success that would help the U.S. government better insert affordability and resiliency into its current space programs and architecture.

For further information, please visit ***http://www.intelsatgeneral.com/***

***Editor's note***

*This article has been repurposed from Intelsat General's "From The Top" newsletter, the May 2014 edition, with permission.*

***About the author***

*Kay Sears was named President of Intelsat General Corporation in 2008 and is responsible for the overall leadership of the organization, setting the strategic direction and managing all facets of the business. Ms. Sears joined Intelsat in 2006 when it acquired PanAmSat. With PanAmSat from 2004-06, she most recently served as Senior Vice President of Sales and Marketing. Prior to joining PanAmSat, Ms. Sears held senior management positions with Verestar, American Tower Corp. and COMSAT.*

*In 2009, Ms. Sears was appointed to the President's National Security Telecommunications Advisory Committee (NSTAC) to provide information, technical expertise, advice and guidance on issues affecting national security telecommunications capabilities. In 2011, she was named to the board of the Space Foundation, an international non-profit organization and the foremost industry advocate for all sectors of the space community.*

*Ms. Sears earned an MBA from George Washington University and a Bachelor of Science degree from the University of Richmond.*

# THE HPA CORNER: POLICY + LEGISLATION ENCOURAGE HOSTED PAYLOADS… SO, WHAT'S THE HOLD UP??

*By Nicole Robinson, Vice Chair, Hosted Payload Alliance + Corporate Vice President, SES Government Solutions*

**The time and cost benefits of commercially-hosted government payloads have been touted across the satellite industry for years, from payload and satellite manufacturers, to fleet owner/operators, system integrators, and even launch providers.**

In recent years, innovative industry and Government leaders working with the United States Air Force, the European Commission and the Australian Defense Force have provided governments around the world with example hosted payloads that have validated the value of this efficient means of leveraging industry and accessing space.

With experience under our belts, and government doctrine lending support to hosted payloads, the question remains: why aren't hosted payloads more commonplace? Why in an austere budgetary environment, is the U.S. Government finding it challenging to launch additional cost-saving hosted payload programs?

The U.S. National Space Policy explicitly directed the use of non-traditional options for the acquisition of space goods and services, and cites hosted payloads as one of these non-traditional options. In 2013, the Defense Business Board recommended that the DoD, "Continue hosted payload efforts and their ability to fill special needs in a short time frame." Within the FY14 National Defense Authorization Act, Congress directed the DoD to craft a Space Acquisition Strategy (Section 913) in which alternative business models are to be considered to access space capability—and specifically listed hosted payloads as one such model.

***This column's Question For HPA members***

*With such clear, strong encouragement coming from policymakers, Congressional leaders and senior DoD officials, what can be done to further connect the requirements, proposed solutions, acquisition models and budgets to foster an environment in which hosted payloads become an integral part of the various space mission architectures going forward?*

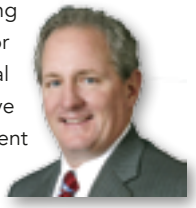
"It is incumbent on industry to bring forward fully priced business case analyses showing how the U.S. Government can leverage the highly competitive satellite bus market and significant commercial investments already being made in space infrastructure to procure more affordable, resilient and time-efficient space capabilities that government agencies can depend upon and adapt as mission needs evolve. By taking advantage of commercial hosting opportunities, U.S. Government can focus its efforts on procuring mission payloads that can be supported by commercial bus capabilities. This payload-focused acquisition strategy can create stable payload production rates, thereby stabilizing lower-tier suppliers and focusing development resources on maintaining intellectual capital needed for unique government capabilities."—***Dave Anhalt, Vice President + General Manager, Iridium PRIME***

"While the government has done much work to foster an environment conducive to commercially hosted payloads, there is still work to be done.

"Perhaps the greatest single challenge to mainstreaming commercially hosted payloads is the difficulty in establishing them as an integral part of system architectures. Though there is on-going work within several organizations in the USG, until hosting is viewed as an integral program component, and funded accordingly, hosting will be difficult and intermittent. The inability of the DoD to pre-commit funds for commercial integration of hosted payloads also remains problematic. Contained within the discretionary budget, payment for these services is subject to annual approval by Congress and pre-payment violates USG FAR procurement laws. As such, the return on investment for the commercial company owning the host asset is far from secure unless the costs are heavily recovered in the first year or two on orbit. Legislation to allow for changes to these rules may be necessary. Furthermore, the government acquisition cycle needs to adjust to allow for long-term procurement contracts to fully take advantage of the commercial industry's inherent cost savings, shorter time cycle to place payloads in orbit, and the disaggregated nature of commercial constellations."—***Skot Butler, Vice President, Satellite Networks & Space Services, Intelsat General***

"We must help the U.S. Government to transition from programs of record from the last decade to more resilient, disaggregated systems with smaller hosted payloads, more economical space vehicles, and commercial-like approaches to architecture, while keeping within the DoD budget. In order to accelerate the adoption of hosted payloads, we need to create an environment that enables contractors and government to work together. The National Space Policy provides the vehicle, but it is hampered by sub-policies and guidelines that inhibit contractors from providing commercial solutions cooperatively with the U.S. Government, because these sub-policies and guidelines create additional risks that a commercial contractor will not take. By eliminating these impediments, the government will benefit significantly through the use of commercially available services, and DoD budgets can be more efficiently allocated, since the outcome will result in costs savings of hundreds of millions of dollars."—***Jim Simpson, President, Boeing Satellite Systems, International Inc.***

"As illustrated by the author, policy, guidance and senior leader support is favorably emerging for new capability approaches, but hosted payloads have yet to be produced in significant quantities to satisfy government requirements. Why? Notably, the U.S. Government has yet to formally specify requirements for disaggregated systems and prove the affordability case. Though virtually all major military space systems designed and developed in the past decade are in production and sustainment phase, the U.S. Government has several mission area analyses of alternatives progressing that will inform their respective next generation systems. These on-going architecture assessments must ultimately determine the right mix of capabilities to satisfy requirements with the context of total system affordability. When fully analyzed with recent study data provided by commercial industry, I believe new mission capability approaches will prove favorable for hybrid constellations comprised of large single mission systems augmented by dispersed payloads on commercial spacecraft."—***Chuck Cynamon, Vice President, Business Development, SSL Federal***



"HPA members as a group are reaching out every day to all constituencies for hosted payloads, especially congressional members and military leaders. We have developed and are delivering consistent messages so that all audiences hear the same thing. And we deliver those constantly. The challenge is adding more value each time we meet with members of Congress, their staffs and those in the Defense Department. The upgraded HPA website is well on its way to helping further the hosted payloads discussion. We should support it with the right content and leverage it in our campaign as much as possible."—***Tim Frei, Vice President, Communication Systems, Northrop Grumman Aerospace Systems***

"Cost and schedule benefits of utilizing hosted payloads alone will not be sufficient to change the current acquisition practices of the U.S. Government. Current programs of record will need to run their course because often times it can cost more to terminate a program. However, the continuing decline of the defense budget will force defense planners to consider more cost effective and innovative options to meet the ever increasing demands of warfighters and other end users. Given the proof being provided by the many pathfinder programs like the Commercially Hosted InfraRed Payload (CHIRP) and the Australian Defense Force (ADF) Ultra High Frequency (UHF) hosted payload, the U.S. Government will recognize the benefits of harvesting the well-established and successful commercial enterprise to help meet their requirements. Hosted payloads will not work for all requirements but they will provide frequent access, on-time and on-budget, adding resilience to a mission architecture through diversity and redundant capability."—***Rich Pang, Senior Director, Hosted Payloads, SES Government Solutions***

***About the HPA (http://www.hostedpayloadalliance.org/)***

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


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

# NSR ANALYSIS: CIVIL GOVERNMENT SOFTENS MILSATCOM WOES

*By Jose Del Rosario, Research Director, NSR Manila*

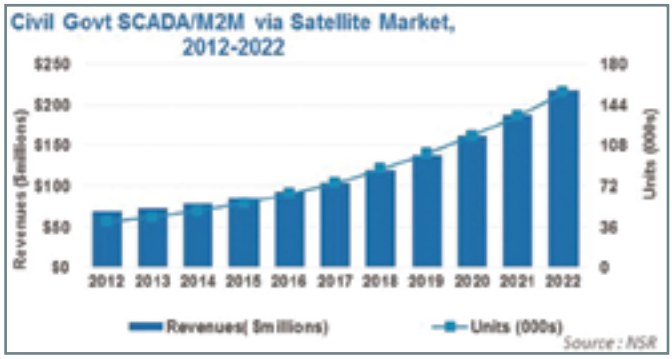
**With the reality of land mobile military demand decreasing due mainly to budget concerns as well as the effects of the Afghanistan drawdown, some recent deals may signal that civil government uptake could present tangible opportunities, thus softening the blow from milsatcom decline in most markets in the short/medium term.**

The string of notable deals includes:

- *A March 11, 2014, deal between Inmarsat and Hughes Network Systems to manufacture a new Low Profile BGAN terminal, which will equip police forces and other government departments around the world with a discreet communications terminal.*
- *A March 10, 2014, announcement that the Indonesian National Board for Disaster Management (BNPB) has chosen Ansur and Inmarsat to pre-deploy an emergency communications infrastructure, which will support the country's disaster response in the event of a natural catastrophe. The pre-emptive deployment will include two Unmanned Aerial Vehicles (UAV) with advanced cameras on-board and additional BGAN satellite communications equipment on the ground.*
- *A January 21, 2014, announcement by Thuraya that it has been selected by Badan SAR Nasional which is the National Search and Rescue Agency for the Republic of Indonesia to improve its search and rescue efforts in the country by installing a combination of Thuraya IP terminals.*
- *A February 20, 2014, announcement by Thuraya of a multi-year deal with Smart Communications of the Philippines to provide mobile satellite handsets and airtime services branded as SmartSAT to provide connectivity to first responders, relief workers and government agencies during disaster recovery operations.*

NSR has forecast in its recently released *Land Mobile & Handheld Satellite Markets* study that the Military/Government sector will lose market share in revenue terms over a 10-year period. However, the revenue share loss is nominal in terms of a market snapshot when 2012 and 2022 are compared.

In NSR's view, Military/Government will continue to be steady over time, driven by a variety of requirements on a number of fronts such as Police, First Responders, Disaster Preparedness, border patrols, drug interdiction, and many others that are under the domain of civil government missions. In the SCADA/M2M market segment, for instance, Civil Government demand in terms of installed units and revenue streams are expected to increase by double-digit CAGR levels within a 10-year timeframe.




Military demand will, of course, continue to dominate the revenue picture, but it is also the most vulnerable in terms of taking a market hit. As such, deals and initiatives on the civil government front will be important buffers to decreasing military spending, which is dominated widely by the U.S. Department of Defense. The deals previously outlined are worth noting, given that all are coming from agencies outside the U.S. Department of Defense (DoD) and come, as well, from the Asia Pacific region where the U.S. military pivot is slated to take place.

Moreover, and more importantly, even if the market share figures for the Mil/Gov sector compared to commercial markets are expected to decrease, the annual revenue changes or growth forecasts specific

to Mil/Gov are still expected to be positive. What this means is that the overall pie or the market base is increasing as a whole; however, commercial markets are growing slightly faster such that the overall market take or commercial market share edges the Mil/Gov sector by a few percentage points over a 10-year period.

The Mil/Gov sector has, is and will continue to be dominated by military spending, specifically by U.S. DoD procurement. However, requirements on the Civil Government front that are becoming as urgent as military peacekeeping missions include disaster preparedness, emergency communications and a host of other disaster mitigation steps and strategies, will lead to increased spending over time.

Military procurement—specifically for COTP—will continue to drive growth, but civil government spending similar to the recently announced deals can, and will, certainly help keep the market afloat until military budgets and macroeconomic factors start to become more favorable over time.

In NSR's view, it is tempting for players to give up, or perhaps re-focus, on other market verticals given the serious challenges in the Military front, which is understandable given the revenue picture over the past few years and prospects over the next two to three years. However, the re-focus should not altogether take away market players from fully tapping available opportunities in the Civil Government verticals that could eventually springboard to high market opportunities once Military budgets begin to stabilize and, perhaps, even increase.

It is encouraging to see that market players are not simply going through the motions of serving civil requirements by meeting the bare minimum in their market offers. On the contrary, re-packaging high-value military products, developing new offerings with R&D components, partnership schemes and value-added services are being developed to promote compelling platforms and services. The Military market is indeed currently a tenuous proposition, but it is prudent to target and engage in "market push" in the Civil Government vertical not just to buffer the military hit but to create new and substantial opportunities over the long term.

Information for this article was extracted from NSR's report: *Land Mobile & Handheld Satellite Markets*. (***http://www.nsr.com/***)

***About the author***

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

# THE SPACE SAFETY CULTURE IS NOW A COMPLEX DOMAIN

***By Lt. Col. Beth Kelley Horine, Air Force Safety Center Public Affairs***

**Space, long thought to be America's final frontier, has transformed over the past several decades into a complex domain the Air Force must operate in safely.**

Recent Hollywood productions depicting dangerous space events—hurtling space debris blowing satellites to bits; disconnected astronauts flying off into infinity—help show the risk, albeit exaggerated, of operating safely in space.

History has proven the dangers of space and launch operations with examples of failed missile launches, exploding rockets on the launch pad, two Space Shuttle mishaps, and even a 'mid-air' collision in space. Today, these tragedies and accidents emphasize the need to develop and mature a safety culture for Airmen operating in the space domain.

According to the Air Force's top safety chief, space safety continues to grow as a vital industry among space professionals worldwide. A newly-defined mission set within Air Force safety circles, the Space Safety Division (SES) at the Air Force Safety Center, recently obtained full authority to develop space safety policy, guidance and initiatives to help prevent Air Force space mishaps.

"The Space Safety Division was designed to help promote and emphasize space safety program development," said Maj. Gen. Kurt Neubauer, chief of Air Force safety and the Air Force Safety Center commander. "Understanding space safety's impact and the role it plays in the international space industry, U.S. national defense, and global space management is crucial for safe Air Force space operations."

Drawing parallels to flight, ground, and weapons safety programs, SES seeks opportunities to improve space situational awareness, or SSA. Improved SSA can, in turn, potentially mitigate the risk of future mishaps. According to Mark Glissman, SES director-space hazard mitigation, explained that has SSA a safety focus and offers unique challenges to Air Force operations, as space is a shared, global domain requiring international collaboration and management.

"Air Force space safety development requires extensive coordination across other government agencies, non-government agencies and the international space community," Glissman said. "SES is the launch button to facilitate the Air Force's space safety role and help develop a space safety culture."

"Even amidst budgetary uncertainty and sequestration, space safety is a vital strategic program requiring continued growth and development to increase SSA and mitigate risks of space mishaps," Glissman added. "There is a need to communicate and advocate for the development, funding and growth of space safety initiatives, priorities and policy."

The Space Safety Division didn't form overnight. In 2001, the U.S. Congress's National Commission on Space concluded the security and well-being of the U.S., its allies and friends depend on the nation's ability to operate in space. To ensure continued U.S. space leadership and ability to meet future threats, the Commission made several recommendations for the administration, Department of Defense and Air Force to reflect the growing importance of space.

In response, the Air Force released a directive with a requirement for the Air Force chief of safety to review, coordinate, and approve all new space safety-related policy documents to ensure adherence to international treaties and Department of Defense and Air Force space safety policy.

"Combined with the Commission's recommendations, this directive not only outlined the mind-set that safety should be normalized into U.S. Air Force space operations to the same degree and commitment as Air Force flying, ground, and weapons safety, but also planted the seed for a Space Safety Division equal to the other established Air Force Safety Center divisions," Glissman said.

Today, where there once was little, if any, policy language regarding space safety, it's evident space safety is fully incorporated into Headquarters Air Force directives with flight, munitions, nuclear, and ground, Glissman added.

"Our HAF Mission Directive 1-46 makes our SES mission clear: 'Formation of space safety policy, the execution of plans, and the establishment of programs to implement Air Force safety policies and plans.' In layman's terms, we provide instructions for field-level programs and feedback on mishap prevention effectiveness of efforts," Glissman explained.

As SES becomes more integrated with the Air Force safety enterprise and the international space community, new programs to provide improved SSA to Air Force operations are on the horizon.

"For example, by trending existing space debris data we may be able to use that information to reduce future mishaps, either by adjusting space asset maneuvers, improving fuel planning, or increasing payload lifecycles," explained Lt. Col. Baron Greenhouse, SES deputy director.

"This could help prevent potential issues for Air Force assets in highly congested areas," Greenhouse added.

Similar to the Air Force's Bird/Wildlife Aircraft Strike Hazard, or BASH, program that strives to mitigate the impact of wildlife on air operations, or similar to current proactive safety programs, which take aerial hazard reports from aviators to develop a better situational site picture of the airspace, SES plans to work toward space-related mitigation and/or situational site programs for space operators in the future.

"We have most of the required data, but we are still maturing the safety culture in our Air Force space community," Greenhouse said. "We must continue to focus on incorporating the safety mindset into Air Force space personnel as much as it is present in our flight, ground and weapons communities."

Is space truly the final frontier for the safety industry? Some point toward the cyberspace domain as the next arena to explore safety applications and development. For now, SES will focus on space safety development for the next generation of Airmen.