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# MILSATMAGAZINE

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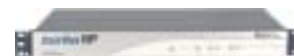
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We are all mostly aware the world was altered forever on October 4<sup>th</sup>, 1957, as the first satellite to orbit the earth, Sputnik, was tracked by the only radio telescope in the world at that time—the University of Manchester's Jodrell Bank Observatory in the United Kingdom. Sputnik opened new worlds and vista. The satellite initially created fear and panic in the western world. A rush to invest and invent new technologies to create a more secure world and, hopefully, a better life for all of Earth's citizens followed the initial impetus of alarmism.

During the 50 years since Sputnik gained orbit, many goals have been met; others have succumbed to failure. Yet the indomitable human spirit continues to forge onwards and upwards. Today we have a global satcom industry filled with promise and reward.

We owe a debt of gratitude to our warfighters: Army, Navy, U.S. Air Force, Marines, Coast Guard as well as to those who fight the good fight while remaining "invisible". Regardless of personal opinions regarding conflicts throughout the world, the military constantly place themselves in harm's way to ensure stability through strength, order from havoc. Non-com or officer, advisor or civilian contractor, the armed forces apply the technologies our industries create and sacrifice their very lives to ensure our freedoms. Thanks to the many leaders, companies, scientists and academicians who are involved in the military satcom and equally important ancillary businesses, our industry is able to offer the armed forces the advanced tools and equipment necessary for them to become more effective each day.

Sputnik was truly a momentous event... such as is this issue of Milsat Magazine, our first printed version of the publication. This issue will be distributed at MILCOM 2007 in Orlando, Florida that convenes toward the end of the month. I hope all will find the contents to be of interest and helpful.

Our lead story, *Taking Customization to the Next Level... The Iraqi Connection* is authored by Marc LeGare, the CEO of Proac-

tive Communications, and is a first-hand account of communication implementation working directly with the Iraqi Ministry of the Interior. *Sword From The Heavens* by our Asian Editor, Peter I. Galace, digs into the role of satellites in the Middle East. Our former Managing Editor, Virgil Labrador, interviews the Senior Vice President, Marketing and Business Development of Intelsat General, Ms. Kay Sears.

*Bruno Dapas* tackles the world of Commercial Off-the-Shelf products while *David Mulholland* examines the present and future of military satcom capabilities in Europe with *The European Dilemma—Communications Cost Versus Tactical Needs*. The Director of DoD Systems with Raytheon Company's Space Systems for Intelligence and Information Systems division, Mr. *Robert N. Canty*, is interviewed. *Nick Yuran* discusses satellite acceleration technologies and *Martin Jarrold* with GVF, offers a preview of an upcoming MilSatCom Conference.

Your antenna system is not going to do anyone much good if its "down". Author *Tony Castronova* presents some ideas on how to secure this critical equipment. In closing, some of the latest military satcom news is for your desert.

Any interest in writing for future issues of MilsatMagazine or SatMagazine is warmly welcomed. Simply email me at [Hartley@satnews.com](mailto:Hartley@satnews.com) to discuss your ideas and thoughts. And for all of the missions, the hard work, the dangerous environments, the thankless tasks the warfighters take on for us, a simple thank you is a true expression of my respect and admiration for your ongoing, momentous efforts. I am certain our readers heartily agree!



Hartley Lesser, Editorial Director for Satnews. He is responsible for all Satnews editorial activity worldwide including SatMagazine,

MilsatMagazine, and Satnews.com's daily and weekly offerings. Hartley brings 20 years of experience as a senior technology writer, editor, videographer and publisher to SatNews Publishers.

## MILCOM 2007

*the Free World's premier military communications conference*



Melbourne, Florida-based **Harris Corporation** is hosting **MILCOM 2007**, one of the largest government/industry conferences in the world, at the end of October in Orlando. Co-sponsored by the **Armed Forces Communications and Electronics Association (AFCEA) International** and the **Institute of Electrical and Electronics Engineers (IEEE) Communications Society**, MILCOM celebrates its 26th anniversary as the premier international conference for military communications. The **Defense Information Systems Agency** is the military advisor for the conference.

The conference and exposition occurs from October 29 – 31 at the **Gaylord Palms Resort and Convention Center**. From sun-filled beaches to the Kennedy Space Center, as well as the greatest theme parks in the world, the Orlando area offers an exciting array of activities to enjoy before and after the conference.

MILCOM is the premier technical communications, information and networking event and draws attendance from government agencies, contractors, commercial sector, our allies, and leading educational institutions. The conference includes classified and unclassified sessions, panel discussions, and tutorials focused on strategies, technologies and processes for developing and enhancing cutting-edge military communications.

With a conference theme of *Interoperability: Policy to Performance*, this year's event showcases nearly 100 technical sessions, panels, workshops and tutorials focused on current issues regarding military communications, including:

- Meeting the Warfighter's Interoperability Requirements
- Homeland Security and Disaster Recovery Interoperability Challenges
- Industry Perspectives on Interoperability and Information Assurance Within Federal, State and Local Civil Agencies
- Coalition and Joint Interoperability: Solving the Policy, Technical, Procedural and Operational Issues.

Authors will present more than 600 papers as part of the conference's technical sessions, with a focus on interoperability, service-oriented architectures, advanced communications, network management, mobile and wireless communications, radio systems and technologies, net-centric systems and technologies, and many other advanced communications and electronics topics.

The conference brings together some of the world's brightest technical experts and government/industry leaders. Confirmed speakers and panel members include:

- LTG *Keith Alexander*, USA, Director, NSA

- BG *George Allen*, USMC, Director for Command, Control, Communications and Computers and CIO, USMC
- Mr. *Vernon Bettencourt*, Acting Chief Information Officer/G-6, U.S. Army
- VADM *Nancy Brown*, USN, J6, The Joint Staff
- The Honorable *Jeb Bush*, Former Governor of Florida
- RADM *Kendall Card*, USN, Director, Command Control Systems, J6, NORAD/US NORTHCOM
- GEN *Kevin Chilton*, USAF, Commander, Air Force Space Command
- LTG *Charles Croom, Jr.*, USAF, Director, DISA
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- MG *Barbara Fast*, USA, Deputy Director and Chief of Staff, Army Capabilities Integration Center
- The Honorable *John Grimes*, Assistant Secretary of Defense for Networks and Information Integration and Department of Defense CIO
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- MG *William Rajczak*, USAF, Deputy Director, Joint Capability Development, US JFCOM
- RADM *Victor See, Jr.*, USN, PEO Space Systems, Director, Communications Systems Acquisition and Operations Directorate, NRO

**MILCOM** draws decision makers from government, military, academia and industry, including the heads of multi-national forces that influence key technology investments for their agencies and organizations. Attendees have the opportunity to interact with leading communications subject matter experts regarding the latest in technology advancements.

The conference also features more than 250 military communications industry exhibitors who will showcase new technologies and promote state-of-the-art products and services that provide existing and potential customers with solutions to mission-critical challenges.

Attendees will want to network with their peers in the relaxed environment offered at two evening social events. On Monday, start your visit to the exhibit hall and join fellow conference attendees for an exciting evening at the largest **Hard Rock Live** venue in the world! Truly this will be a memorable evening with plenty of food, fun, drinks, and entertainment by the world-famous *Beach Boys*. During Tuesday's **Chairman's Awards Banquet**, dine with new acquaintances and familiar friends and associates and take part in a special tribute to our military – past and present.

Conference details and registration are available at:  
<http://www.milcom.org>

# COVER STORY

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## TAKING CUSTOMIZATION TO THE NEXT LEVEL...

### *The Iraqi Connection*

by Marc LeGare, CEO of Proactive Communications, Inc.

As a former Army Battalion Commander, I've had to navigate through my share of complex logistical environments. Now as the CEO of satellite communications provider **Proactive Communications, Inc.** (PCI), my military experience is being put to

the test with our work in Iraq. Holding the distinction as the first US IT company working directly with the **Iraqi Ministry of the Interior (MOI)** doesn't come without its challenges! As with any advanced technology deployment, customization has played a critical role in our success installing and operating the world's largest secure satellite VoIP network, which connects nearly 6,000 Iraqi police, commandos, customs officials, and command centers across the country.



*Jon Sintel, PCI Engineer, handling the installation in Bagram, Iraq*

To be successful doing business in Iraq, PCI had to have a keen understanding of the country, the culture, the Iraqi security forces, and the US military's role; as well as offering a tremendous value proposition. Not only did we work closely with the US military on its Iraq satellite communications to gain experience on the ground, but we also went the extra mile by stationing permanent personnel in Iraq (including extended duty by our executive team). We hired Iraqis for key posts in our Baghdad office, and started an equipment installation company that is now completely comprised of, and run by, Iraqis. These good business and good faith steps were critical in convincing the Iraqi MOI to sign its first contract with a US IT company.

The term "value proposition" takes on a new meaning in Iraq. In Western business operations, the value proposition differentiates an offering from competi-

tors. In Iraq, the network operations had to withstand wildly fluctuating power, a wide range of user skill levels, the language barrier, and support complexity. Low price, superior past performance and a sound technology does not assure a foreign IT company of winning a deal with the Iraqi government.

PCI needed years to demonstrate we were partners focused on the success of the Iraqi government, while funded by the US. Once the decision was made to transition contracts and technologies to the Iraqi MOI, a new level of understanding had to be reached.

One of the first steps we took was to ensure we had direct communication with the MOI program manager, a cordial and forthright officer attempting to support the government in a very difficult situation. PCI deployed a video teleconference suite to his office to connect him with the PCI complex in Baghdad and our corporate offices in Texas. Although there have been differences in opinion, language limitations, and political hurdles, video conferencing has enabled us to meet face-to-face and work through these issues by appreciating each other's perspective and communicating honestly about what's best for the personnel in the field.

The second step was to understand the MOI's general philosophy of the "agreement." The MOI team viewed the contract as a *framework* of agreement, subject to interpretation. This was in contrast to the US interpretation of a contract as the acceptable *standards* for an engagement. There has been a dynamic dialogue on what the network requires and what can be performed, based on the agreed upon price.

While "customization" tends to refer to integration with other technologies in a network and user interfaces targeted for a specific company or industry, PCI has taken the concept to the next level in our Iraqi deployment. We have certainly worked hard to ensure the PCI satellite VoIP solution seamlessly interoperates with hardware from companies such as Cisco and Dell, but that's just the tip of the iceberg (or sand dune, in this case).

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True business success in places such as Iraq requires a commitment that starts years before the actual engagement with the local government. In this scenario, PCI provided satellite communications for the US military in Iraq for more than two years. This established trust with US officials and got our foot in the door to build a relationship with the Iraqi MOI.

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*Ali Installing IC2N Site in Baghdad*

In order to further enhance the trust of the Iraq government, PCI actually created a separate company in which we have no financial stake. We trained the employees and continue to subcontract work to the company to this day. Also, we're proud to say that half of our own employees in Baghdad are Iraqis. This is not only an important good will gesture, but also good business as it gives us Arabic-speaking personnel with insights into local customs and business climates. Based on our success with the US military and our local relationships, the Iraqi MOI was convinced it was in *their* own interest to do business with PCI to support their critical communications needs.

Then came the task of actually maintaining and operating a satellite VoIP network, in an environment where downtime and security breaches are, quite literally, a matter of life and death. One of the first tasks was to develop a sound training program for our Iraqi co-laborers, which accounted for wide degrees of skill levels and focus on installation of very specific equipment sets. The training was built around a group of discrete tasks resulting in the commissioning of a ground VSAT terminal and the deployment of a computer/VOIP LAN. This program took two months and then proceeded on to a series of supervised installations, culminating with a "solo" install.

Another aspect of customization dealt with the size of the network. In some cases, the OEM equipment was not designed to handle the scale of our Iraq WAN deployment. In one case, when we approached an OEM regarding their High Assurance Internet Protocol Encryptor (HAiPE), they were surprised to learn that we had expanded its usage far beyond their large-scale customers. This began a series of productive discussions where the OEM got first-hand accounts and performance metrics from PCI and we received customized firmware and software that vastly increased

the amount of meshed tunnels the network could handle. The network can now support a fully meshed, secure voice network of more than 200 nodes, with latency at 650ms, and achieve toll quality voice connections. Additionally, the software can now monitor these tunnels much better as a result of the dialogue between PCI and the OEM.

A third aspect encompassed our equipment deployment processes. As the network grew, the security features increased in complexity. Rather than solving the technical issues that could arise from field environmental conditions (such as poor power), we revised our test and integration procedures. We currently test the security features at a safe and secure location with solid power generation capabilities and multiple layers of supervision that can rapidly solve technical problems. We then ship the equipment and perform a very simple, but important, remote procedure to finalize the security functions. This creates a faster install with less chance of complex troubleshooting in what could be a very dangerous location.

We have encountered a number of unique challenges in setting up and operating a secure satellite VoIP network in Iraq, including security concerns, technological limitations and cultural considerations. PCI has "customized" its solution and business practices on a number of fronts to operate effectively and respectfully in the country. We take great pride in addressing challenges head-on by working through issues directly with Iraqi officials and going out into the field to personally handle any technical support issues that arise. No amount of technology customization will ever take the place of hands-on customer service in terms of establishing trust, especially in a location such as Iraq. ■



Mr. Marc LeGare became CEO of Proactive Communications, Inc. (PCI) in 2006, after serving as the company's Chief Operating Officer and Operations Manager since 2003. Prior to joining PCI, Mr. LeGare was Senior Consultant and Operations Manager for Force XXI Battle Command Brigade of TRW/Northrop-Grumman. From 1981 to 1999, Mr. LeGare served various command and staff positions for the US Army worldwide, including Battalion Commander from 1999 to 2001. LeGare earned a B.S. from the United States Military Academy, West Point, a Master of Science from the Air Force Institute of Technology and a Master of Military Arts and Sciences from the School of Advanced Military Studies.

Proactive Communications offers satellite communications, enterprise services, IT consulting and field support services. More information on the company and their services may be obtained by accessing their website, <http://www.proactivecommo.com/default2.asp>

## SWORD FROM THE HEAVENS

### *Satellites in the Middle East*

by Peter I. Galace

The Middle East is definitely a more dangerous place these days and, depending upon your point of view, satellites have played key roles in either creating this dangerous instability, or in preventing a nuclear war from breaking out.

Consider the following:

- Unconfirmed, but persistent, reports state eight Israeli fighter bombers launched a night attack on a nuclear facility inside Syria on September 5th to prevent the processing of weapons grade plutonium supplied to Syria by North Korea and destined for Iran. Such a night attack could only have been possible with the aid of GPS (Global Positioning System) and GPS guided bombs. U.S. satellites probably confirmed the location of the Syrian nuclear facility that was producing the material for nuclear weapons. Neither Israel or the United States confirm, or denies, the attack or other involvement.
- In a rare show of technological braggadocio, Iran claims to be using “highly advanced satellite technology” to monitor U.S. troop movements in neighboring Iraq. Iran has only one in-orbit spy satellite (the 170kg Sina-1 launched by Russia in 2005 and ostensibly an earth resources satellite), but this carries two low-resolution cameras. This means Iran must be using the satellite of a third party provider, perhaps Russia or commercially available satellite imagery, to spy on U.S. forces in Iraq, and probably provide intelligence to Iraqi insurgents.
- Israel will launch its Polaris/TechSAR satellite soon, its most advanced radar imaging spy satellite, to keep tabs on Iran and its nuclear facilities. Israel orbited an advanced photoreconnaissance satellite, Ofeq-7, only last June to spy on Iran and Syria. India will launch the Polaris/TechSAR satellite on one of its PSLVs (Polar Satellite Launch Vehicles).
- Saudi Arabia has acquired satellite guided, U.S.-made JDAM (Joint Direct Attack Munition) guidance kits that transform iron or “dumb” bombs into smart bombs, thanks to GPS guidance. JDAM bombs can weigh from 500 to 2000 lbs. Saudi Arabia is the only Middle East country other than Israel that carries JDAM smart bombs in its arsenal. Pakistan and Egypt have pending requests for JDAMs. Satellite guided JDAMs have an accuracy, as measured by circular error probability (CEP), of 13 meters or less.



*TechSAR is the first Israeli Synthetic Aperture Radar technology demo satellite*

- The U.S.-made “Excalibur” 155mm GPS guided artillery round deployed to Iraq assassinated Abu Jurah, a top al-Qa-eda leader, who was meeting other terrorists in a building south of Baghdad. Two Excalibur rounds took out Jurah and 14 others last July. It was the first publicized success for Excalibur, the world’s first satellite guided artillery shell to be used in combat. Excalibur, fired from the new U.S. M777 howitzer, has a CEP of six meters and a range of 30 km.

### *More Israeli satellites*

By offering a “god’s-eye view” of surface activity day or night, in good weather or bad, today’s military satellites provide real-time intelligence that tends to prolong peace in a region as explosive as the Middle East.

As the rumored raid by Israel into Syria has shown, satellites might just have helped snuff out the threat of a nuclear war by depriving Iran of weapons grade plutonium necessary in manufacturing nuclear weapons.

Israel today counts on two-photoreconnaissance satellite to stand watch over its neighbors, Iran and Syria, as well as “watch” other points of interest in the Middle East.

Partnering the recently launched Ofeq-7 is Ofeq-5. The Ofeq vehicles are high-resolution imaging satellites used solely for military intelligence. The 300 kg Ofeq-7 went into orbit last June to fill the gap in the coverage of distant high-priority areas in the Middle East including Iran.

Israel then intends to loft Amos-3, its third military communications satellite, later this year. Following the launch of Polaris/TechSAR comes Ofeq-8, a new type of satellite. The Amos-4 communications satellite is also up for launch.

The next generation Israeli spy satellites (starting with Ofeq-8) will carry new high-resolution cameras that feature greatly improved imaging without significantly increasing the weight of the spacecraft. It will employ PAN (panchromatic) and MS imaging cameras and PAN-sharpening functions.

The use of Israel’s homegrown Shavit launch vehicle to launch Ofeq-7 also has greater significance: it was a signal to Iran that its entire territory was within the range of Shavit, which is a nuclear capable ballistic missile in its military configuration.

Preceding the Ofeq-7 launch were three successful launches in February and March, kept under wraps by a news blackout. Russia



*Israel’s Ofeq-7 satellite launches on the Shavit booster*

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is said to have reacted to these secret Israeli spy satellites by orbiting a new Cosmos spy satellite to keep closer watch on Israel.

Israel stepped up its satellite spying following a Knesset report that confirmed the vital contribution of satellite imagery to reliable intelligence. The parliamentary report included a recommendation to expedite Israel's espionage satellite development "as a long-term visual intelligence infrastructure in the regional strategic balance".

Iran is a leading target for Israel's enhanced satellite spying campaign. Israeli analysts said Israeli military intelligence places the highest priority on the detailed monitoring of Iranian efforts to obtain nuclear, chemical and biological weapons, and the development of long-range weapons delivery systems such as the Iris launch vehicle.

High-resolution satellite imagery has become one of Israel's major intelligence assets, hence the appearance of Ofeq-7, Ofeq-8, Polaris/TechSAR and Amos-3 and -4.

Some of the technologies used by Israeli spy satellites include multi-spectral (MS) imagery, which captures images in different wavelengths, including color. Analysis of images at different wavelengths can reveal the presence of hidden objects.

## *Dual use satellites*

Described by some military analysts as spy satellites, the two in-orbit Israeli Eros satellites—Eros A and Eros B—are owned and operated by the Israeli company, ImageSat International. These "dual use" satellites complement Israeli military satellites in keeping watch on the Middle East.

Eros A carries a high-resolution camera capable of discerning objects 1.8 meters across while the newer Eros B can identify objects 70 centimeters across and is now used to monitor Iran's nuclear program. Each of the satellites passes over Israel and neighboring states four times a day.



*This hires space camera is installed in the Eros A satellite and is thought to be similar to the one used in the Ofeq 3 payload... this camera offers finer resolution via an advanced sensor.*

Eros A has a planned lifespan of 10 years in orbit and is scheduled to remain in service until 2010, when it will be replaced by the more advanced Eros C.

## *Smaller and better*

Israel also intends to upgrade the quality of its future spy satellites by taking the lead in developing what are considered the next generation nanosatellites (10 kg) and microsatellites (100 kg).

These new satellites will be launched from specially configured Israeli jets in much the same way air-to-air missiles are launched. Scientists at Rafael and Israel's Armament Development Authority are examining technology to upgrade existing missiles with more powerful engines and install microsatellites in their noses. Israel expects to have these small satellites available by 2008, but first for civilian use. Israel's defense industry will build these small satellites.

The increasing popularity of miniaturized satellites corresponds to a U.S. new strategic concept, the "Operationally Responsive Space" initiative. This plan attempts to give the U.S. the ability to quickly launch appropriately configured satellites in a matter of months instead of years, as is the norm today, in response to an emergency situation. Hence the U.S. interest in Polaris/TechSAR, which is a small satellite weighing just 360kg.

Israel Aerospace Industries (IAI), builder of TechSAR-1, last April was reported to have reached an agreement with Northrop Grumman Space Technology that gives the U.S. company rights to sell modified versions of the spacecraft to the Pentagon. IAI and Northrop Grumman hope a successful launch of Polaris/TechSAR will increase the Pentagon's interest in miniaturized satellites.

Northrop is attempting to convince the White House to include funding for TechSAR clones in its 2009 budget request to Congress. If this program is approved, initial plans call for IAI to ship the basic platform to be modified at Northrop Grumman's facilities in California.

The Pentagon plans to demonstrate the concept by launching a series of experimental Tactical Satellites, or TacSats, and conducting military simulations and field exercises. The first of those satellites, TacSat-2, was launched in December 2006.

Northrop Grumman said TechSAR fits the bill for Operationally Responsive Space. It said TechSAR-1 is an operational system that can be built, from the time receipt of order, in 28 months.

## *The Challenge From Iran*

The launch of the Russian-made Sina-1 (or Mesbah, meaning lantern) marked the start of Iran's accelerated space program, said Israeli analysts. A second satellite, this one made by Iran, is expected in 2008. Iran is known to have developed a satellite launch vehicle of the Shahab family similar to North Korea's Taepodong 2 missile, also named Iris.

Iran officially declared its space ambitions in 2003 with the announcement it would launch its first satellite with a home-produced booster rocket within 18 months. This was the Russian-built Sina-1, which carries two cameras and communication

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equipment. Although Iran claims Sina-1 is designed to locate and monitor natural resources and perform similar missions, Israeli and U.S. intelligence sources believe the satellite is part of Iran's future military space program.

Israel has often warned that the Iranian space program is being used as camouflage to allow Iran to develop its long-range ballistic missile program without nuclear non-proliferation treaty restrictions. Analysts said Iran achieved its significant missile technology know-how through its cooperation with North Korea. An advanced Iranian version of the Shahab-3 ballistic missile appears capable of either carrying satellites or a nuclear warhead.

## *Powers In The Middle East*

Israel and Iran are the Middle East's leading space powers. They are also enemies, and that is to be regretted as advances in their space programs now have roots in their overarching need to gain military advantage.

But let's not forget that Iraq—yes, Iraq—was the first Muslim country and the 10<sup>th</sup> nation on Earth to successfully orbit a satellite. Iraq achieved this feat on December 5, 1989 with a satellite launched from the Al-Anbar Space Research Center 50 miles west of Baghdad. The rocket is said to have been a modified version of Argentina's Condor ballistic missile.

Other Middle East countries might soon duplicate Iraq's feat (Saudi Arabia is a prime candidate) thereby complicating the Middle East equation.

As it stands now, however, satellites guard the peace in the Middle East. That peace must continue. ■



*The Argentinian  
CONDOR ballistic  
missile*



In addition to working as the Asia Editor for SatMagazine, Peter I. Galace writes extensively on telecommunications developments in Asia for numerous, international publications. He is the co-author of "Heavens Fill with Commerce," a brief history of the satellite communications industry, published in the United States. He may be reached at his email address of [peter@satnews.com](mailto:peter@satnews.com)

# SPOTLIGHT

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## INTERVIEW WITH KAY SEARS, SENIOR VICE-PRESIDENT, MARKETING & BUSINESS DEVELOPMENT, INTELSAT GENERAL

by Virgil Labrador

At the recent *ISCe 2007 Conference and Expo*, the then-Managing Editor of *MilsatMagazine*, *Virgil Labrador*, spoke with *Kay Sears*, **Senior Vice-President, Marketing & Business Development, Intelsat General.**

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Intelsat General is a wholly owned subsidiary of **Intelsat**, the largest satellite operator in the world after its merger with **Pan-AmSat**. Intelsat General focuses on the military and government markets. In a candid interview Sears talked about the prospects of the government and military market and how Intelsat General is approaching this important sector.

Excerpts from the informative interview follow...

**Q.** For the benefit of our readers, can you offer a brief background on what Intelsat General does?

**A.** Certainly. Intelsat General is a wholly owned subsidiary of Intelsat Corporation. We're a US company based in Bethesda, Maryland. Our primary focus is to develop rapid solutions for the US military, its allies and the civil government agencies of the US. So it was formed as kind of a sector company to go after a particular niche, that being the government sector, to really solve some of their unique communications requirements.

**Q.** You came from PanAmSat, among other jobs that you've had in the industry. How did the merger of PanAmSat and Intelsat impact on your current company's position?

**A.** I think it is worth talking a little bit about the merger, because I think it is one of the most success mergers that I have been part of in my career. They really brought two companies together that had different cultures and different histories. They were able to blend those cultures and develop something that, I think, is going to benefit the satellite industry and all of our customers. And what I mean by that is not only the increased infrastruc-

# SPOTLIGHT

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ture when you bring two major satellite operators together. We have 52 satellites, 8 teleports around the world, and a very extensive fiber infrastructure. Just the sheer capabilities that we are now able to bring to bear on the market have increased twofold. As we efficiently manage that, and make sense of that entire infrastructure, we're able to offer new services and, I think, respond more rapidly to the demands of the marketplace. The merger is going to end up being a big benefit for our different customers, including the broadcasters the data providers, and the government sector.

**Q.** Do you cover the entire world, or do you just focus on the US military market?

**A.** We do focus our services all around the globe. We support the US military and it is certainly our biggest customer, and as they deploy around the world, we provide communication solutions for them. We also serve other government militaries, like the Australian Defense Force, the Japanese Defense Force, other foreign militaries and NATO are other good examples. There is a strong push for the militaries, especially the allied militaries, to interoperate and communicate more effectively together. By using a commercial operator, we can provide common platforms across military systems to help further that interoperability and exchange of critical information.

**Q.** Do you see opportunities in the military markets outside of the US and Europe?

**A.** Absolutely. I think that you have a lot of countries with smaller militaries but still rapidly growing communications needs. If you look at Poland or you at some of the Czech Republics, they have developing militaries; they have forces that need increased communication services. You'll find that they participate in peace-keeping operations, and they're deployed to Afghanistan to help in different conflict areas, and they all need communications. Some of their communications needs can go through NATO, but beyond what NATO provides, they need to reach back to their own countries

for typical enterprise type applications, morale and welfare, as well as to connect to their families. Those are some of the new demand areas that we see in Eastern Europe.

**Q.** Talk about your recent contracts with SATCOM II and the IRIS project?

**A.** SATCOM II is a follow on contract to the General Services Administration, what we call the fixed satellite side. That contract is

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a very popular vehicle for lots of government agencies, really outside of the DoD, although the DoD can use the GSA. We find a lot of the civilian agencies use the GSA to buy their communications services, because they don't have that expertise—they don't have a group of satellite engineers, nor should they.

The GSA contract and the SATCOM II are going to provide a broad range of services, from satellite bandwidth to turnkey solutions to emergency response communications and vehicles. You can buy almost anything on that contract. I think one of the agencies that will probably end up using SATCOM II is the Department of Homeland Security. They're a relatively new agency and they don't have a huge amount of communication expertise. They'll go to the GSA with their requirements and those will be completed through the SATCOM II. There are a lot of good vendors that are now on that contracting vehicle and we hope to see a lot of business coming through that.

Your other question was about IRIS. IRIS is very exciting for us. IRIS is an approved JCTD or Joint Concept Technology Demonstration, and it is a way for the DoD and other agencies to rapidly procure technology. In this case, we are going to be demonstrating and testing layer three IP routing in space. IRIS will fly on the IS-14 satellite in early 2009. It will be interconnected with one C-band and 2 Ku-band transponders. By moving the routing from the ground to the sky, we are hoping to see a dramatic improvement in throughput and the types of communications services that can take place. For example, the way you would get a message out right now to different parts of the military, maybe the Navy being at sea in the Atlantic, you would have an army forward deployed into Europe, and you would have the Pentagon back in the United States. When you want to communicate a message to those three different groups, you are making individual connections to each one.

When you put the router on board the satellite, you can send one message and it gets distributed to all three of those continents and users at once. Just the power of IP on the satellite will enable some types of communications, which are very onerous today. There's a lot of latency and double hops and it makes it very difficult to get messages out in a broad way to hundreds and hundreds of users. IRIS will solve that problem.

We are very excited for this new technology to fly. We will be working very closely with DoD constituents who are interested in the technology. There will be a very formal testing period demonstration period that will last from about 3-6 months. From those results, we will be able to go out to the community and say this is what IP routing can do for you in the future.

**Q.** You are also spearheading a "Hosted Payload" program. Can you explain this program?

**A.** IRIS is an example of a hosted payload. Hosted payloads are a new way of using commercial satellites to solve tactical missions or science missions. Or, in the case of IRIS, to test a technology that will eventually be a part of our infrastructure going forward, or the DOD's infrastructure going forward. But they want to test it early to develop a concept of operations around, in this case, IP routing in space.

It could be a NOA sensor that needs to fly, or couldn't fly, because something wasn't ready in time. Hosted payloads are a way to take advantage of Intelsat's continuous replenishment of our fleet. We are launching satellites and buying new satellites and new programs about every four to six months. Each one of those new programs is an opportunity to put a payload on that spacecraft to do something unique. In the case of the military, that could be as tactical gap filler. If they see that they are running out of a particular type of communications service, they can use one of our upcoming satellites to put a payload on it to fill that gap.

There are many good reasons why the DoD and other agencies can take advantage of this continuous cycle with Intelsat launching and building satellites. I think that it is going to be another way that we can partner with our government friends to solve problems. It can be very rapid, and it can be very cost effective, it really becomes a win-win for the government and our industry.

**Q.** It looks like your company has a lot on its plate. What can we expect from Intelsat General in the near future?

**A.** I think we are operating under a couple of mantras right now. The first one, and probably the one that has been reiterated during the conferences and the shows that we have attended recently, is that if you are not responsive, you're irrelevant to the situation. We are challenged as a satellite provider to be as responsive as possible. I think you'll see Intelsat General developing solutions around this mantra that we have got to be responsive. Otherwise, we are not going to be relevant to what's going on in our community. The hosted payload ideas, and some of the other projects we're working on, such as IRIS, are ways that we can become incredibly responsive to our customers and solve their problems. And I think that's what driving us—I think it's a really urgent time. The DoD needs contractors that are going to be really responsive. There's our challenge. ■



**Kay Sears, is the Senior Vice-President, Marketing & Business Development for Intelsat General.** She has an extensive background working for various companies, including PanAmSat's government business subsidiary, **G2 Satellite Solutions.** Prior to that, she served as the **Vice President of Government Services at Verestar** where she launched Verestar's government services business.

## INTEGRATING COTS SYSTEMS—A WORTHY EFFORT

### *Success From Off The Shelf*

by Bruno Dupas, President, Integral Systems, Europe

Over the last ten years, **COTS** (Commercial Off-the-Shelf) products have become increasingly popular within the satellite industry. “Better, faster, cheaper” was the mantra of the mid-90s—COTS products helped to address this mandate.

During this period of time, many integrators were learning to develop COTS products as part of the systems they delivered. Regrettably, the systems provided by some integrators were less than ideal. Many times, the systems were based on products poorly suited to perform the tasks required and were limited in flexibility. Often, these systems required extensive custom “middleware” and were difficult and costly to maintain.

A few companies, such as **Integral Systems, Inc.**, were quite successful in avoiding these problems and established a firm foundation from which to provide ICS (Integrated COTS Systems). Such increased the adaptability and flexibility of various solutions and ensured system viability throughout operational life.

In the pioneering days of the satellite industry, developers of complex custom ground systems spent millions of euros and dollars to develop hundreds of thousands of lines of custom code to support telecommand and telemetry processing, equipment control, and communication monitoring, as well as to develop specialized hardware to support just one satellite. Over the last few decades, the demand for satellites by both commercial businesses and governmental agencies worldwide increased dramatically.

As the number of satellites and satellite designs that comprise their operations continue to grow, satellite operators, particularly those in the commercial sector operating fleets of satellites, began to look for more cost-effective and reliable ways to address their short- and long-term satellite ground system needs. They started asking questions, such as:

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- How can I minimize my ground system operations, training, procurement, and maintenance costs as my fleet continues to grow?
- Why should I want multiple ground systems that can support only a specific satellite, when I need to support multiple satellites of varying design from different manufacturers?
- How do I ensure the ground system hardware and software will be supported long term, and not just through warranty?

Fifteen years ago, Integral Systems, then a provider of custom satellite control system and ground system components, realized there was a far better way. Integral Systems offered the first COTS satellite command and control system: **EPOCH 2000**. This system was devised to support any satellite design and operated on readily available and affordable COTS computing hardware. By offering a common, flexible solution for command and control, Integral Systems reduced both procurement and operations and maintenance costs for their customers. EPOCH 2000 also eliminated custom or toolkit-based development and maintenance risks.

Integral Systems continued to expand the capabilities of their COTS products and the control systems they deliver based on them. Their comprehensive solution for operating multiple satellites of varying design and manufacture as part of a single common COTS package addressed the needs of growing satellite fleet operators, such as Loral Skynet and EchoStar.

Within a few years, commercial satellite operators began to appreciate the benefits of this approach. Today, Integral Systems' **EPOCH IPS (Integrated Product Suite)** is the most widely used satellite control system in the industry.

The same COTS-based approach has benefited other aspects of the satellite ground system industry. For example, in the areas of network management and carrier monitoring, companies such as **Newpoint Technologies, Inc.**, and **SAT Corporation** have, and continue to follow, an identical paradigm. Their **Monics** and **Compass** COTS products, and the systems they develop based on these offerings, have made them leading suppliers of such systems to satellite operators, service providers, broadcasters and SATCOM users in general worldwide.

Regrettably, the generic use of COTS products and integration of COTS-based systems in the satellite industry has not been without problems:

- Often, integrators choose COTS products that are, essentially, difficult-to-integrate black boxes.

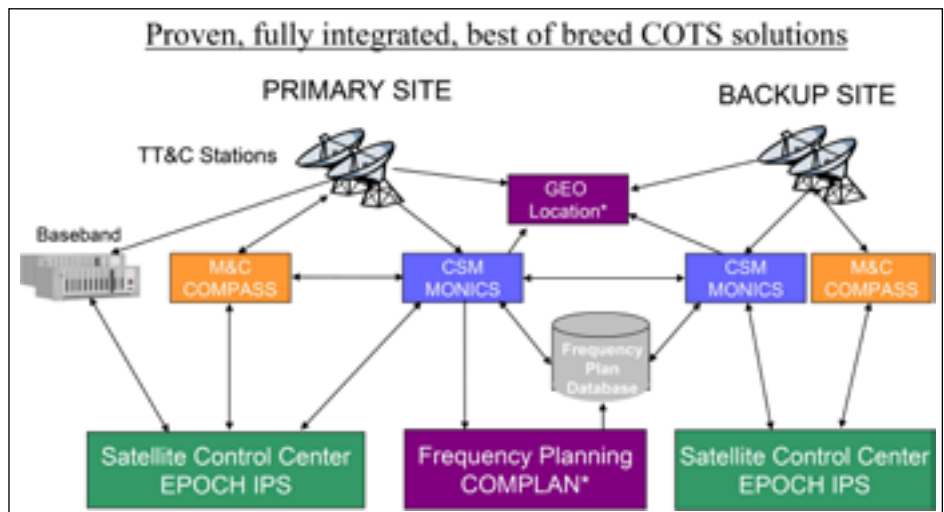
- Many integrators have developed extensive "middleware" between multitudes of disparate products. This middleware makes some systems difficult to maintain.
- COTS product interfaces are sometimes limited, proprietary, or not well documented.
- There can be hidden costs associated with integrating these products.
- System integration may not be the integrator's core competence.

Today, COTS product integrators with proven track records providing end-to-end systems spanning any and all aspects of the ground system (not just command and control) are highly valued by commercial and government customers alike. COTS product integrators, like Integral Systems, continue to lead the way in developing and refining the ICS concept. This is due to their ability to provide solutions for both major subsystems, such as satellite command and control, and entire turnkey ground systems, including carrier monitoring, network and equipment management and operations centers, antennas, RF (Radio Frequency)/IF (Intermediate Frequency) equipment, and mission and payload planning.

The ICS concept emphasizes:

- Selecting well-supported COTS products from established providers with proven long-term track records.
- Choosing COTS products that are inherently flexible and scalable by design to support extensibility.
- Establishing between these products integration mechanisms that are (1) off-the-shelf, and (2) public and documented, to support ease of integration, maintainability, and future system growth.
- Developing or acquiring software COTS products on which APIs (Application Programming Interfaces) are made homogeneous.
- Selecting hardware equipment (computers, network equipment, antennas, and RF baseband units) as a commodity. The new ICS should be independent of the commodities.

**Figure 1** illustrates the ICS concept as it applies to subsystems that comprise a typical satellite ground system.



**Figure 1.** ICS Concept for Satellite Ground Control Systems

By choosing COTS offerings such as those shown in **Figure 1** that meet the ICS criteria, the following advantages are realized:

- It may be used for any type of satellite or fleet of satellites.
- It may be adapted for any kind of mission by updating the database.
- It is documented, so that the customer can tailor it to suit any operations concept.

Integral Systems consistently applies the ICS approach with great success. All of Integral Systems' commercial customers receive the same highly flexible, mature COTS product offerings. These products are all from leading manufacturers, have established and flexible interfaces, and require no customization. By using this approach, Integral Systems has not only shortened delivery times, reduced procurement, maintenance, and training costs but also provides systems that can readily grow with customers' changing needs.

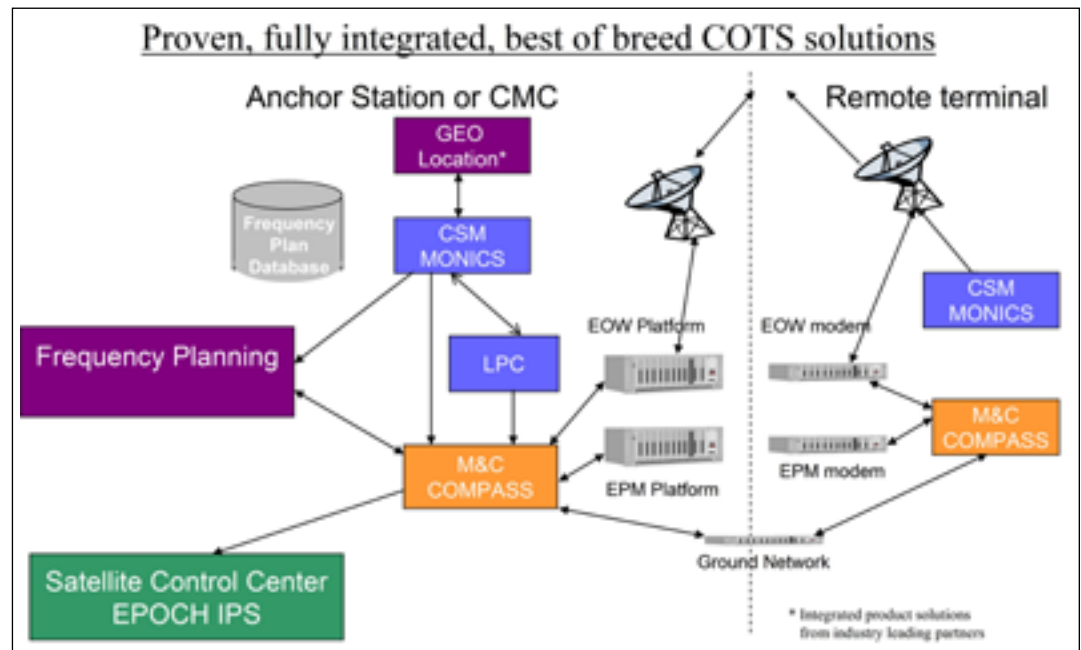
Additionally, Integral Systems constantly enhances and maintains its COTS offerings and systems based on them, offering new features and capabilities, supporting new satellite designs, and ensuring continued compatibility of all system components if ever they are upgraded or replaced. In this way, Integral Systems continues to offer to all customers added value to their systems and to ensure the long-term viability of each product offering. Integral Systems has supported its COTS product-based systems for over 12 years and, today, delivers the fourth generation of the EPOCH product line.

The ICS concept also can be readily extended to other satellite ground segment applications, such as military satellite communications systems. These operations currently require significant bandwidth and must be performed in conjunction with other governments and agencies. Customarily, each country provides its own communications data. Once again, the ICS paradigm of using mature, flexible, and scalable COTS offerings can help, especially in countries addressing for the first time their need to obtain reliable, proven satellite communications systems at an affordable cost.

**Figure 2** illustrates the ICS concept as applied to military satellite communications.

ICS is now a mature concept based on proven, flexible, well-maintained COTS products with open APIs that can be readily scaled and configured to meet the customer's changing needs. By work-

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**Figure 2. ICS Concept for Military Satellite Communications Systems**

ing with proven, knowledgeable COTS integrators, like Integral Systems, who have successfully used the ICS approach, satellite operators and service providers can readily and affordably obtain a quality, reliable system.



Bruno Dupas is **President of ISE (Integral Systems Europe)**, Toulouse, France. Mr. Dupas created ISE in 2000 after spending 10 years in project management and system engineering roles with **Matra Espace** in France and the United Kingdom. Mr. Dupas graduated from Ecole Nationale Supérieure des Mines de St-Etienne (France) and has 22 years of experience in software and systems engineering.

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## THE EUROPEAN DILEMMA

### *Communications Costs Versus Tactical Needs*

by David Mulholland

The major European countries are committed to improving their satellite communications capabilities through both dedicated military and dual-use systems. The U.K., France, Spain, Italy and NATO already have dedicated military communications satellites

and Germany is planning to launch its own soon. The greater bandwidth required by the post-Cold War focus on digitizing the battlefield and expeditionary warfare have stiffened their resolve to continue to improve communications.

The experience of fighting in Afghanistan and Iraq has highlighted the importance of communications. Even with huge capabilities, the U.S. has run short of communications capability and has leased bandwidth from commercial satellites. The U.K. has experienced similar shortages in communications capacity. Modern military operations depend on communications.

In large operations and in mountains, this means satellites or aircraft acting as communications relays. While this is well known, the size of the demand took military planners by surprise. In particular, it was not appreciated how much communications capacity is required for other functions, such as logistics.

This is easy to ignore in peacetime. As General Omar Bradley is alleged to have said, "amateurs study strategy, professionals study logistics." When countries actually go to war, they abandon their focus on "gee whiz" programs, such as missile defense, and start looking at the nuts and bolts of military operations, such as communications and armored trucks.

Computer record keeping and reliable communications promises to revolutionize logistics, but all depend on communications. Simply put, people need to be able to place orders and track them. This places huge demands on

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communications in 2009 when its first SatcomBw begins operating.

Even cash-strapped Russia is working to improve its military satellite communications. The country has a large constellation of satellites; however, many of them are past their design life and need to be replaced. In response, Russian satellite makers are trotting out small satellites as a low-cost option for maintaining capability.

## More Money

One of the chief hurdles for the European countries in developing their space assets is funding. Europe's aggregate spending on military space programs, which combines reconnaissance and communications, is about €500 million to €1 billion (\$700 million to \$1.4 billion) a year for the next 10 years. Compare that to the U.S. Air Force's 2008 budget request for \$11 billion for unclassified space programs, an increase of \$1.5 billion over the previous budget. The increase itself is larger than Europe's entire military space budgets put together. France, Italy and Germany are also spending money on reconnaissance satellites.

Paris believes that if Europe wants to have a working military space system, it must increase spending to at least €2 billion (\$2.6 billion) a year by 2012-15, but European military budgets are falling and there appears to be little political will to devote money to military space.

French Defense Minister Michèle Alliot-Marie earlier this year called for a 50 percent rise in military space spending across Europe, which would bring France's military space budget to €650 million (\$900 million) a year. She proposed that Europe develop a comprehensive military space system built around mutual dependence on nationally owned satellites.

## Public-Private Partnerships

Seeking to save money, the U.K. has offloaded buying and operating its military satellite communications equipment onto the private sector. The SkyNet 5 communications satellites are not owned and operated by the U.K. Ministry of Defence, but rather by Paradigm Secure Communications, a U.K. subsidiary of EADS, the European Aeronautic Defence and Space Company.

The U.K. MoD has a 20-year contract worth about £2 billion (\$4 billion) with Paradigm for communications services. As excess capacity was built into the SkyNet 5 satellites, the business plan has been to sell that capacity to others. The company has already signed deals with the Netherlands, Canada, Portugal and NATO. Paradigm is also operating the SkyNet 4 constellation.

Spain has also involved the private sector in its satellite implementations. HISDESAT Servicios Estrategicos was set up by



A U.K. soldier uses the SkyNet 5 network while deployed in Afghanistan  
Photo Credit: Paradigm

communications. For instance, convoys in Iraq originally had no satcoms. Troops quickly learned that they could not call for help if attacked. The rear of the convoy would have no idea what was occurring at the front of the convoy.

In addition to armoring trucks, the big upgrade to logistics forces has been the implementation of satcoms. Also, the volume of information being sent regarding supply is enormous. In Iraq, large portions of satcoms are being used over civilian networks. This may seem risky, but commanders on the ground believe there is a greater risk posed by the logistics system not working than from enemy intercepts.

## Money

As always, locating the money for large military programs in Europe is difficult, given the tight European military budgets. However, recent conflicts in Afghanistan and Iraq, where soldiers' and marines' biggest demand is better communications, have pushed European militaries to bolster their telecoms capabilities.

Despite cash constraints, Europe has a long history of military satellite communications. The British Skynet program launched in 1969 was the first, followed by NATO in 1976, France's Syracuse system in 1984, Spain's Hispasat/Secomsat in 1992, and Italy's Sicral in 2001. Germany's SatcomBw is planned for 2009. The U.K., France, Spain, Italy and Germany are all either planning or in the midst of upgrading their satcoms.



Ariane 5 rocket rolling out for France's Syracuse 3A launch

The rising profile of space is clearly seen with Germany, which had no satellites until 2005 when the SAR-Lupe radar reconnaissance satellite came on-line. The country will have its own secure satellite



SSL's XTAR EUR satellite

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Hispasat to run the Xtar-Eur and Spainsat satellites. A web of private and government-owned companies owns Hispasat. The Royal Danish Navy has already purchased some capacity from the Xtar-Eur satellite.

Some question how such systems will work during wartime, given that demand for satellite communications has skyrocketed on the battlefield. In Iraq, for example, 75 to 80 percent of U.S. military satellite communications are over civil satellites because the military satellites do not possess enough bandwidth. If that is the case with the U.S., how will agreements such as the one with Paradigm work? Will the U.K. demand all of the satellites' capacity during contingencies? This is further complicated by the fact that other users are likely to be fighting alongside U.K. forces, which would make depriving them of their satellite communications self-defeating as well as terribly bad manners.

## NATO

As a way of stretching money further, a number of European countries are pooling their assets. The U.K.'s SkyNet 5, France's Syracuse 3, and Italy's Sircal satellites will jointly provide NATO's new satcoms.



Artists impression of a SkyNet 5 satellite deployed.

Image Credit: EADS Astrium

Italy is also providing the ultra-high frequency (UHF) capacity contracted with NATO under a separate contract valued at €70 million (\$97 million). Similarly, countries within Europe are leasing each other capacity.

For instance, Germany is leasing the equivalent of two SHF transponders on Syracuse 3A for five years until its two SatcomBw military communications satellites are online. Bel-

gium is also leasing a small amount of capacity, leaving French forces with only 45 percent of Syracuse 3A for their own use. The U.K.'s SkyNet 5 is leasing capacity to NATO, the Netherlands, Holland, Portugal and France.

France and Italy are also looking at a largely military dual use geosynchronous satellite called Athena-Fidus. It would be capable of very high rates of data transmission and could augment or even replace some of the Syracuse and Sircal satellites. But there are ongoing concerns over the price of the system, especially its ground segments.

## Russia

Ever vague, Russia's Armed Forces plan to begin using a new-generation command and communications systems by 2015, which will presumably include new communications satellites. This is according to a statement last August by Sergei Ivanov, first deputy prime minister in charge of the defense industry. He was quoted as saying, "In line with a state armaments program for 2007-2015, we have planned the outfitting of Army and Navy units with new command and communications systems." The former defense minister said the plans were drafted in 2002, when the Defense Ministry pressed for the need to modernize communications systems, particularly for battlefield operations.

## Conclusion

The major European countries are forging ahead with military satcoms programs despite tight budgets as part of their plans to continue transforming their militaries into expeditionary forces that take advantage of the advances in computing and communications technologies. The recent conflicts in Afghanistan and Iraq have underscored the tremendous demand that modern militaries have for flexible communications when deployed. In the past, satcoms were seen as a "nice-to-have" but are now increasingly viewed as a "must-have" for operations. ■

Name	Number	IOC
France		
Syracuse 3	3	2005
Britain		
SkyNet 4	6	1989
SkyNet 5	3	2007
Italy		
Sircal	3	2001
Germany		
SatcomBw	2	2009
Spain		
Xtar-Eur	1	2005
Spainsat	1	2006

## GPS OCX: THE VIEW FROM RAYTHEON

*An Interview with Robert N. Canty*

by Hartley Lesser

The next generation Global Positioning System (GPS) Operational Control Segment (OCX) will provide command, control and mission support for current GPS Block II and all future Block III satellites as well as support for existing and new interfaces. The focus will be on military transformational and civil needs across the globe. This will include advanced anti-jam capabilities, improved system security, accuracy and reliability. GPS OCX will be based on a modern, service-oriented architecture that will integrate government and industry open system standards.

I was able to chat with Robert N. Canty, the Director of DoD Systems of Space Systems for the Intelligence and Information Systems business of The Raytheon Company. He oversees DoD space programs in Space Systems' headquarters in Aurora, Colorado. Canty served previously as Site Manager and Assistant Product Line Manager for Commercial Space Systems business area in El Segundo, California.

Mr. Canty joined the former Hughes Space and Communications Company in February 1984. Before assuming his current position, Canty was the Raytheon Six Sigma Champion and Expert for Space Systems in the Strategic System business unit of Raytheon.

Canty won the Future Imaging Architecture Mission Control System (FIA MCS) program as the Capture Manager. He received his bachelor's degree in Electrical Engineering from Purdue University and his MBA from Pepperdine University.

**Q:** Mr. Canty, would you please offer your view of how GPS functions and the different segments involved?

**A:** In GPS, there are three different segments and a Systems Integrator. The first segment is the control segment or GPS OCX. The control segment, to the first order, is the timekeeper for the system. The control segment receives all of the satellite signals and calculates the satellite ephemeris and clock updates. As necessary, the control segment commands the satellite to update clocks and position knowledge in order to maintain system timing and navigation accuracy. Optimizing the GPS System requires a number of very complex math algorithms.

The second segment is the user equipment. User equipment can be a hand held device for a soldier, a device in guided munitions, or a unit in the cockpit of an aircraft. The user equipment processes the signals from space and triangulates on a minimum of four satellites to determine its location.

The third segment is space. Twenty-four satellites are required for a full constellation. Additional satellites above twenty-four provide further redundancy and system availability. The satellites are, essentially, clocks in the sky. The GPS system sends out the time of day and the location of the satellites.

**Q:** Which of these systems is of interest to Raytheon?

**A:** The future ground control segment, or GPS OCX, is the focus of Raytheon's Intelligence and Information Systems (IIS). We bring more than 40 years of high availability precision satellite ground command and control system experience to GPS. There are currently three competitors for GPS OCX. One of these competitors will be eliminated within the next few months and in about 18 months; one contractor will be selected to work on this project for the next 15 to 20 years.

Raytheon's Space and Airborne Systems is currently performing on the Modernized User Equipment (MUE) contract. Raytheon has led close to 100 GPS related programs and has delivered thousands of pieces of user equipment for the DoD, civil, commercial and national markets ranging in activities from navigation, transportation, surveying and rescue operations. There are three contractors currently performing work on the MUE. Preliminary Congressional Budget language calls for maintaining continued competition in this segment and accelerating the development of the MUE.

**Q:** Regarding the spacecraft contractors, you have worked with most of these companies before?

**A:** Raytheon builds control systems for every U.S. satellite provider. GPS OCX is required to perform with a mixed constellation of vehicles and payloads produced by different vendors. Raytheon IIS's focus is the control segment. Our company does not have a satellite-manufacturing group, unlike other companies that typically only produce control segments to support their own vehicles. We have supported all of the satellite contractors currently involved in the GPS III spacecraft competition.

The Air Force has separated the control segment from the satellite contract in order to address the challenging military and civil needs across the globe. The Air Force looks at GPS OCX acquisition as a pathfinder for future acquisitions. Establishing each segment as a separate contract allows better contract oversight, a commitment towards strengthening Space and Missile Commands industrial base and facilitates technology infusion into the GPS architecture.

In past acquisitions if the space segment milestones slipped, so did the control segment milestones. Decoupling space and

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control segment allows for delivery of enhanced system capabilities much more rapidly in the future. By integrating commercial best practices, enhanced automation and state-of-the-art mission management software hosted on a service-oriented architecture, OCX will provide the revolutionary opportunity to focus not just on flying satellites, but enhance services to operational users.

Therefore, time certain delivery is a critical aspect of the control segment procurement going forward. Being able to not only deliv-

er on time, but to deliver enhanced capabilities much more rapidly, is the key to success. Our unique history of working with all satellite vendors enables our approach to time certain delivery.

**Q:** Could you give us an example?

**A:** The first delivery of the control segment takes full advantage of the modernized capabilities on the launched IIR-Ms and the future IIF satellites by activating the new civil signals (L2C and L5) and the new improved military M code. The current control segment does not provide this capability. These enhanced capabilities are independent of the GPS III satellite schedule. Improved M code capability does require MUE delivery.

**Q:** It really is immaterial which spacecraft provider ends up getting the contract, as far as Raytheon is concerned, because you've already worked with most of them and, as you have stated, it's an independent activity.

**A:** That's correct. We don't have a preference if it's a Boeing satellite, a Lockheed satellite, or anybody else's satellite. The control segment has to work with any satellite vendor's product going forward. It's that ability to be independent that is a key attribute. Raytheon is uniquely positioned because we have worked with all U.S. satellite vendors. The control segment is our focus. Raytheon has a tremendous track record of delivering projects on time, independent of space vendor.

**Q:** What enhanced capabilities will GPS OCX implement that will be beneficial from both a warfighter as well as a civilian perspective?

**A:** A key attribute is improved accuracy of the overall system. The control segment is the key component to satisfying this need. More data points from the satellites, better predictive algorithms and more frequent clock and ephemeris updates ensure increased accuracy.

Increasing accuracy is important for future warfighting. Many evolving systems depend on improved accuracy such as persistence surveillance and the use of a small diameter bomb.

To get the maximum effects using a small diameter bomb, you have to be more accurate in your ability to hit the target.

There are also many civil applications that can benefit from increased accuracy. For instance, modern networking takes advantage of GPS as a timing source. Better timing precision allows a network to process more

packets of data. There's a huge commercial economic benefit associated with improved accuracy. There are several new markets that would come online, thanks to improved accuracy, markets we can't even envision today.

Integrity is another area of enhanced capability enabled by the control segment. Users of GPS need to know that the GPS signal is good and therefore their location is known. This is especially true for critical operations such as aircraft navigation or use of force in military operations. Critical users of GPS need a warning in a short period of time indicating that a signal is potentially misleading and should be disregarded. Raytheon has developed the only FAA certified satellite navigation system in the Wide Area Augmentation System (WAAS). Our solution applies this experience to offer the Air Force a cost-effective implementation of integrity.

**Q:** As you are probably well aware, ITT just was awarded the contract from the FAA for the next GPS system for aircraft. How will this affect your implementation, if such occurs?

**A:** I believe the aircraft will receive the GPS signal and broadcast its location to the FAA as well as other aircraft in its proximity. The location information received will be displayed enabling the FAA and pilots to determine where all other planes are located. That system is dependant on GPS integrity either through GPS or WAAS.

**Q:** I've heard a great deal about resistance to jamming... how is this to be implemented?

**A:** Our adversaries realize we have an advantage when it comes to GPS enabled precision operations and being able to jam GPS can have a significant impact. Implementing GPS capabilities to be more resistant to jamming is of critical importance. This is a need for the warfighter as well as for civil and commercial users.

Many commercial and civil systems such as communications, energy and banking depend on GPS. To the maximum extent possible, the GPS system will need to be impervious to jamming. Implementation will require contributions from all segments of GPS.

From the control segment standpoint, better situational awareness for system operators is an important attribute. Situational awareness of system health, status and performance offers a view of the actual performance of the GPS system and a predictive tool of future performance. This includes an understanding of the jamming environment and how to respond. This capability can be enhanced independent of satellite delivery.

**Q:** How about redundancy – big issue – how will redundancy be addressed with GPS OCX?

**A:** GPS OCX delivers a primary and backup control system. The primary and backup systems are each fully redundant. Redundancy is a critical requirement for the implementation of integrity. Our implementation uses approaches and designs from our successful implementation of WAAS.

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**Q:** What does Raytheon mean by “commercial best practices”?

**A:** We've delivered over 40 commercial systems, many of which were fixed price contracts. We have become extremely good at delivering high quality systems, on time and within budget. We developed an industry leading software re-use approach. Our software is designed for re-use. Because Raytheon history of working with different types of satellite busses, payloads, and vendors, our software is extremely mature at adapting to new requirements. When you're using software designed for re-use, you can complete projects much more rapidly with fewer defects.

**Q:** Raytheon has many worldwide interests. How does this play into the national security plans for the United States? Would a financially rewarding overseas project be of interest to Raytheon if it were to impede work on our own nation's defense systems?

**A:** Raytheon makes a commitment under a contract, the appropriate dedicated resources are assigned and management ensures that sufficient resources are maintained throughout the program lifecycle. Decisions for pursuing new business always takes into account current commitments and availability of resources. Raytheon has a proven track record of successfully completing programs on time and within budget.

**Q:** Thanks for your time, Mr. Canty. Do you have any closing thoughts?

**A:** GPS OCX is the pathfinder for the US Air Force Space & Missile Systems Center for separating the acquisition of space and control segments. This approach allows for better contract oversight, enables more responsive technology infusion and demonstrates commitment towards strengthening the industrial base. We applaud the Air Forces direction. ■

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## THE FUTURE OF SATELLITE ACCELERATION

### *SCPS and Tactical Military Satellite*

by Nichols Yuran

Satellite acceleration technologies have been well known to users of military satcom for many years. Performance Enhancing Proxies (PEPs) are now a fixture in today's tactical satcom equipment suites.

The technology underlying most PEPs is the *Space Communication Protocol Standards* (SCPS) transport protocol, commonly pronounced "skips". SCPS is an open-source, TCP variant. The capabilities of the standard transport protocol are extended for adaptation to the rigors of satellite communications. Simultaneously, SSPS must remain fully interoperable with standard TCP implementations.

Mil-Std-2045-44000 is the designation and mandated for use in PEPs by the DoD IT Standards Registry (DISR). SCPS maintains high bandwidth efficiencies while performance loss associated with high round-trip times, channel asymmetry, packet loss, and other environmental impediments common in military satcom, are lessened.

For purposes of standards compliance and interoperability, SCPS is specified as a requirement for most of today's tactical DoD satcom programs. There are thousands of worldwide implementations currently supporting US tactical military satcom. SCPS is also the standard acceleration technology deployed by DISA, implemented in the Standard Tactical Entry Point (STEP) and Teleport programs to provide accelerated connections to deployed warfighters. As a result, many satellite equipment vendors have been compelled to offer SCPS either as an integrated solution in their product lines, or in the form of a standalone SCPS-based PEP.

With the increasing sophistication of military satellite networks, and the complex architectures and advanced modem technologies deployed in the modern battlefield, many SCPS implementations are strained beyond their original capabilities. Such has forced vendors to reexamine their approaches to the technology.

Traditional PEPs operated under a simple assumption; once the PEP was configured and deployed, the parameters of the satellite channel would remain fixed. The proper acceleration attributes could be applied to the satellite WAN, knowing that neither its speed nor round-trip time would fluctuate over the life of the connections. This practice is known as *rate-based* acceleration.

However, many of the satcom packages in the military today employ TDMA-based systems. The bandwidth allocated to a specific terminal may be increased or decreased on-demand. What's

more, many of today's architectures are both mixed-bandwidth. Not every path a connection might travel operates at the same speed, and heterogeneous, meaning networks are often hybridized mixtures of satellite, wire and radio. The effect on the common PEP is confounding.

Because the PEP doesn't know which of the paths a given connection will travel, it cannot apply optimum acceleration attributes. The PEP is forced to apply the same acceleration criteria to every connection, regardless of the path taken. The results can be catastrophic—dropped packets, large network queues, as well as dramatic degradation of overall network performance.

This problem was quite apparent in the U.S. Army's JNN network. Comprised of a mixture of FDMA and TDMA satellite, as well as HF line-of-sight radios and tactical fiber connections, the JNN network's design was truly complex. A variety of media, fluctuating bandwidths, and a mix of environmental conditions, all plagued the network. All traffic had to be routed through a single SCPS-based PEP due to architectural requirements, regardless of which of the media was used.

A customized SCPS implementation from Global Protocols called SkipWare® powered the PEP. Recognizing the network's complexity, Global Protocols adapted their standard SCPS implementation through inclusion of a unique set of network controls. The PEP could make automatic adjustments to changes in bandwidth allocation without user intervention.

These controls allow the PEP to recognize changes to the network, from redistribution of bandwidth to changes in the media being used. The acceleration attributes for each connection would automatically adjust in response to these changes. This allows for operation in TDMA networks where bandwidth is assigned on a variable basis. Also supported is acceleration in mixed-media networks where connection paths are uncertain.

The benefits these additions to the SCPS standard offered the JNN network were extraordinary. Rather than limited to a single set of acceleration criteria, which improved some connections while degrading others, Global Protocols' "smart" SCPS is able to learn how to best optimize each individual connection. This optimization is regardless of the media, speed, or environmental conditions.

Today, more than 3,000 turboIPs with SkipWare are in use throughout the Army's JNN network. Acceleration, error-resistance and bandwidth optimization for thousands of deployed warfighters is provided. The success of turboIPs has influenced other, wide scale deployments of the technology. The USMC's

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Satellite Wide Area Network (SWAN) program, the DISA's STEP and Teleport programs, and several other smaller military programs are prime examples of turboIPs' success.

SCPS, as a standard, will likely remain a fixture in tactical satcoms for several years, due to its specification for several, large military programs extending beyond 2010. With the many complementary WAN optimization technologies emerging from today's satellite industry, SCPS is becoming an even stronger, more pervasive technology in tactical satcom. Implementations such as Global Protocols' SkipWare line are testimony to the adaptability and portability of this technology across the increasingly sophisticated and complex DoD communication architectures. ■



Nick Yuran is the Director of Sales and Marketing for Global Protocols, Inc. As a founding member of the company, Nick has worked to promote SCPS and other standards through DoD. His focus is on Interoperability in tactical systems. Prior to joining Global Protocols, Nick served as a telecommunication analyst for various U.S. intelligence agencies. He possesses a BA in Slavic Languages from the University of Arizona as well as a MS in Telecommunication from George Washington University.

# PREVIEW

## 9<sup>TH</sup> ANNUAL GLOBAL MILSATCOM CONFERENCE

### *Fixed & Mobile MilSatCom Assets in the Evolving Role of Military Force*

by Martin Jarrold, Chief of International Program Development, GVF

The title of my first offering for MilsatMagazine is actually a preview of a workshop the Global VSAT Forum (GVF) is organizing as part of overall program of content comprising the **SMi 9th Annual Global MilSatCom Conference**. This important event for all involved in the milsatcom environs occurs in London from the 5th to the 7th November, this year.

Each year, Global MilSatCom focuses on the processes of transformation taking place within the sphere of military satellite communications. Such includes examination of commercial/military satellite partnerships and country-specific programs. Conference content includes a number of international case studies on procurement strategies, as well as on the operational deployment of specific milsatcom programs. Specific themes for 2007 include: Software Portability; Programmable Architectures & HSD; Resilience & Network Protection; COTM; Assured & Secure Command & Control; Future Proofing; Bandwidths; Legacy Systems; Internet Standards/IP; On-board Processing; and, Interoperability.

To add to this, as occurs each November, GVF will, for 2007, provide a body of value-added content in the form of a post-conference workshop. During the workshop, certain key conference themes or complimentary topics will be examined and tackled in more detail and depth.

The main thrust of the GVF Workshop on 7<sup>th</sup> November 2007 can be described as an examination of the military use of satellites in the fields of intelligence gathering, various voice, data and video applications, and in asset tracking. With the main title of *“Remote Battlespace Warfighters & Boots-on-Ground Peacekeepers”*, the workshop’s premise revolves around the communications needs of today’s globally deployed, remote, and multi-task military units.

The military role of ‘Warfighter’ shares much in common with its role as ‘Peacekeeper’. For example, the requirement for access to data, to information and to knowledge which, just as each stage or element in this sequence is a progressively more evolved version of the former, all are dependent on systems and processes for gathering, analyzing, and interpreting, countless digital data streams. For decades, it has been amply demonstrated that only satellite can successfully deliver on the type of requirements characteristic of the multi-functional military, while providing outstanding Quality of Service and reliability.

Contributors to the workshop will examine, in detail, precisely how each of these three facets of the use of combinations of in-orbit technology resources and on-the-ground equipment, each contribute to the current fulfillment, and evolution, of the effectiveness

of both the ‘Warfighting’ and ‘Peacekeeping’ roles of the modern military machine. Through three separate, but inter-related program sessions, the Workshop will also examine the nature of the increasingly mission critical and highly sophisticated interfaces between these facets of the global milsatcom infrastructure:

- (1) Military Intelligence Gathering via Satellite
- (2) The Military Context of Voice, Data & Video via Satellite
- (3) Military Requirements for Asset Tracking via Satellite

More information about the Global MilSatCom conference can be found at:

[www.smi-online.co.uk/events/overview.asp?is=1&ref=2636](http://www.smi-online.co.uk/events/overview.asp?is=1&ref=2636)

and about the GVF Workshop at:

[www.smi-online.co.uk/events/execbrief.asp?is=1&ref=2636&eb=#2769](http://www.smi-online.co.uk/events/execbrief.asp?is=1&ref=2636&eb=#2769)

In the remaining portion of this workshop preview, I wish to look back to the GVF Global MilSatCom Workshop hosted in 2006, as well as peer forward to our plans for potential future content for the milsatcom and milsat environment.

The program of the 2006 GVF Workshop at Global MilSatCom focused on key topics of such importance we will certainly return to them in the not-too-distant future. Entitled *“MilSatCom & the Global Information Security Guarantee: Assessing the Current role and Future Development of Internet-based Applications in Global MilSatComs Information Capacity”*, the workshop’s initial premise was that for many sectors of the world’s economy, access to Internet via satellite is an increasingly important communications tool in delivering mission critical applications. That this was – and is – no less true for the military space (in fact, even more so) is undeniable. Military communications needs are constantly evolving. They require constant flexibility, mobility and scalability to fit with the demands of:

- Theater conflicts
- Next generation military inter-networking
- Development of post-conflict infrastructures
- Personnel morale initiatives

Only satellite can successfully deliver on these requirements while providing outstanding Quality of Service and reliability.

Through a sequence of three sessions, the 2006 workshop examined how the communications needs of the modern, highly mobile and multi-functional military unit can be, and are, met by state-of-the-art satellite technologies, providing connectivity to the Internet for access to next generation applications and technologies.

The three-part program offered:

- **Theatre Conflict Environments & the MilSatCom Internet Space: Military communications over IP: High security for voice, data and video**

**[1]** Internet over satellite in the 'battlespace': Keeping the mission critical satellite-based application secure.

**[2]** Above and beyond the horizon: Expanding the functionalities of satellite applications within the secure 'battlespace' intelligence arena.

**[3]** Mobility and the 'intelligent' warfighter: Accessing the mission-critical application over satellite... on the move.

- **Evolving MilSatCom, Evolving Applications: Next generation satellite-based technologies and IP-based applications**

**[1]** Next generation MilSatCom: Pointing the way for more secure traffic in the commercial satcoms arena?

**[2]** Evolution of satellite access: How will things change with next generation 'inter-networking'?

**[3]** Is the military space influencing the shape of applications over the 'internet-to-come'?

- **Securing & Leveraging the Critical MilSatCom Environment for Post-Conflict Operations: New Fixed and Mobile Satellite Communications Infrastructures for Low Security Traffic**

**[1]** Characterizing the demand challenges; supplying and deploying effective satellite and satellite-hybrid solutions. A case study: Iraq

**[2]** Identifying the critical strengths and potential weaknesses of IP over satellite: How is the satcoms industry responding to the demand dynamics of the *mobile* Internet arena?

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**[3]** Does the Internet over satellite provide cost-effective communications solutions to support key post-conflict applications?

**[4]** 'Phoning home': Defining, measuring and costing the low security MilSatCom requirement in servicing personnel morale initiatives.

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[5] Military satellite and the 'turnkey' solutions marketplace: Mission-ready or costly upgrade?

## *MilSpace and MilSatCom*

The milspace environment does, of course, extend far beyond the specific boundaries of the milsatcom arena. Future GVF programs devoted to the role of satellite in the military "vertical" will clearly acknowledge this by drawing out the distinction between milsatcom as a primary subject/focus and milsatcom as a secondary focus. Then, the role of milsatcom assets is in supporting the broader milspace environment. To put it more simply, the milsatcom may sometimes usefully be viewed as a subset of the milspace.

*"Maximizing the Application of Space-based Resources for the Military Requirement via Future Generation Communications Networking"* is the subtitle of a workshop program that is now in development. The objective of is to take an overall view of the planning of future strategic milspace communications capabilities, and the development of associated critical assets.

The ability of a military force to leverage communications networks to obtain and maximize its exploitation of information on everything from enemy strategic planning to tactical deployments, from geospatial intelligence to meteorological systems analysis, from navigational asset tracking to combat unit communications, and from terrorist-threat assessment/elimination to infrastructure protection and 'cybersecurity', is dependent on reliable satcoms systems which provide for constant flexibility, mobility and scalability.

Such a high-level of dependency necessitates the various arms of the military – and the governments which direct and fund them – engage in the long-range, strategic planning to guarantee future military needs are successfully met. The private sector satellite systems vendor must play a role in this strategic planning too, necessitating effective link decision-making in all aspects of resource allocation, performance measurement and accountability processes.

Programs that comprise the future of milspace communications require the development of investment strategies that give priority to questions of funding and the establishment of a sound business case prior to the first phases of an acquisition program. The leaders of this future GVF workshop will focus on detailed analyses of precisely how the private sector vendor community – the developers and providers of state-of-the-art satellite networking technologies – contribute to the strategic planning agenda and system capability delivery.

Looking back to early 2007, the nature of milspace was changed by two important geo-political strategic developments – one

arising from the western extremity of Asia, the other from the Eastern extremity.

- **Iran:** As well as elevating a region-wide perception of an imminently enhanced missile threat and of a future potential military threat that may extend even to the eastern-most parts of Europe, the Iranian conversion of its most powerful ballistic missile type into a satellite launch vehicle will, in the longer-term, help to facilitate the Iran regime's independent communications satellite launch capability. This situation has just recently been exacerbated by the Tehran regime's unveiling of an even-more extended-range ballistic missile. Iran in the broadband IP-space certainly compromises the future regional milspace.
- **China:** China has effectively – though without patently overt hostility and with plentiful denials about any escalation of the militarization of space – signaled its capability to further occupy and influence the milspace. Described in the western press as a "small ballistic missile" and by Chinese sources as a "civilian launch vehicle", an anti-satellite 'kinetic kill vehicle' targeted and destroyed an ageing Chinese weather satellite at an altitude of 537 miles. This indicates China has "mastered key space sensor, tracking and other technologies important for advanced military space operations. China can now also use 'space control' as a policy weapon to help project its growing power regionally and globally." (*Aviation Week & Space Technology*) A Chinese capability at such altitudes certainly poses a potential threat to imaging reconnaissance and other satellites operated by governments around the world. This is serious enough, even if only as an enabler of wider policy leverage, but may even be taken to pose a longer-term threat to all forms of satellites – in the milspace and elsewhere.

This planned workshop program will also include coverage of the following key themes:

- Future Developments in MilSpace Communications Infrastructures
- C4 Technologies Evolution & the MilSpace Requirement
- Inter-Satellite Links & Enhancement of Speed & Security
- SatComs Networking & the Defence of Key Space-Borne Military Assets
- Safeguarding the MilSpace: From Space Command to Space Control
- The 'Business' of MilSpace: The Dynamics of Planning, Acquisition & Deployment
- Effective National Space Policies for the War Fighter/First Responder Interface

and further information about this and other future GVF program activity may be obtained by contacting [martin.jarrold@gvf.org](mailto:martin.jarrold@gvf.org).



Martin Jarrold joined the GVF in June 1991 and was appointed to the position of Chief of International Programme Development. His particular responsibilities include outreach to the member organizations of the GVF and to further develop the profile of the Forum within the satellite communications industry, as well as across the global telecommunications policy and regulatory community.

Prior to joining the GVF, Mr. Jarrold was Commissioning Editor and Head of Research for Space Business International magazine. Mr. Jarrold holds an honors degree in History and Politics from the University of Keele in the United Kingdom.

## EARTH STATION ANTENNA SECURITY AND SURVIVABILITY

by Tony Castronova, SES Americom

### *Introduction*

Today's requirements for secure, interoperable communications systems, as well as rapidly deployable networks for emergency response, are driving the need for inexpensive, simple, satellite earth station antennas, ranging in size from sub-meter to 5 meters in diameter. When selecting and siting antennas, systems engineers rarely consider the earth station antenna's vulnerability to damage or destruction by the forces of nature or man.

The antenna, and in some cases antenna mounted Ground Communications Equipment, represent the most vulnerable components of any earth station installation. Mounted in plain sight and exposed to the elements, antennas are at risk of damage from high winds, or even deliberate attack. This article explores ways and means of mitigating the risk of damage or destruction of earth station antennas.

While satellite communications systems can offer a higher degree of security to users than terrestrial networks, systems engineers must be aware of the underlying security risks of an earth station and the methods of mitigating these risks. A fiber optic communications network has a 'linear vulnerability profile,' meaning the fiber optic cable is vulnerable at every point along its length; this can cover many thousands of miles. Repeaters, blockhouses, telephone central offices and local loops are vulnerable, as well. Damage

from natural disasters such as fire, flood or prolonged power outage, and intentional or inadvertent cable breaks, are nearly impossible to avoid. The reliability and availability of fiber networks depend upon having the ability to re-route traffic around failed sections of the network on diverse paths.

An end-to-end satellite communications system has a 'point of presence' vulnerability profile. Failures can occur, and vulner-

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ability exists, only at the points where equipment exists: the satellite, associated earth stations, and any terrestrial interconnections. The reliability and availability of a satellite network can rival that of a common terrestrial network, when proper consideration is given to system design. The satellite itself is hardened against damage by the harsh environment of outer space. Only a sophisticated and determined attacker can even consider a direct attack on orbital assets operating more than 22,000 miles above the equator. This leaves the earth stations, and other points of presence on the ground, which if properly designed and executed, can be made less vulnerable to attack, failure, or damage from natural phenomena than most other communications facilities.

## *Risks and Solutions: Environmental*

When selecting the location for an earth station antenna of any size, the primary consideration is to ensure a clear view of the orbital arc, which allows the antenna to 'see' the maximum number of satellites. Placing an antenna on a rooftop is often the optimal solution. However, extremely high winds can damage or destroy a parabolic dish antenna.

Most properly installed earth station antennas are designed to survive winds of at least 60 or 70 miles per hour. When located in areas prone to hurricanes, tornadoes, or seasonal periods of high winds that can exceed these speeds, special considerations should be made in selecting the location of the antenna.

Properly siting the antenna can increase the chances of surviving high wind conditions. Locating an antenna on the leeward side of buildings or hillsides, or using large roof structures, such as air conditioning units as windbreaks, while maintaining a clear view of the orbital arc, can make the difference between an antenna's survival or destruction in a storm. As every rooftop antenna installation is unique, it is important to work with the building owner or landlord in order to determine the optimum location.

Many manufacturers make antennas and antenna mounts capable of surviving higher wind conditions, than standard units. High wind antennas are more robust, and reinforced mounts should be considered in areas having an elevated risk of wind damage to outdoor structures.

In the case of non-penetrating roof mounted antennas being installed in high wind areas, the maximum amount of ballast recommended by the manufacturer must be installed, or even exceeded, in order to ensure that the antenna does not move from its moorings during high wind conditions. The ability of the roof to bear this additional load must be considered to avoid damaging the building upon which the antenna is mounted. In general,

hard mounting an antenna to a building is preferred over the use of a non-penetrating roof mount.

Having a replacement antenna available in the event of an emergency is a costly, yet highly effective means of mitigating the risk of prolonged outages in crucial networks. Installing a second, fully equipped and operational antenna on a nearby building provides full redundancy, and 'space diversity' for the system. While costly, this risk mitigating option may be appropriate in high priority, high value communications networks.

## *Deliberate Attack*

The antenna is, by necessity, the most visible component of any earth station. In a hostile or post 9/11 domestic environment, a knowledgeable assailant can incapacitate an earth station antenna, of any size, with nothing more than a high-power hunting rifle.

A metal parabolic reflector can actually absorb a reasonable number of bullet impacts before its performance begins to degrade. The number of impacts it can withstand is roughly proportional to the size of the reflector. On the other hand, a fiberglass reflector is somewhat more vulnerable to gunfire by virtue of the fact the resin used in its construction is brittle and portions of the reflector will break away when hit. Therefore, a fiberglass antenna's performance will begin to degrade when the first bullet strikes; mechanical failure could eventually occur.

While the main reflector of an earth station antenna presents an inviting target, it is capable of absorbing a limited amount of gunfire without immediate impact on the earth station's operation. A knowledgeable assailant will target the antenna's feed horn, or in the case of a VSAT, the RF Package, rather than the reflector. A few well-placed rounds into the feed horn or RF package could knock an antenna of any size off the air from hundreds of yards away.

While the external RF components of an antenna, as well as connecting cables and waveguide are highly vulnerable to damage from gunfire, or other projectile weapons, steps can be taken to reduce the vulnerability of these components at critical, high-risk, or high value facilities. Locating the antenna out of direct site from surrounding terrain or buildings is the best method of protecting it from all forms of projectiles. Buildings, terrain contours, plantings and screening walls can all be used to maximum effect in protecting an earth station antenna. Roof mounted antennas can be located in such a way that they are not visible from the ground. Air conditioning units and other roof mounted building elements can also be used to good effect in screening an antenna from view and eliminating sight lines that could admit dangerous gunfire.

As in the case of windstorm protection, having a replacement antenna, or spare parts available in the event of an emergency is a somewhat costly, yet highly effective, means of mitigating the risk of prolonged outages in crucial locations of high value networks. Installing a second, fully equipped and operational

antenna in a secure area, provides full redundancy, and 'space diversity' for the system. While costly, this last option may be viable in high priority communications networks.

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Limiting access to ground mounted antennas is critical to communications system security. To limit access by the public, fencing is most commonly installed around an earth station antenna. But protection from vehicular collision should also be considered, especially for critical communications networks. Solid steel and concrete bollards, walls, high curbs, berms, swales, decorative barriers, Jersey Barriers, or sandbags may be appropriate, depending upon the situation.

## *Critical Communications Conclusions*

Earth station antennas providing high value, critical communications links must be protected against natural, and man-made threats. While some devastating situations are unavoidable, it is incumbent upon systems engineers to design a level of security and survivability into earth station facilities, which is commensurate with the importance of the communications traffic being carried by the facility. Selecting an appropriate location for the antenna can greatly increase its chances for surviving a storm or avoiding deliberate attack. Providing sufficient spares, and or redundancy/diversity can avoid outages or greatly reduce down time in the event of an interruption caused by either weather or attack. ■



As a Principle Member of SES Americom's Engineering Staff, Tony Castronova designs and builds satellite communications earth stations using antennas that range in size from 1-meter to 21-meters in diameter. While serving in the U.S. Air Force, and throughout his 32 year career in the satellite communications industry, Tony has faced numerous situations where the physical security of communications antennas has been a major concern.

# MILITARY NEWS OF INTEREST

## *Agilent's Powerful Power Purveyors Provided To USN*

**Agilent Technologies Inc.** [NYSE: A] finds the U.S. Navy selecting the company's test equipment for the **General Purpose Electronic Test Equipment**



program. The five-year contract, awarded by the **Naval Inventory Control Point**, is valued at approximately \$3.3 million. The Agilent test solution includes the **Agilent E4418B** power meter and **Agilent 8481A/8481D** power sensors, a combined unit that provides accurate, true-RMS RF power measurements for electronic systems support—*Santa Clara, California*

## *Aussies Go With WGS*



The Australian Minister of Defence has made all official... the **Australian Government** will enter into a A\$297M partnership with the U.S. to access a world-leading communications capability provided by the new **Wideband Global Satellite Communications (WGS) Constellation**. Australia will fund one satellite as well as associated ground infrastructure to extend the constellation to six satellite. The U.S. will fund the remaining five WGS satellites.

## *Broadcom Chips Away At 802.11n With Silicon Wonderment*



**Broadcom Corporation** [NASDAQ: BRCM] has announced the world's first full-featured, single chip 802.11n solution. The neWest member of the Broadcom **Intensi-fi** product family is the smallest and most cost-effective 802.11n solution on the market and is the first to enable Wi-Fi products to achieve over 200 Megabits per second (Mbps) of actual wireless throughput—*Irvine, California & Beijing, China*

## *Modem Government Work For Comtech EF Data*

**Comtech Telecommunications Corp.** [NASDAQ: CMTL] subsidiary, **Comtech EF Data Corp.**, has garnered a \$1.2 million order from the **U.S. Department of Defense (DOD)** for satellite communications infrastructure equipment. The equipment will be deployed to support a new, managed satellite-based communi-



cations network. The order consists of the **turboIP(R)-45 Performance Enhancement Proxy**, the **SLM-5650 Satellite Modem** and the **Vipersat Management System (VMS)**. The turboIP-45 was designed to combat the inherent challenges of transmitting Transmission Control Protocol (TCP) over satellite links. Transparent acceleration of TCP sessions is supported as well as the

Space Communications Protocol Standard Transport Protocol (SCPS-TP). Designed specifically for government satellite networks, the SLM-5650 Satellite Modem complies with the requirements of the Defense Satellite Communications System (DSCS) defined in Military Standard (MIL-STD)-188-165A, modem types I, II, IV, V and VI. This high-speed modem supports data rates up to 155 Mbps.

## *DataPath's Swan Smiles*

**DataPath, Inc.** has received US\$8.7M in delivery orders for continued support and enhancements to the **U.S. Marine Corps' Support Wide Area Network (SWAN)** programs. Under the delivery orders, DataPath will upgrade VSAT fly-



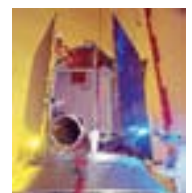
way systems and Satellite Transportable Terminals (STTs). The company will also provide spares kits, training programs and other services and support. —*Duluth, Georgia*

## *Joy At ESA With Flight Software*

The compatibility of the final **Jules Verne Automatic Transfer Vehicle (ATV)** flight software has been successfully tested for the first time in coordination with the **European Space Agency (ESA)**. Additionally, the remainders of the vast International Space Station (ISS) flight software by global teams at the **NASA Software Verification Facility (SVF)** in Houston were also completely tested. This ISS-level stage test, the so-called 'five-box' test, is a new step where the ATV software is integrated into the whole ISS software ground testbed. The testing ran for 12 days over three weeks by about 43 engineers from **NASA, ESA, Astrium, RSC-Energia** and **Boeing** at the SVF Software Development and Integration Laboratory (SDIL), a few miles from NASA's Johnson Space Center. Another 30 people behind the scenes also provided support on site, in Russia and Europe—*Paris, France*

## *GeoEye Looks At Improved Imagery And Buys In*

**GeoEye** owns and operates the **IKONOS** satellite and is nearing completion of the integration and testing of its next-generation commercial satellite, **GeoEye-1**. This space-based camera will provide imagery with a ground resolution of 0.41-meter panchromatic (black & white) and 1.65-meter multispectral (color). When operational, GeoEye-1 will be the world's highest resolution and most accurate commercial imaging satellite. The launch of GeoEye-1 is slated for late first quarter or early second quarter 2008 from Vandenberg Air Force Base, California. The company has announced their MJ Harden subsidiary's (acquired by GeoEye in March of 2007) acceptance of Optech's Airborne Laser Terrain



# MILITARY NEWS OF INTEREST

Mapper (ALTM) Gemini 167 LiDAR imaging unit. MJ Harden is now able to merge imagery from their current digital mapping camera with LiDAR imagery to produce enhanced products ideally suited for large-scale mapping projects, such as mapping flood plains, coastal zones and public right of ways and corridors— *Dulles, Virginia*

## *Globecomm Gets Government Goodies*



**Globecomm Systems Inc.** [NASDAQ:GCOM] has been awarded two contracts from U.S. Government agencies for **Auto-Explorer** portable satellite terminals valued at \$4.0 million. For the first contract, Globecomm will continue the development of its Xband family of portable satellite terminals. **X-band** is primarily used by military and space agencies for non-commercial satellite apps. The second contract is for multiple, 1.2-meter terminals that support Ku band operation. All Auto-Explorer terminals are Internet Protocol (IP)-enabled to accept optional routers and IP satellite optimized solutions. The Auto-Acquisition and Terminal Management Software is designed to allow operation of the terminals by personnel with little or no communications or satellite communications experience. The terminals can receive IP data rates ranging from 64 kbps to 18.2 Mbps and send IP data rates ranging from 64 kbps to 8.4 Mbps—*Happauge, New York*

## *Inmedius Provides Due Diligence For Docs*



**Inmedius, Inc.** now has a multi-user, multi-year contract with **Lockheed Martin Integrated Systems & Solutions (IS&S)** for the use of their **S1000D Publishing Suite**, which will support the production of electronic documentation for Lockheed Martin's **Transformational Communications Satellite (TSAT) Mission Operations System (TMOS)**. The comprehensive, Commercial-Off-The Shelf (COTS) software met the authoring and presentation needs of TMOS to capture, create, manage and deploy technical information assets, supporting the documentation lifecycle. The Inmedius contract also includes maintenance, onsite training and consulting services—*Pittsburgh, Pennsylvania*

## *Juniper IPv6'ing With Lockheed Martin*



**Juniper Networks, Inc.** [NASDAQ: JNPR] is going to team with **Lockheed Martin Corporation** [NYSE: LMT] to develop a pilot **Internet Protocol version 6 (IPv6)** transition test bed designed to simulate a government agency transition. Lockheed Martin will transition a portion of its global network to IPv6 for use during the simulation. To support this transition, Juniper Networks will contribute its high-performance IPv6-capable routers to the test bed for the simulation—*Sunnyvale, California*

## *Contractor Jells Juno To Jupiter Jump*

**NASA's Launch Services Program Office** has selected **Lockheed Martin Commercial Launch Services** for the Juno mission to Jupiter. This is a \$190 million contract award. The work includes the launch service for an **Atlas V** model 551 rocket as well as the payload processing, launch vehicle integration, and all necessary tracking, data and telemetry support. The lift off from Cape Canaveral Air Force Station in Florida is scheduled for August of 2011. The solar-powered spacecraft will arrive at Jupiter in August of 2016 to uncover what may be hidden beneath the planet's thick and colorful clouds. Juno's remote sensing and gravity science measurements will map Jupiter's interior, atmosphere and polar magnetosphere. The primary science goal is to understand the planet's origin and evolution—*Cape Canaveral, Florida & Littleton, Colorado*



## *Loral Locks Up Telesat*

The final Federal Communications Commission (FCC) and the Public Sector Pension Investment Board (PSP Investments of Canada) have given their final, required regulatory approval for the closing of the **Telesat** acquisition by **Loral Space & Communications**. The transaction should now close later this month. You may well recall that on December 16th of 2006, a joint venture company was formed by both of the aforementioned firms to enter into a definitive agreement with BCE Inc. to acquire 100 percent of Telesat Canada's stock for CAD 3.25 billion—*New York, New York*

## *MESSENGER Probe Sim Success*

The **MESSENGER (Mercury Surface, Space Environment, Geochemistry, and Ranging)** probe to Mercury will use low-gain radio frequency antennas and other telecom systems to study various aspects of the planet. The probe's Radio Science team has just completed a month of successful Doppler performance testing sims within an environment similar to what the probe will encounter in space. The tests were conducted from August 20th through September 19th for radio frequency system calibration in order to receive accurate velocity measurements. **Deep Space Network (DSN)** ground stations will receive the probe's radio signals—*Washington, D.C.*



## *Great Galileo Goodies For NovAtel*

**NovAtel Inc.** [NASDAQ: NGPS] has been awarded of a contract worth €6.3M (US\$8.6M) by **Thales Alenia Space Italia (TAS-I)** for the continued development of the **Ground Reception Chain (GRC)** reference receiver for **Galileo**, Europe's state-of-the-art **Global Navigation Satellite System (GNSS)**. TAS-I, NovAtel and

# MILITARY NEWS OF INTEREST

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Space Engineering were initially selected by the European Space Agency (ESA)/ESNIS/Thales Alenia Space France (TAS-F) and began work on the program in June 2005. Since then, NovAtel has been developing technology under preliminary authorizations and has already generated €2.1 million (US\$2.7 million) in revenue between Q3 2005 and Q2 2007—*Calgary, Alberta*

## *Orbital Sciences Boosts Interception*



**Orbital Sciences Corporation's Orbital Boost Vehicle (OBV)**, which is the booster rocket for the **Ground-Based Interceptor (GBI)**, was successfully launched as part of a test of the Ground-Based Midcourse Defense (GMD) program. Orbital provides the OBV as part of an industry team led by **The Boeing Company** [NYSE: BA] for the U.S. Missile Defense Agency (MDA). The OBV was launched from Vandenberg Air Force Base, CA on Friday, September 28th. This action was part of the test designated as **Flight Test Ground-based Midcourse Defense-03a (FTG-03a)**. Following its launch from a silo, the OBV flew downrange over the Pacific Ocean and successfully supported the intercept of a target vehicle launched earlier from Alaska—*Dulles, Virginia*

## *Power To The Project By QinetiQ*

A battery developed by a **QinetiQ**-led consortium, including **ABSL Space Products (ABSL)**, has successfully powered key, scientific payloads during the final stages of the **Foton-M3** mission into space. Foton-M3 is a Russian unmanned spacecraft launched on September 14th from the Baikonur Cosmodrome in Kazakhstan. It was a **Soyuz-U** rocket placed the spacecraft into orbit, with the recoverable spacecraft carrying a payload of more than 40 European Space Agency (ESA) experiments over the twelveday mission—*Hampshire, United Kingdom*



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