

Worldwide Satellite Magazine

May 2011

SatMagazine

***A Tale Of Two Spaceports
Telemedicine
SATCOM Testing
Forrester's Focus
A Chat With Mike Antonovich
Middle East Connections
A Case In Point x2***



SatMagazine

Vol. 4, No. 3 — May 2011

Silvano Payne, Publisher + Author
Hartley G. Lesser, Editorial Director
Pattie Waldt, Editor
Jill Durfee, Sales Director, Editorial Assistant
Donald McGee, Production Manager
Simon Payne, Development Manager
Chris Forrester, Associate Editor
Richard Dutchik, Contributing Editor
Michael Fleck, Contributing Editor
Alan Gottlieb, Contributing Editor
Dan Makinster, Technical Advisor

Authors

Chris Forrester
Beate Hoehne
Hartley Lesser
Pattie Waldt

Published monthly by
Satnews Publishers
800 Siesta Way
Sonoma, CA 95476 USA
Phone: (707) 939-9306
Fax: (707) 838-9235
© 2011 Satnews Publishers

We reserve the right to edit all submitted materials to meet our content guidelines, as well as for grammar and spelling consistency. Articles may be moved to an alternative issue to accommodate publication space requirements or removed due to space restrictions. Submission of content does not constitute acceptance of said material by SatNews Publishers. Edited materials may, or may not, be returned to author and/or company for review prior to publication. The views expressed in our various publications do not necessarily reflect the views or opinions of SatNews Publishers.

All included imagery is courtesy of, and copyright to, the respective companies.

SatMagazine — May 2011 — Payload

InfoBeam <i>The editors</i>	08	Focus A Tale Of Two Spaceports <i>By Jos Heyman</i>	36
Tech Talk Realistic Testing Of Satellite-Based Comms Systems <i>By Beate Hoehne</i>	20	A Case In Point Communication Integration For Emergencies	48
A Case In Point A Stronger Sightline From The NOC	26	Insight Middle East Connections	52
Forrester's Focus Euro-Satellite Rides The Economic Wave <i>By Chris Forrester</i>	28	A Case In Point Globetrotting Journalist	56
Executive Spotlight: SatBroadcasting™ Mike Antonovich, Global Crossing Genesis Solutions	32		

SatMagazine — May 2011 — Advertiser Index

AAE Systems	45	Intelsat General	05
Advantech Wireless	09	MANSAT	47
AnaCom, Inc.	43	MITEQ / MCL	27
Arabsat	25	NewSat	51
APSCC 2011 Satellite Conference	41	Newtec CY	07
AVL Technologies	03	O3b Networks	02
Azure Shine International	19	SENCORE	05
Comtech EF Data	04	Teledyne Paradise Datacomm	06
Comtech Xicom Technology	35	W.B. Walton Enterprises, Inc.	39
Integral Systems	cover + 33	Wavestream	29

Help From The Sky

The International Fund for Agricultural Development has been funding projects in Madagascar for over 30 years to eradicate rural poverty. With the country facing an exploding population and food crisis, the agency is looking skyward for support.



Malagasy farm owner with the land title certificate illustrated by a satellite map.

The **International Fund for Agricultural Development (IFAD)** is not only working in Madagascar but also supporting poor rural people around the world to help them grow more food and achieve better livelihoods.

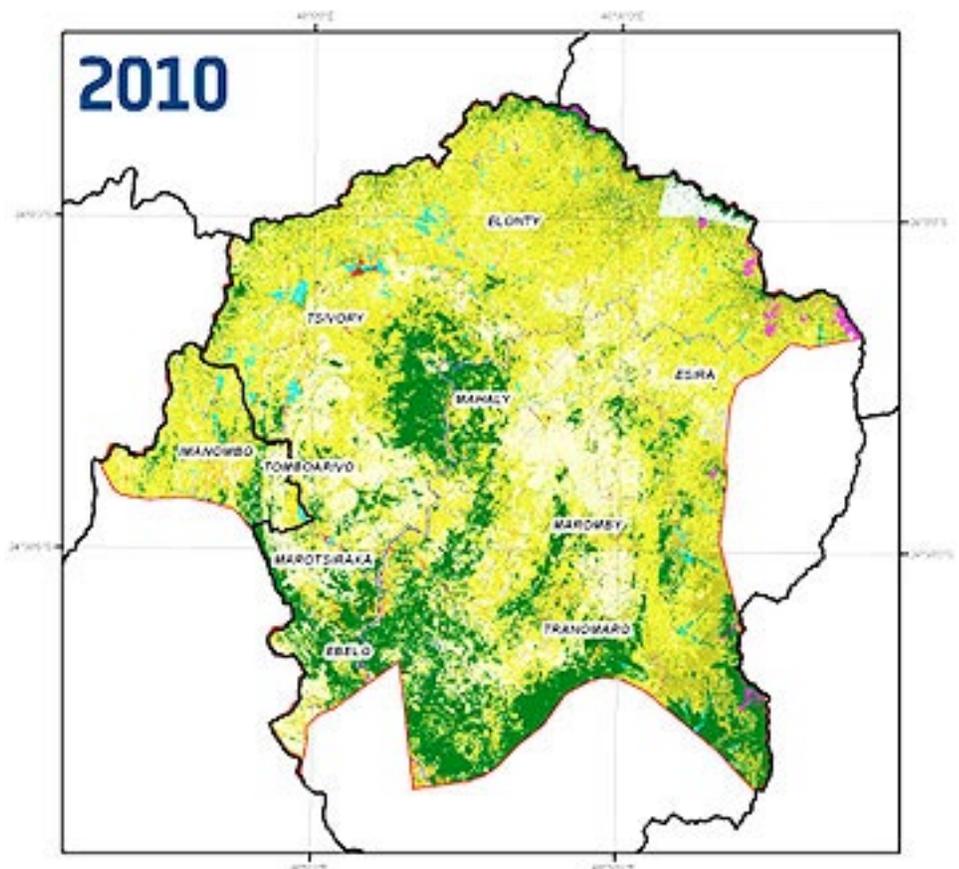
Earth observation satellites allow objective assessments of remote rural areas to help design, plan and monitor the impact of IFAD's development projects. **ESA** and **IFAD** have been working

together to identify the detailed information needed to support selected projects in Madagascar. ESA has carried out three trials to demonstrate how state-of-the-art Earth observation services can provide this information and improve the impact of IFAD's project.

Strengthening Food Security

One of IFAD's projects is to strengthen the food security of the rural population in the dry, famine-prone region of the Mandraré Basin by increasing productivity of the irrigated and rain-fed crops.

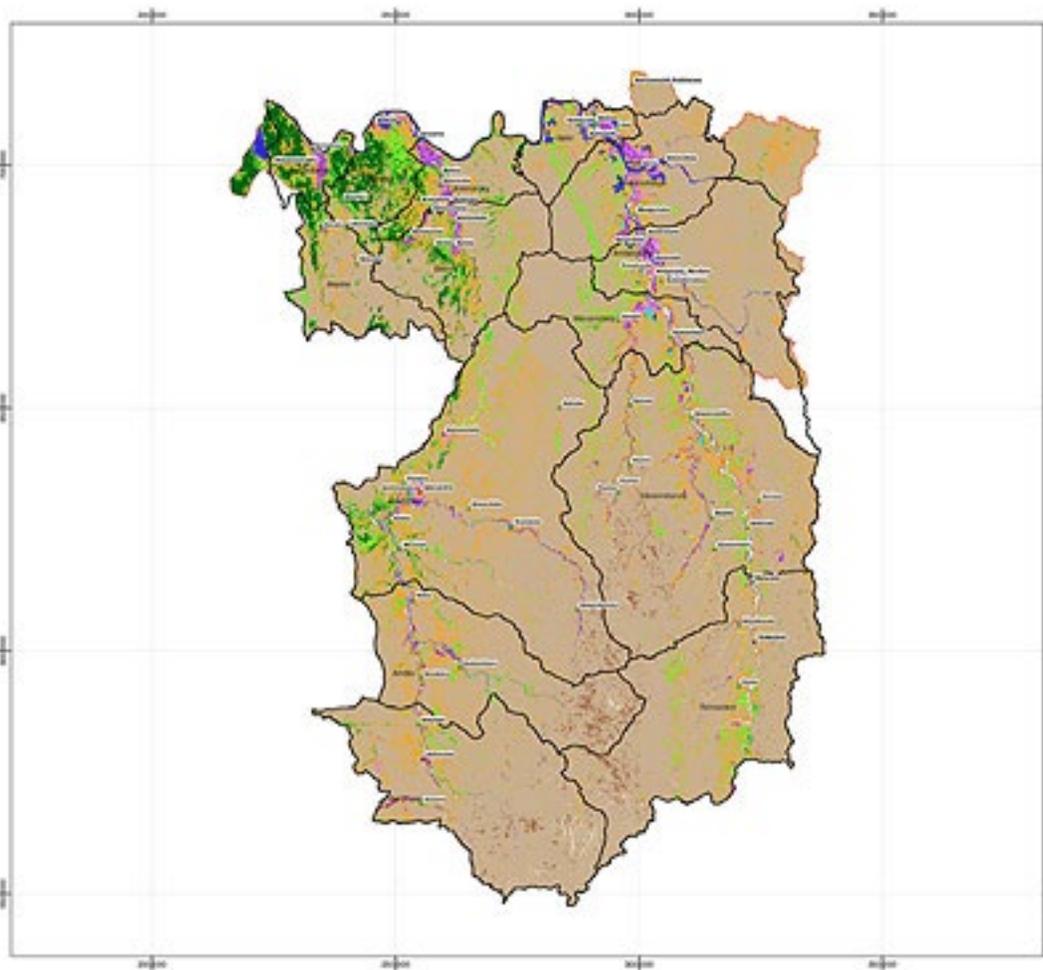
To help IFAD assess the effect of their project and monitor previous activities, the trial delivered satellite maps to determine the current state of crops and changes in land cover over a period of 15 years. "Since remote sensing has become a popular area of study and experts can be found all around the world, incorporating these data into our projects helps us to strengthen local capacity and transfer knowledge to local stakeholders to improve national capacities," said *Benoit Thierry*, IFAD's *Madagascar Country Programme Manager*.



Land cover change detection from 1996 to 2010 in Madagascar's Mandraré Basin to assess the increase of rice acreage under a project funded by the International Fund for Agricultural Development (IFAD).

Credits: GeoVille

Land Cover Map 2009 - Service Trial 2 Area



Land Cover Map 2009



Land cover map of Madagascar’s Menabe region to facilitate the planning of the International Fund for Agricultural Development (IFAD) developing investments, such as irrigation and road construction. Credits: GAF

Improving Development Planning

IFAD’s project to support development in the Menabe region focuses on the sustainable expansion of arable land, mainly through irrigation schemes and securing agricultural land.

In order to allow IFAD to single out areas for further agricultural activities, the trial produced land-cover maps and digital models of the area’s slope and drainage system to pinpoint areas prone to flooding.

“With these products, we can get details about the land and develop action plans much quicker by sending teams only to select areas,” Thierry said.

IFAD is supporting a scheme introduced by the Malagasy Government that offers rural farmers the opportunity to formalise ownership of the land on which they depend.

In order to simplify the exchange of land titles, a mosaic based on

new very high resolution satellite images was produced of three districts in Haute Matsiatra. The mosaic allows IFAD to estimate the location and size of specific fields.

Following these initial trials, IFAD and ESA are discussing how satellite data can support other development activities, including assessing food security, managing water and adapting to climate change.

“If we don’t incorporate this technology into our work

now, I'm afraid we will miss the train," *Thierry* said.

The preceding article is courtesy of the European Space Agency.

Double Departures

A heavy-lift Ariane 5 successfully orbited two satellite payloads on Friday, April 22nd...

The two satellites will supply telecommunications services for two new customers who join the growing list of **Arianespace** commercial launch services users. In a flight conducted from the Spaceport in French Guiana, the **Ariane 5** deployed the **Intelsat New Dawn**, which was built for the new joint venture of **Intelsat** and **Convergence Partners**, as well as **Yahsat Y1A**, the first satellite to be operated by the United Arab Emirates' **Al Yah Satellite**

Communications Company.

Adding to this mission's milestones was the lift performance record for Ariane 5: delivering a total mass of 10,050 kg. to geostationary transfer orbit, of which 8,956 kg. was the combined weight of its two satellite payloads.

Lifting off on time at 6:37 p.m. on the 22nd. in French Guiana, the Ariane 5 climbed through a partial cloud cover at sunset, and continued its downrange flight in clear skies. This allowed a direct view of the separation for Ariane 5's two solid propellant boosters at an altitude of 66.5 kilometers, followed by the payload fairing's jettison at a 105-kilometer altitude. It marked another of Ariane 5's highly accurate flights, with the following estimated orbital parameters at the injection of its cryogenic upper stage:

- ◇ **Perigee: 249.8 km. for a target of 249.7 km**
- ◇ **Apogee: 35,975 km. for a target of 35,956 km**
- ◇ **Inclination: 5.98 deg. for a target of 6.00 degrees**

Yahsat Y1A was positioned in the upper passenger slot of Ariane 5's dual-payload "stack," and was released at 27 minutes into the flight. This spacecraft was built by Astrium and was based on the Eurostar E3000 platform, while its Ku- and C-band communications payload was supplied by Thales Alenia Space. Yahsat Y1A will have a coverage footprint spanning the Middle East, Africa, and Southwest Asia, creating regionally-focused capacity to meet the region's expanding requirements for government, commercial and consumer satellite communication services. Operating from an orbital slot of 52.5 degrees East, it will support Abu Dhabi's ambition to become a hub for media broadcasting and telecommunications services – enabling customers from Europe and South Asia to connect with customers across the entire coverage area.

Intelsat New Dawn, which was deployed from Ariane 5's lower payload position at 35 minutes into the's flight, is owned by a joint venture of Intelsat and a consortium led by Convergence Partners. This satellite's C- and Ku-band transponders are to support the communications infrastructure for African customers who have experienced exceptional growth,



◇ **Ariane 5 lifted off from the Spaceport carrying a record payload mass with its Yahsat Y1A and Intelsat New Dawn satellite passengers. Photo courtesy of Arianespace.**

and contribute to the region's development. It is tailored for voice, wireless backhaul, Internet and media applications services. Built by Orbital Sciences Corporation using its STAR-2 platform, Intelsat New Dawn will be integrated with Intelsat's global satellite fleet and stationed at the 32.8 degrees East orbital location. It was the 52nd satellite launched by Arianespace for Intelsat, the world's leading satellite operator.

Getting Set

The Indian GSAT-8 multi-role spacecraft for Arianespace's next Ariane 5 mission is undergoing an in-depth checkout at the Spaceport in French Guiana in preparation for its liftoff on May 19.

GSAT-8 was built by the *Indian Space Research Organisation (ISRO)* using its I-3K satellite bus, and validations being performed in the Spaceport's S5 payload preparation facility include antenna and solar panel deployments. With a liftoff mass of 3,100 kg., *GSAT-8* carries 24 transponders to augment India's Ku-band relay capabilities, and also is equipped with the two-channel *GAGAN* (GPS and GEO augmented navigation) system. *GAGAN* will support the Indian government's implementation of a regional satellite-based augmentation system to assist in the navigation of aircraft over Indian airspace and in adjoining areas.

The upcoming *GSAT-8* launch will continue India's long-

term relationship with launch services provided by Ariane, which dates back 30 years to the orbiting of the country's *APPLE* experimental payload. In total, 13 Indian satellites have been lofted by Ariane launchers.

For the upcoming launch, *GSAT-8* will be joined by a co-passenger — *ST-2* for the *ST-2 Satellite Ventures* joint company — on Arianespace's third Ariane 5 mission of the year at French Guiana. Arianespace is targeting a total of six heavy-lift Ariane 5 flights from the Spaceport during 2011, along with two initial launches of the medium-lift *Soyuz*, and the maiden flight of its lightweight *Vega*. Additionally, three *Soyuz* flights from Baikonur Cosmodrome are slated for this year, to be performed on behalf of Arianespace by its *Starsem* affiliate.

A Swift Schedule Send Off Space Systems/Loral (SS/L) announced that Telstar 14R/ Estrela do Sul 2 was delivered ahead of schedule for the start of its launch campaign.

The satellite, designed and built for Telesat, arrived early at the Baikonur Space Center in Kazakhstan, where it will be launched in late May aboard an ILS Proton Breeze M

vehicle provided by International Launch Services (ILS).

Telstar 14R/Estrela do Sul 2 is a Ku-band satellite that will deliver services to growing markets that include Brazil, the Continental United States, the North Atlantic Ocean Region, as well as the Andean and Southern Cone region of South America. The satellite has 46 Ku-band transponders and five antenna beams with on-orbit switching capability that will allow its capacity to be reconfigured depending on market demand.

"It is a great credit to the combined efforts of Space Systems/Loral and Telesat that *Telstar 14R/ Estrela do Sul 2* was completed in less than two years' time," said *Dan Goldberg*, Telesat's President and CEO. "When our newest satellite goes into service this summer, it will provide significant benefits to our current and prospective customers, including roughly double the capacity of the satellite it replaces as well as significantly improved geographic coverage and higher power."



Telstar 14R / Estrela do Sul 2 photo is courtesy of SS/L

Added *John Celli*, president of SS/L, “Great teamwork, dedication and focus enabled us to deliver Telstar 14R/Estrela do Sul 2 well ahead of schedule. For Telesat’s customers, the satellite will bring valuable communications capability to some relatively remote parts of the world. It is heartening to know that the satellites that we design and build at SS/L can improve people’s lives by contributing to better healthcare delivery and education, and much needed infrastructure when emergency services are required.”

Telstar 14R/Estrela do Sul 2 will be positioned at **63 degrees West**, replacing Telstar 14/Estrela do Sul, which was also built by SS/L. The new satellite is based on the highly reliable **Space Systems/Loral 1300** platform and has 27 Ku-band transponders that are fixed and 19 that are switchable. With approximately 12-kW of end-of-life power, Telstar 14R is designed to deliver service for 15 years or more.

But wait... there’s more...

Fleet Furtherance

Space Systems/Loral (SS/L) has been awarded a contract to manufacture a spacecraft for Australian telecommunications service provider, SingTel Optus.

The satellite, **Optus 10**, will be used to augment the existing fleet of **SingTel Optus** satellites and to assure the highest level of ongoing service into the future. Optus 10 is planned to be launched in 2013. With 24 Ku-band transponders, the

satellite demonstrates the flexibility of the 1300 satellite platform to accommodate missions requiring smaller satellite payloads. This



Artistic rendition of Optus 10 satellite, courtesy of SS/L

highly reliable and proven platform is designed to provide service for 15 years or longer. Optus 10 will be the tenth satellite in the SingTel Optus fleet to be launched for Australia and the second built by SS/L. In 2003, SS/L provided the bus for **Optus C1** satellite, which also carries a hosted payload for the **Australian Defence Forces**.

“Satellite continues to make sense for Australia,” said SingTel Optus Wholesale and Satellite Managing Director, *Vicki Brady*. “We are pleased to work with SS/L to deliver Optus 10, enabling us to provide support and service to our customers across Australia and New Zealand. As the only Australian full service telecommunications provider to own and operate satellites, Optus 10 expands SingTel Optus’ fleet to be

the largest in Australia’s history.”

“As leaders in our industries, both SingTel Optus and Space

Systems/Loral share a commitment to quality and innovation,” said *John Celli*, president of Space Systems/Loral. “We look forward to providing a spacecraft that will augment the SingTel Optus fleet for many years to come.”

Integration Impetus

EMC Satcom Technologies GmbH

has established

a new benchmark in satellite networks optimization by achieving operational integration with all six of the world’s major TDMA hub systems that cover 90 percent of the market. With satellite capacity across the globe continuing to be in short supply satellite TDMA hub operators are finding that savings and network growth can be achieved by the straightforward addition of the EMC Satcom Technologies’ **NRS RAY** at the hub side only.

“With this milestone it’s clear just how flexible the NRS Technology really is. The owner/operator of any type of the world’s six top TDMA systems can benefit from an average of 30 percent opex savings just by putting the technology at hub”, said James Alderdice, Business

Director, NRS Sales globally. The top six DVB-RCS/TDMA hub vendors comprise more than 90 percent of the world market. As an overlay to the modulator, the NRS Technology allows the inbound carriers to be placed under the outbound with the MHz of the inbound carriers being saved. Operators commonly save 6-12MHz and if those saved MHz are used to grow the network the savings are even greater. The NRS RAY is available for satellite MHz bandwidth cancellation at 12MHz, 25MHz, 36MHz, 54MHz and 72MHz and is completely modulation agnostic. As a hub only installation the NRS RAY achieves these savings without any physical changes to the remotes making it ideal for networks large or small.

EMS SATCOM has now merged with their sister divisions **EMS Sky Connect** and **EMS Formation** to form **EMS Aviation**. EMS Aviation will include the Company's EMS SATCOM division, a leader in Inmarsat SwiftBroadband systems, and the recently-acquired EMS Formation, and EMS Sky Connect, providers of air-to-ground connectivity and Iridium-based tracking and messaging.

A Controlling Presence

Integral Systems, Inc., (Nasdaq:ISYS) has received an Authorization to Proceed from Orbital Sciences Corporation (NYSE:ORB) to provide the major ground segment elements for the MEXSAT-3 satellite program.

MEXSAT-3 is being built by **Orbital for Boeing Space & Intelligence Systems** as a part of a three-satellite, turnkey geomobile satellite system awarded to Boeing in December. An Orbital **STAR2** satellite will provide the complete *Fixed Satellite Services (FSS)* of the MEXSAT satellite system for the Federal Government of Mexico.



To support MEXSAT-3, Integral Systems will provide primary and backup satellite control centers incorporating its industry leading **EPOCH Integrated Product Suite (IPS)**, as well as executable satellite procedures and displays. Integral Systems will also provide primary and backup *Telemetry, Tracking and Control (TT&C)* stations located in Mexico, and deliver its **COMPASS™ Network Management System (NMS)** from **Newpoint Technologies**, a wholly-owned subsidiary of Integral Systems. A turnkey carrier monitoring and frequency planning system based on the **Monics® Carrier Monitoring and Interference Detection** solution from **SAT Corporation**, also a wholly-owned subsidiary of Integral Systems, will be installed at two locations in Mexico. **Integral Systems Europe (ISE)**, a wholly-owned subsidiary of Integral Systems, will provide all antenna and radio frequency aspects

of the ground segment. "Orbital is pleased to contract with Integral Systems to support the ground segment that will serve MEXSAT-3, and looks forward to providing the end user, SCT, with a product that allows them to maximize their goals and objectives through an established teaming relationship that combines the best of Orbital

and Integral Systems," said *William Cook*, Orbital's MEXSAT Program Director. Additional information

regarding the EPOCH System is available at:

<http://www.integ.com/EPOCHTC.html>

Connectivity Connections

SES WORLD SKIES has three new capacity deals with Global Crossing to meet growing connectivity demand across Latin America. The agreements represent the latest expansion in a longstanding alliance between SES WORLD SKIES and Global Crossing's Latin America unit, which now uses about 290 MHz of capacity aboard SES satellites to serve markets across the region.

On the heels of last year's 90 MHz renewal on NSS-10, **Global Crossing** secured an additional 12 MHz of C-band capacity on the spacecraft to enable the implementation of a new VSAT network to meet growing demand for corporate connectivity

in Brazil. Global Crossing also has contracted for a full 36 MHz transponder of Ku-band capacity aboard **AMC-4** to provide corporate voice, video conferencing, internet access and other offerings in the Andean region using a newly installed hub in Colombia.

Under the third deal, the telecom innovator is increasing its corporate network capacity with an additional 10 MHz of Ku-band on NSS-7 to meet the communications needs of mining and manufacturing companies, multinationals and other firms across Argentina and Chile.

Consummate Connector

TE Connectivity (TE) has introduced the Quadrax D-Sub style connector for military and commercial aerospace environments. The new connector was designed to provide a gigabit Ethernet solution in an industry standard D-Sub platform, while offering superior shielding performance.

The **Quadrax D-Sub** style connector was created to meet the high-speed data rate needs in commercial avionics, aircraft data networks, in-flight entertainment systems and military communications applications. The rugged metal shell construction provides four Quadrax connections in a size 3 shell with a 0.5" x 2.0" window, and supports both cable-to-cable and cable-to-board configurations. It serves as a low-profile alternative to the Circular 38999 Style Connectors, providing

the perfect solution for cable-to-PWB high-speed interconnect.

The easy-to-assemble connector features cable applied plug and receptacle, along with Right Angle PCB Mount receptacle. It also meets the requirements of TIA/EIA-568-B.2 for insertion loss, return loss, as well as near end crosstalk (NEXT) and far end crosstalk (FEXT).

The Race Is On...

This 3,000 km race starts in Darwin and ends in Adelaide, and this university team is going to be highly reliant upon this Company's SATCOM products...

Thuraya Telecommunications Company will be sponsoring the *Istanbul University Solar Race Team* in the **World Solar Challenge** across the continent of Australia. During this week-long international green technology initiative, the Turkish racers will be depending on **Thuraya IP** and **Thuraya XT** as their full communication solutions.

There are 11 countries participating in this car race which takes place on a bi-annual basis. Thuraya provides ubiquitous coverage over Australia and Tasmania, even in remote areas through its satellite network, all within the

Thuraya-3 satellite coverage area that spans the Asia Pacific region. Thuraya is coordinating with Turkish communications specialists **TEKNOMOBIL** for the provision of equipment to the Istanbul University Team. **TEKNOMOBIL** are also a long-standing Thuraya service partner. Thuraya XT IP54/IK03 certified making it dust, splash water and shock proof. It has the fastest data service on a satellite handheld and supports GPS waypoint navigation. Thuraya IP is A5 sized and is the world's smallest satellite broadband solution that supports 384 Kbps data streaming — based on a plug and play system facilitating use without additional software. The terminal provides asymmetric streaming allowing users to freely select upload and download speeds for cost-effective service.

Hosted Payload Alliance Hosts First Meeting
Due to challenging budgets, in both industry and government enterprise, creative solutions were shared at the first meeting of the Hosted Payload Alliance...

More than 120 representatives from industry and government recently attended the first meeting of the **Hosted Payload Alliance (HPA)**, an organization formed earlier

THURAYA 
stay close



this year to advance the use of hosted payloads on commercial satellites. The meeting took place April 11, 2011, immediately prior to the **National Space Symposium** in Colorado Springs.

diverse group of attendees for the first general meeting of the Alliance is a clear validation of the need for this sort of forum.”

Lord commented, “Federal budgets

for many space programs are being reduced. Hosted payloads present an opportunity for the government to leverage commercial investments to provide access to space. But there

is a lot of work to be done to align the government’s operational requirements and timetables with the commercial constraints of the private sector when it comes to the details of acquiring, designing, manufacturing and deploying payloads into space.”

The panel of experts discussed ways that the U.S. government would benefit from using commercial spacecraft to host certain missions. The benefits include significantly lower cost, shorter development cycle times, the opportunity to share orbital slot locations, and the ability to disaggregate assets for a more resilient space architecture.

Thoma noted that the HPA is not a lobbying organization, but strictly a group of companies interested in furthering the goals set forth in the National Space Policy. It will also have a strong educational focus, providing a source of industry expertise on hosted payloads on commercial satellites to stakeholders

in the public and private sectors. Steering Committee members include **Boeing Space and Intelligence Systems, Intelsat General Corporation, Iridium Communications Inc., Lockheed Martin Space Systems, Orbital Sciences Corporation, SES WORLD SKIES U.S. Government Solutions, and Space Systems/Loral**. Membership will be open to other satellite operators, satellite manufacturers, system integrators and other interested companies. The Steering Committee is working to create an organizational structure and identify specific tasks and action plans for the group and will issue guidelines for prospective members to join the Alliance.

Engineering Examples
Gazing through infrared cameras and building paper structures strong enough to hold textbooks are just a few of the many activities elementary, middle and high school students throughout the Chicagoland area are taking part in to learn about engineering.

This year, **Northrop Grumman Corporation’s Discover “E”** (engineering) program sent more than 50 engineers to 35+ local schools to promote science, technology, engineering and mathematics (STEM) concepts. “The Discover E program has been a great benefit to my students and I believe has been very influential in sparking interest in some of my students to pursue engineering careers,” said **Paul F. Piel**, science teacher at **St. Peter Lutheran School**. “Thanks again to Northrop Grumman and



Retired Gen. **Lance W. Lord**, former Commander, **U. S. Air Force Space Command**, moderated a panel of senior government officials who presented their perspectives on the opportunities and challenges associated with operationalizing the guidance outlined in the *2010 National Space Policy*. The policy calls on government departments and agencies to explore the use of innovative, nontraditional arrangements — including hosted payloads — for acquiring commercial space goods and services to meet U.S. government requirements.

“A major goal of the Hosted Payload Alliance is to serve as a bridge between government and private industry to foster an open dialogue between potential users and providers of hosted payload capabilities,” said **Don Thoma**, chairman of the *HPA Steering Committee*. “The fact that we brought together such a large and



Students at Fox River Grove Middle School put their mechanical and structural engineering skills to the test as they design and build a “paper table” during a recent Discover E visit from Northrop Grumman Engineer Mark Trandel.

everyone who has been involved in providing this wonderful experience to my students.”

Each year, representatives from the company’s Rolling Meadows facility visit local schools in Rolling Meadows and the surrounding counties to share their engineering expertise, discuss potential careers in engineering and involve the students in hands-on classroom projects and activities. Each school visited receives a stipend from Northrop Grumman to support math and science-related programs and activities

“Northrop Grumman is committed to working with students in the community, especially when promoting engineering and related fields through STEM education,” said *Jeff Palombo*, sector vice president and general manager of Northrop Grumman’s Land and Self Protection Systems Division. “Our goal is to

inspire area students to pursue math and science-related careers and to encourage them to become future engineers and technologists.”

The *National Society of Professional Engineers* introduced Discover “E” many years ago as part of an outreach effort aimed to foster

student interest in engineering. Northrop Grumman has been a major sponsor of Discover “E” in the Chicagoland area for the past 13 years in an effort to help address a critical national need to identify, cultivate and motivate the engineers of tomorrow.

Beijing Bound

The China Satellite 2011 Conference and Exhibition will be held on 26th - 28th of this October at Hotel Nikko New Century in Beijing.

China Satellite is a large-scaled, comprehensive, international conference that focuses on the area of the Chinese satellite application industry. It has been 13 years since the first **China Satellite Conference**, which was held in 1999. The conference will include keynote speeches, an equipment

exhibition, technology lectures and roundtable discussions, becoming an open platform for professionals to discuss the development of satellite communication, satellite broadcasting, satellite remote sensing and navigation and location and more.

In China, the satellite communication and satellite TV service markets are being energetically promoted in rural and remote border areas. The participants of this conference come from all the areas covering broadcasting, communication, military, power industry, water conservancy, oil industry, education, meteorology and navigation. The China Satellite Conference will pay attention to market development, business cooperation, channel expansion and so on, providing an effective business platform for interaction between the products and solution providers and the buyers. Many more details will be available during this conference and further details are available at...

<http://www.china-satellite.org/index.htm>

Outer Space Issues 2011

There are outstanding issues in the coming year that deserve increased attention in terms of global outer space activities — from tackling the growing problem of orbital space debris, enhancing Earth security via satellite data, protecting our planet from Near Earth Objects, and assuring a sustainable space environment for all nations to improve their well-being.

“Space isn’t the ‘new frontier’ any more. It’s an integral part of our daily existence,” said *Cynda Collins Arsenault*, President and co-founder of **Secure World Foundation (SWF)**. “As we move into 2011 new ideas for the practicalities of utilizing space are coming forward. Working collaboratively to know ‘what’s where’, coming to agreements on responsible behavior in space, and a cooperative approach to understanding and responding to threats from asteroids, they are all on the SWF agenda for 2011.”

There is no doubt that space satellites continue to bring us perspective and solutions for many of Earth’s issues,” *Arsenault* added. “SWF continues to work on understanding our impact and responsibility to the larger ecosystem in order to reap the benefits it has to offer.”

Stronger Push

“This has been an exciting year for advocates of a stronger push toward the goal of space sustainability,” *Dr. Ray Williamson*, Executive Director of Secure World Foundation. Williamson said that from the new *U.S. Space Policy* to the **European Union’s Draft International Space Code of Conduct** to the new *Working Group on Space Sustainability* in the *United Nations Committee on the Peaceful Use of Outer Space (COPUOS)*, “the world community has shown a new understanding and a new willingness to tackle this important issue for the long term utility of space activities.”

On the other hand, SWF’s Williamson noted that much remains to be done. “Space faring countries need to be more aggressive in tackling the ongoing problem of space debris, which threatens to undercut our ability to use space for human benefit. They also need to find improved means to use the information that satellites provide for human benefit,” *Williamson* said.

Impressive List Of Activities

Throughout 2010, Secure World Foundation has chalked up an impressive list of activities, including:

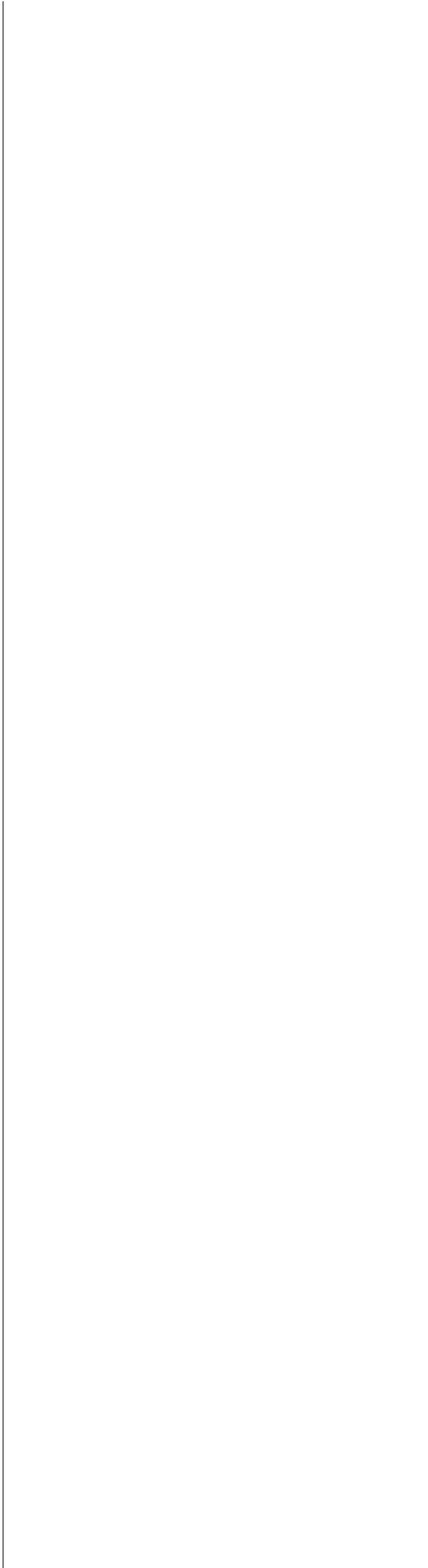
- ◇ **Convening meetings on steps needed for securing a more sustainable environment in outer space, as well as advocating transparency and confidence-building measures.**
- ◇ **Partnering with China’s Beihang University in Beijing and International Space University in Strasbourg, France to work on orbital space debris mitigation issues.**
- ◇ **Encouraging dialogue and conducting analysis of President Barack Obama’s National Space Policy.**
- ◇ **Joining forces with the French Institute of International Relations’ (Ifri) Space Policy Program to foster an open discussion on topics of mutual interest in the arena of outer space security.**
- ◇ **Engaging in active dialogue with participants in the Sixth**

Space Conference of the Americas in Pachuca, Mexico regarding Latin America space policy development. SWF played a leadership role in helping to shape the Pachuca Declaration and the Plan of Action of the 6th Space Conference of the Americas.

- ◇ **Outlining with international experts needed steps and concerns in establishing a global detection and warning network to deal with possible Near Earth Object (NEO) threats to Earth. SWF contributed to a special NEO report to the United Nations Committee on the Peaceful Use of Outer Space (UNCOPUOS).**
- ◇ **Issued fact-filled briefs on the U.S. government’s Space Situational Awareness Sharing Program, the Iranian space program, and the U.S. Air Force X-37B’s orbital space plane project.**
- ◇ **Advocated for “Citizen Science” and “Community Remote Sensing” to push for the combining of Earth remote sensing satellite data with social networks to establish a “take charge” public management of local environmental issues.**

For further information about Secure World Foundation (SWF), go to: <http://secureworldfoundation.org/>

InfoBeam



Realistic Testing Of Satellite-Based Comms Systems

By Beate Hoehne, Agilent Technologies

Providers of high-end and satellite-based communications systems seem to face never-ending demand for new services, new capabilities and greater data capacity. As a result, system designers are pushing communications hardware to operate with wider bandwidths, at higher carrier frequencies, or both.

For years, a 1 GHz bandwidth provided sufficient headroom for a wide range of services. Today, however, the need to move more data in less time is driving modulation bandwidths to 2 GHz or, in some cases, 5 GHz. In addition, these bandwidths must be available at increasingly higher carrier frequencies.

These changes present challenges to designers, and they also have implications for the testing and analysis of communication systems, subsystems and components. As described below, the necessary test equipment must provide sufficient frequency coverage and bandwidth as well as the appropriate modulation and demodulation capabilities.



Picturing The Challenges

The globalization of “information anywhere, anytime” can create challenging, but common, scenarios. For example, it’s easy to imagine a video transmission originating from a mobile phone in Japan and being received by a viewer in Europe or North America. The challenges aren’t limited to commercial applications: Military communication systems are expected to handle more information in less time, and must do so in a highly reliable and secure manner.

Across these scenarios, the systems may use standards-based modulation (*e.g.*, WCDMA, WiMAX), specialized variants based on those standards, or fully proprietary modulation schemes. With digital modulation techniques, wideband communication systems can provide better security and improved immunity from interference. These developments further intensify the challenges in testing and analysis.

Satellite-Based Systems Focus

Because so many satellites are already in orbit, the most cost-effective approach is to modify the existing infrastructure. This can be done with new modulation techniques that enable higher data rates and expand overall system capacity. As an example, using 16-QAM and 1 Gsymbol/s can provide a data rate of 4 Gb/s.

The alternative is launching one or more new satellites. Getting a new bird in the air presents another set of challenges, in particular the need to ensure interoperability between new and existing communication links. Such links may be required between terrestrial and space-based communications, or between satellites and multiple types of military radios.

Defining A Viable Test System

The preceding scenarios begin to outline the challenges in testing and analysis. Further complications come from the nature of wideband signals: They contain a significant amount of distortion, which makes it difficult to make valid measurements.



Figure 1. This test setup enables receiver and transmitter testing

Four essential pieces of test equipment can address these challenges (*Figure 1*). On the receiver side, the first item is an *arbitrary waveform generator (AWG)*, which can simulate the necessary modulated signals. Next is an

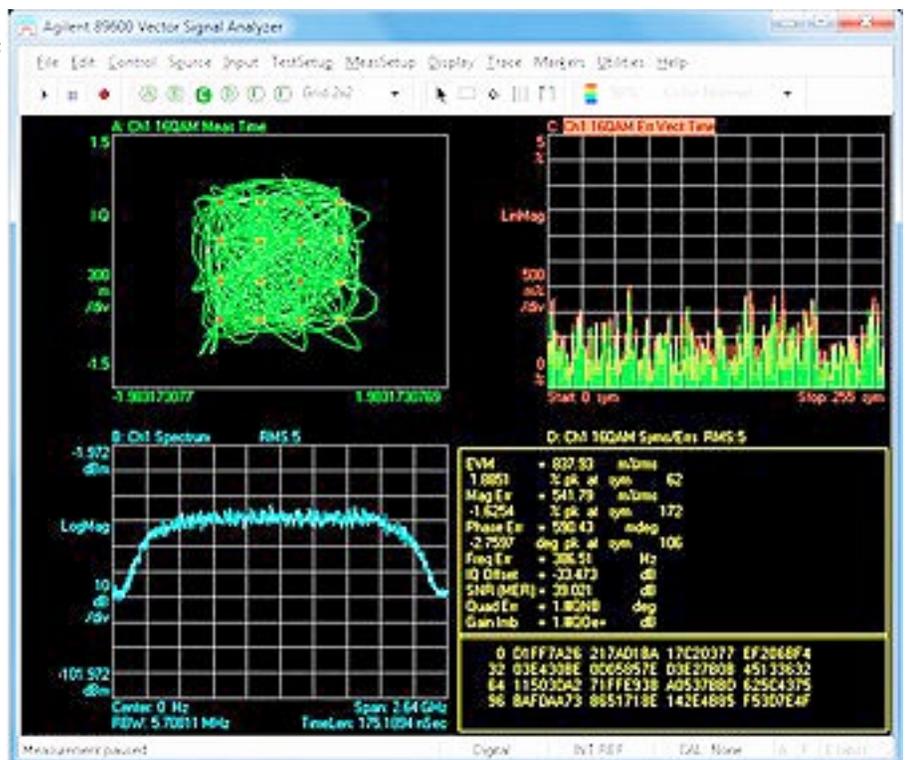


Figure 2. EVM is less than 1 percent in this example measurement

upconverter, which translates the modulated signal up to the required RF frequency.

Measurements on the transmitter side benefit from two devices, a signal or spectrum analyzer and a wideband oscilloscope. Either of these may be enhanced with *vector signal analysis (VSA)* software that provides the necessary demodulation capabilities and essential measurements such as *error vector magnitude (EVM)*.

Making The Essential Measurements

Many communications standards use EVM as a key indicator of system performance (*Figure 2*). As a result, the test setup itself must have a very low EVM. This will improve the likelihood of detecting subtle problems within the *device under test (DUT)*.

Another proven test is a measurement of *noise power ratio (NPR)* using a multi-tone stimulus. Even though this technique has been around since the 1950s, it is an informative measurement that can substitute for measurements of *intermodulation distortion (IMD)*.

An IMD measurement focuses on the middle of the signal band. In contrast, the multi-tone NPR test can cover the entire band with a single measurement. It also creates large signal peaks that stress the communication channel more than, for example, a two-tone test. The resulting measurement provides an at-a-glance view of the noise and distortion characteristics of a communication link.

Multi-tone has another advantage: The greater the number of tones, the greater the power in the band and the more

accurate the test results. Ensuring a steady measurement result requires the use of hundreds or thousands of tones, and all must stand out against any distortion present in the link (*Figure 3*). This technique uses a notch filter, and the center frequency and width of the notch can be easily controlled. In effect, the scope or analyzer measures the “quietness” of the NPR in the DUT.

As final advantage, the multi-tone NPR test setup is simple and repeatable. This enables meaningful comparisons of results from before and after changes to a design, component or algorithm.

Another key measurement is the frequency response of the DUT. Getting a precise result depends on consistent amplitude flatness across all tones in the stimulus signal. This technique becomes less appealing if it is necessary to write error-correction routines, a process that can be difficult, complex and time consuming (*Figure 4*).

Fortunately, amplitude flatness can be measured and corrected using the signal or spectrum analyzer. This is done by reading every tone from the multi-tone signal, calculating the required pre-distortion, and generating a modified multi-tone signal that provides the necessary amplitude correction.

As shown in *Figure 5*, this produces an extremely flat multi-tone signal. The only downside is a decrease in spurious-free dynamic range (SFDR). As a result, the AWG used to generate the multi-tone signal must have sufficient resolution (*i.e.*, have enough bits) to provide SFDR of 65 to 80 dB.

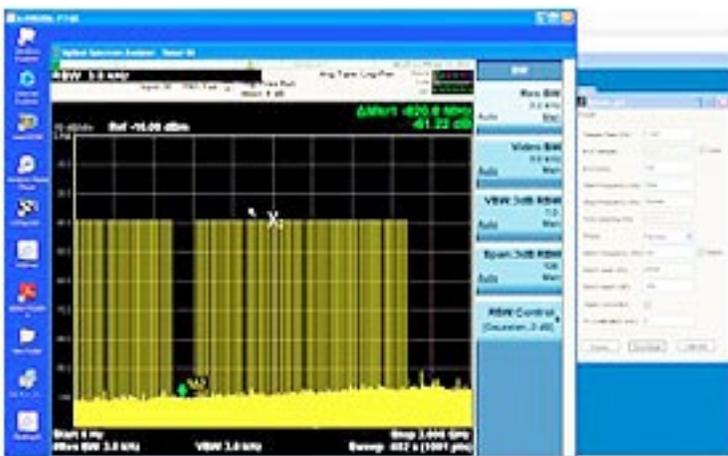


Figure 3. A signal with 1000 tones provides more in-band power and therefore better accuracy than with 100 tones

Amplitude Correction Setup

- AWG and spectrum analyzer are remotely controlled by a PC running an equalization routine
- Magnitude of each tone in the multi-tone signal is measured and frequency response stored in a file
- Pre-distorted multi-tone signal can be calculated

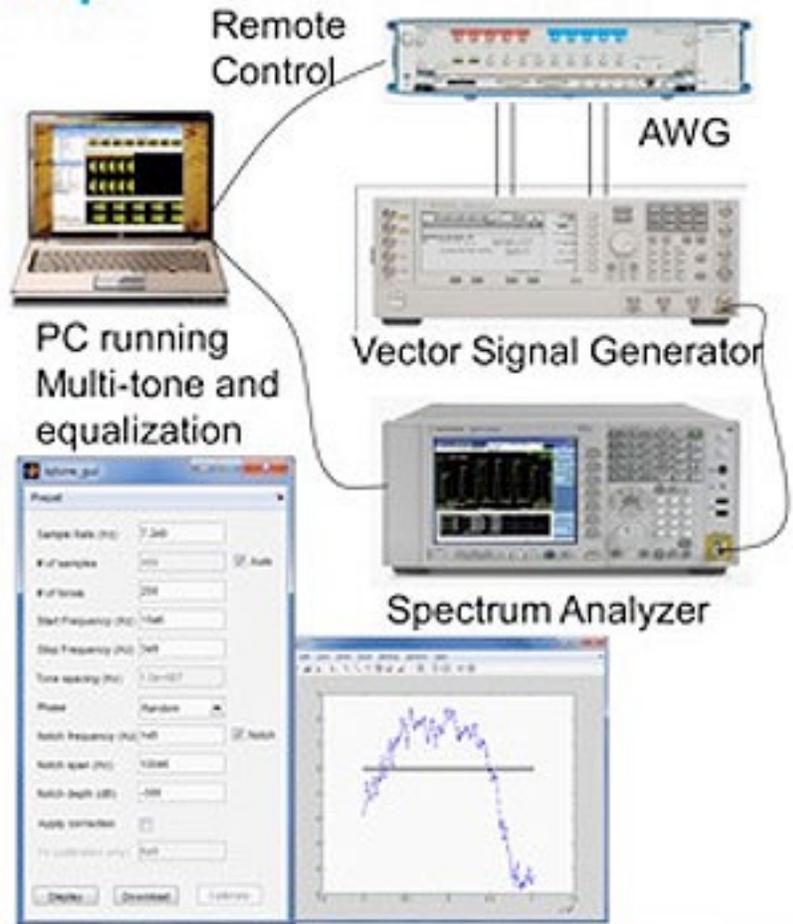


Figure 4. AWG and spectrum analyzer are remotely controlled by a PC running an equalization routine.

Selecting A Suitable AWG

In communication systems, nonlinear distortion is a key characteristic. Components of second-order distortion fall outside of the signal band but third-order distortion falls within the band. At today's typical frequencies, an AWG must be capable of 12 GSa/s to simulate third-order distortion.

Further, a wide-bandwidth AWG makes it possible to create modulation that is wider than some of today's bands. For example, 5 GHz of analog modulation bandwidth provides up to 10 GHz of modulation bandwidth. In addition, a wideband AWG also allows easy frequency hopping across one or more bands.

Accumulating all of the foregoing requirements, the key characteristics of a suitable AWG are as follows:

- ◇ *High SFDR: This ensures that tones will clearly stand out from distortion. It also provides sufficient margin to enable amplitude-corrected measurements.*
- ◇ *Flat amplitude: This enables highly precise measurements of the DUT's frequency response.*
- ◇ *Wide bandwidth: This makes it possible to simulate third-order distortion and test the signal band.*

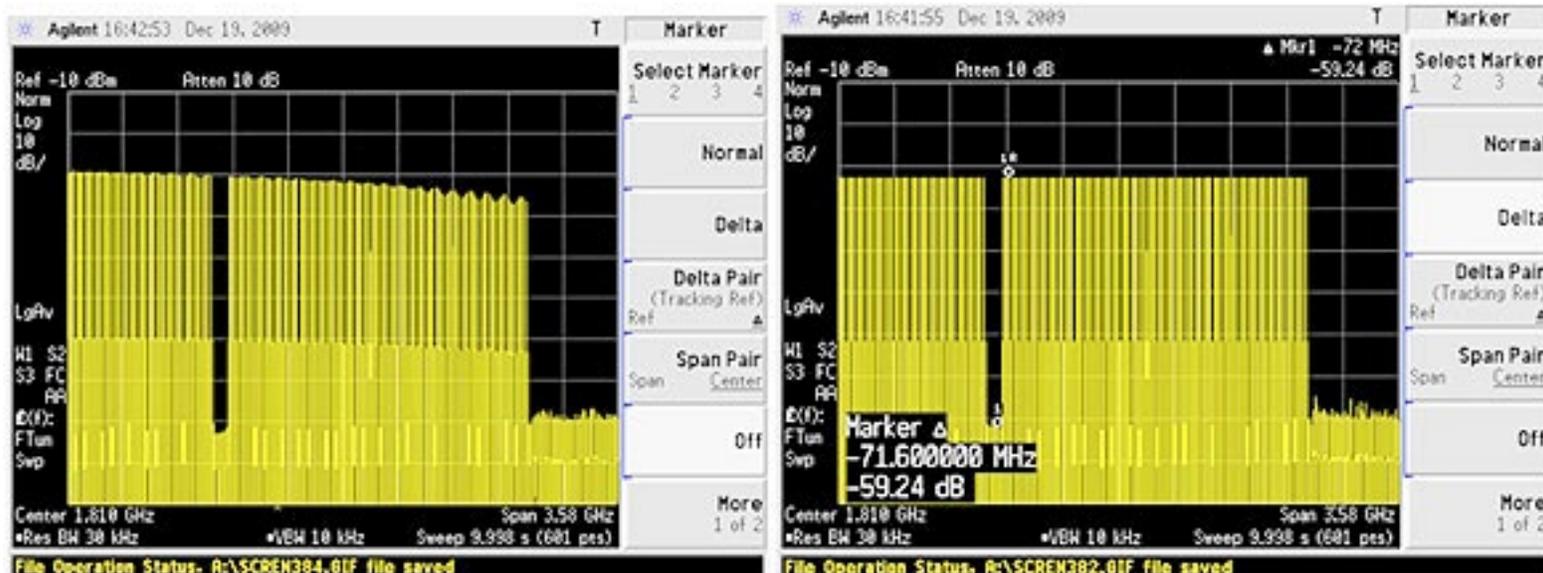


Figure 5. These measurements show before and after results with a 100-tone signal

These capabilities are embodied in the Agilent M8190A AWG, which provides excellent signal fidelity with 14-bit resolution at 8 GSa/s or 12-bit resolution at 12 GSa/s. Compared to other commercially available AWGs, the M8190A is uniquely capable of producing these levels of high resolution and wide bandwidth simultaneously. As a result, this AWG can create signal scenarios that push communication designs to the limit and provide deeper insights into system performance.

When operating in 14-bit mode, the M8190A provides SFDR performance of up to 80 dB; with 5 GHz analog bandwidth, it offers ample headroom for common test scenarios. It also includes 2 GSa of onboard memory for storage of multiple test scenarios and advanced sequencing capabilities that enable creation of highly realistic signal scenarios. When these capabilities are used in concert, the M8190A makes testing faster and more flexible.

Conclusion

It seems reasonable to expect the demand for information anywhere, anytime to continue growing unabated in commercial and military applications around the world. Looking to the future, the watchword is “flexibility” with regard to communication systems and the equipment used to test those systems.

In testing, using the versatility of a high-performance AWG is an essential step toward ensuring present and future flexibility in the test system. Further, an AWG equipped with ample onboard memory and advanced sequencing capabilities makes it possible to create highly realistic signal scenarios that provide thorough and detailed testing of communications systems during development, during system validation, and before real-world deployment.

Note: The examples in this article are based on MATLAB scripts that are available online at www.agilent.com/find/81180_examples.

About the author

Beate Hoehne designs and implements marketing strategies for the most comprehensive pulse and data generator product portfolio for Agilent Technologies’ Digital Verification Solutions Division. Beate is responsible for the marketing activities along the entire product life cycle. Beate joined Agilent Technologies (formerly Hewlett-Packard) in 1989 as a consultant in the computer business.



A Case In Point

A Stronger Sightline From The NOC...

Thanks to OURSES (French acronym for rural satellite services), patients in a nursing home in south-west France were able to test out a round-the-clock satellite-based medical surveillance system. This Astrium-run project paves the way for new, innovative and operational medical assistance services via satellite, particularly in rural areas.

The purpose of the OURSES project is to guarantee the deployment and use of tele-services in areas which do not yet have access to broadband. To assess the performance of these solutions, the Astrium project coordination team found themselves working in the field of medical assistance. The results far exceeded expectations.

The medical assistance system was installed in a nursing home for the elderly and infirm and at a GP's surgery in the Hautes-Pyrenees region. The applications developed enable the nurses in the home to establish a video link with the general practitioner when the need arises. Similarly, all the medical data collected by the system can be simply downloaded and consulted by the doctor at all times. The system's functions include surveillance of higher-risk patients (for example those suffering from Alzheimer's or behavioural disorders), and can raise the alert in the event of abnormal behaviour such as a fall, wandering, disturbed sleep, etc.

The tested communication system comprises a DVB-S/DVB-RCS (1024kbps/512kbps) broadband access point via satellite, coupled with a wireless network to enable the various medical systems to interconnect and be able to communicate their data to a remote medical station, the office of the coordinating doctor or an emergency ambulance centre.

A modified nurse's trolley, equipped with a complete set of medical instruments, can transfer the collected data on

demand to each patient's GP, thus avoiding unnecessary journeys. The trolley is connected to the satellite link via a wireless network. There is also an ECG pickup which enables the patient's cardiac signal to be analysed, sending an alarm to the doctor if any anomalies are detected.



Left: the nurse's trolley, specifically designed for the OURSES project, can be used to send the collected data to each patient's GP. Right: the portable 'TeSA basket' vital signs remote-monitoring system.

The services developed were very well received by both medical staff and patients alike. They demonstrated that space technologies can greatly assist in the provision of special care services. It has been decided that the Tibiran-Jaunac town hall, which hosted the project trials, should remain equipped with the satellite equipment and wireless network to continue the satellite service.

The project was run by **Astrium Satellites'** *Telecoms Systems* department, with a team of five engineers, all experts in the fields of satellite telecommunications, radio-frequencies and networks. Project manager *Patricia Iñigo* said, "The OURSES project was able to develop innovative and operational satellite-based medical assistance services in isolated areas, and create potential new applications for these services, for which we are expecting considerable

A Case In Point

growth in the coming years. The work done by the OURSES project relied heavily on user feedback concerning the systems tested, to ensure that the technology was suited to the envisaged applications.”

A Team Project

The project consortium brought together participants from a wide diversity of backgrounds: medicine, telecommunications, energy and social sciences. It includes laboratories such as the *Laboratoire d'Analyse et d'Architecture des Systèmes* (systems analysis and architecture laboratory) of the **Centre National de la Recherche Scientifique**, the *Laboratoire de l'Intégration du Matériau au Système* (system material integration laboratory) at the **Ecole Nationale Supérieure d'Electronique, Informatique et Radiocommunications** in Bordeaux, a working group from **TélécomParis Tech** in association with the *Laboratoire d'Etudes et de Recherches sur l'Economie, les Politiques et les Systèmes Sociaux* (economics, politics and social systems study and research laboratory), the *Laboratoire de Télécommunications Spatiales et Aéronautiques* (space and aeronautical telecommunications laboratory), the French space agency, and companies from the aerospace industry such as **Thales Alenia Space** and SMEs such as **Medessat** and **APX-Synstar**.

OURSES was co-financed for a period of 30 months, with 1.6 million euros of the total 3.7 million euros budget provided by the **French Ministry for Industry and Finance**

from the Single Fund set up to finance *Competitiveness Cluster* projects. It is one of the projects approved in 2006 by the **Midi-Pyrenees & Aquitaine (Aerospace Valley) Aeronautics, Space and Embedded Systems World Competitiveness Cluster**. It has just received the jury's 'Grand prix' at the first e-health awards organised by the 'Mêlée Numérique' association, in partnership with the Technopole of Castres-Mazamet (south-west France).

Editor's note: This article is courtesy of the Astrium Internet site [<http://www.astrium.eads.net>]

Euro-Satellite Rides The Economic Wave

By Chris Forrester, Editorial Director, Broadgate Publications

Investment bank Morgan Stanley's top European media-related 'overweight' stocks include satellite operators Eutelsat and SES, plus UK commercial broadcaster ITV, pay-TV operator Sky Deutschland and advertising giant WPP. The bankers issued a major report on the state of the media industry, highlighting their top — and not so hot — stocks for investors. Satellite emerged with very high marks.



Forrester's Focus

As regards **Eutelsat**, the bank's report is glowing...

"Eutelsat remains one of our core Overweights. It offers a combination of **(i)** attractive and highly visible revenue growth (8 percent 2010-13 CAGR) driven by **(ii)** medium-term structural trends (Multichannel, HD etc.) **(iii)** controlled OPEX and CAPEX (iv) and a highly focused management team. We believe the stock will benefit from the strong execution of new projects (**Ka-Sat**), de-leveraging and potential selective acquisitions in 2011-12."

Morgan Stanley highlights Eutelsat's 355 new transponders coming on board by June 2013, helped by a generous interpretation of Eutelsat's Ka-band spot beams. "Eutelsat plans to launch an additional six satellites by the end of calendar Q1 2013, after having successfully launched Ka-Sat in December 2010. These satellites will increase the group's transmission capacity by 273 transponders on top of the 82 spot beams soon to be made commercially available on Ka-Sat. For modelling purposes, we assume one spot beam equals one transponder. This means that between December 2010 and June 2013, ETL will have increased its capacity by 355 transponders," says the bank's report.

"New Eutelsat capacity (six new satellites by June 2013) together with new projects (Ka-Sat) will continue to target ETL's core markets. According to **Euroconsult**, Western Europe and the Middle-East & North Africa are among the three areas, with North-East Asia, where the average revenue per transponder is the highest in the world. For instance, ETL said it reached 3.6m euros per transponder across its HOTBIRD network in

1H11."

"The launch of Ka-Sat allows ETL to explore new business opportunities," says Morgan Stanley. "Ka-band has two main advantages: **(i)** It is around eight times cheaper than Ka-band and **(ii)** Its shorter wavelengths allow customers to send and receive signals using very small antennae. ETL intends to dedicate 60 percent of Ka-Sat's capacity to consumer broadband via its **Tooway** brand, while the remaining 40 percent will serve professionals. The B2B2C offer will consist in selling capacity to Telecom operators

Forrester's Focus

or Internet-service providers, who will then re-sell it to their customers under the form of a satellite broadband offer. ETL's consumer offer will target around 500K households located mainly in rural and remote areas."

The bank says that despite only announcing modest contracts to date, they see Eutelsat ramping up revenues from Ka-Sat to reach 100m euros by June 2014, with "the bulk of the growth being achieved in fiscal 2013." The report reminds readers that Eutelsat remains on the M&A trail. "Management said it could be interested in buying out competitors in emerging markets, especially in Asia, in order to reach / consolidate ETL's positioning there. This could provide the group with attractive new growth opportunities in our view," said the bank.

Luxembourg-based SES also received the full Morgan Stanley treatment, although little mention is made of the considerable restructuring now taking place at the business.

Romain Bausch holds onto the top spot in a much-altered set of management committees, with just one overall executive committee emerging and a fresh operating structure where the old "World Skies" and "Astra" staffing divisions come together, with an emphasis on a streamlined sales and reporting structure. More detail should emerge in the upcoming weeks as SES begins its Road Show presentations to investors. It held its AGM on April 7, and a trading update

2010 Average Revenue/Transponder*

Western Europe	\$2.90m
North-East Asia	\$2.49m
Mid-East/N. Africa	\$1.58m
Oceania	\$1.53m
North America	\$1.39m
Central Europe	\$1.37m
Latin America	\$1.35m
CIS/Central Asia	\$1.25m
Sub-Saharan Africa	\$1.23m
China	\$1.16m
Southern Asia	\$1.08m

*Estimated

Source: Euroconsult 2010

is due May 12. However, no major surprises are expected as far as senior management is concerned, other than their responsibilities will now extend to global roles — and there's about €30m in potential savings in the pipeline, says the company.

The biggest difference in the Morgan Stanley report is that the bank has now built in to their price target their full three euros per share valuation for proposed Ka-band constellation O3b. The bank is forecasting 30 percent 2010-2015 free cash

flow CAGR, which is not bad by anyone's measure. "SES plans to launch 12 additional satellites by the end of 2013, providing both replacement and incremental capacity. The latter will grow by 283 transponders, focusing essentially on Europe and emerging markets. On the other hand, SES intends to manage its exposure to the North American market cautiously," says the bank's report.

"Over the last few years, growth in US Government Services (25 percent of SES' U.S. business) has been

offsetting weakness in Enterprise Services (also 25 percent of revenue) in the U.S. The remaining 50 percent, split almost equally between cable and DTH operations, has been broadly stable. However, the U.S. market is highly competitive, while demand for Ku-band is lacklustre compared to other regions of the world. SES, therefore, intends to rationalize its Americom fleet through the non-replacement of satellites. This will start

Germany – from profit to loss

"German broadcasters currently lease 33 transponders to SES serving the nation's analogue broadcasting. The switch-off is expected to cause a revenue shortfall for SES in 2012, as most of these transponders become unused, before demand for HD and 3DTV ramps up and gradually leads the broadcasters to rent this capacity again. Our forecasts assume an 18m euros net revenue decline at Astra in 2012 vs. 2011."

Morgan Stanley

Forrester's Focus

with the non-replacement of *AMC-5*, launched in 1998. Management is also considering taking another satellite out in due course,” states the report.

“Growing capacity, stable pricing and strong demand for satellite transmission, especially in emerging markets, will boost SES’ revenue growth from 2012. Eighty-four new transponders will be put in orbit in 2011, 56 in 2012 and 130 in 2013. The launches most crucial to SES’ growth will be (i) SES-5, due to be launched in 4Q11 (64 Xders) and targeting Northern Europe and Africa, and (ii) SES 6 and SES 8, both due to be launched in 1Q13 and adding respectively 49 and 21 Xders. These will target LatAm, South Asia and Indo-China,” says Morgan Stanley.

“Capacity will grow by 23 percent over the next three years. However, key launches are due in 2H11 (Quetzsat, SES 4, SES 5). Since satellites go through a testing phase before they are fully operational, this means that they will start contributing to revenue only from the very end of this year. Also, the German analogue switch-off, due on April 30th 2012, should negatively impact SES’ 2012 revenue growth before a pick up in demand for other services such as HD or 3D start to make up for the shortfall caused by the switch-over. Growth should thus accelerate from 2012,” states the report.

However, there has been more than a little scepticism over the future prospects of **O3b**, and, in particular, whether the proposed constellation will find sufficient demand for its capacity. The bank’s report has few doubts. “We view SES’ investment in the O3b Networks as a potentially highly attractive source of future value creation. We do not believe the shares are currently pricing in any value for O3b since it is not due to launch initial satellites before 2013. However, we have constructed an initial model which indicates potential EV of 4 billion dollars for O3b, representing a potential 3.0 euros on top of the SES share price. We include it in our bull case valuation of 28 euros / share. This assumes the eventual rollout of 20 satellites using 90 percent of capacity. We expect demand to initially be focused around the medical, governmental, industrial and financial sectors. However, we see scope for the operations to be dramatically up-scaled over time if demand for consumer and small business broadband emerges.

Technically, there is scope to launch a constellation of 120 satellites,” the bank reminds investors.

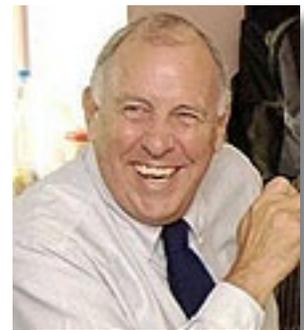
O3b:

“We see this as an excellent way of SES establishing a major emerging markets KA-band business without deploying the required \$1.2bn Capex....” Morgan Stanley

Indeed, the bank add this, “We view O3b as a potentially material positive for the investment case of SES because: **(a)** its initial investment of 75m euros and services in kind looks very attractive and the cash flow has already been deployed, **(b)** SES has a clear option to consolidate on pre-agreed terms through a right of first offer, **(c)** we see this as an excellent way of SES establishing a major emerging markets KA-band business without deploying the required \$1.2bn Capex, and **(d)** the business should generate cash flow at a very early stage.”

About the author

Chris Forrester is a well-known broadcasting journalist and industry consultant. He reports on all aspects of broadcasting with special emphasis on content, the business of television and emerging applications. This includes interactive multi-media and the growing importance of web-streamed and digitised content over all delivery platforms including cable, satellite and digital terrestrial TV as well as cellular and 3G mobile. Indeed, he has been investigating, researching and reporting on the so-called ‘broadband explosion’ for more than 25 years. He has been a freelance journalist since 1988.



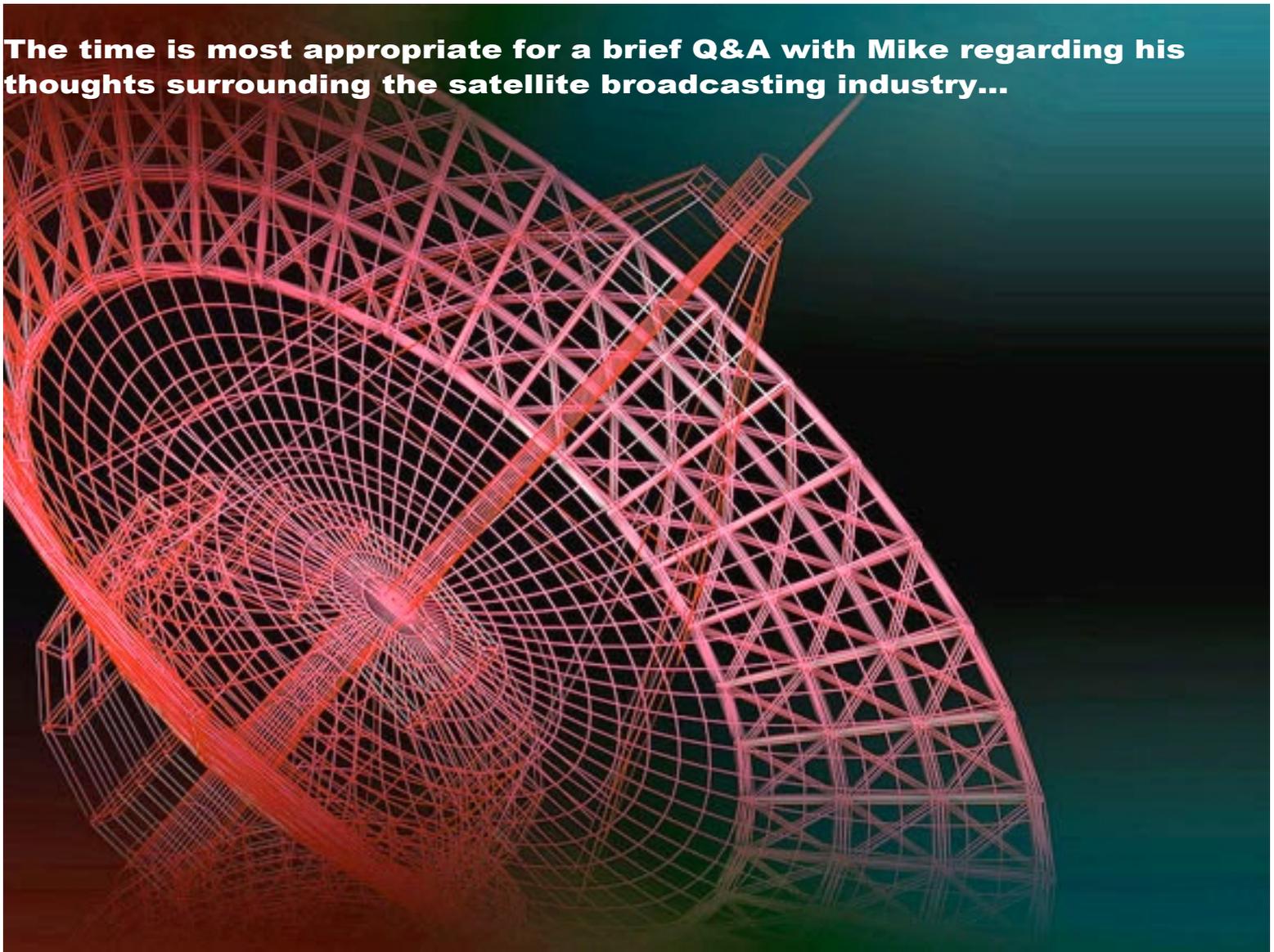
Executive Spotlight: SatBroadcasting™

Mike Antonovich, Managing Director, Global Crossing Genesis Solutions

Mike Antonovich participated in a panel discussion recently that encompassed the future of satellites and broadcasting. The discussion was entitled “Satellites and Broadcasting: A 30-Year Warning.” Mike discussed how satellites are not going away — however, IP networks are spurring growth of “hybrid broadcast and media services models,” models that Global Crossing Genesis Solutions is well positioned to address. He shared what he believes the future holds for these services. As most realize, the market for video services continues to grow. Industry research firm *Infonetics Research* forecasts that worldwide revenue for video services, including IPTV, cable video and satellite video services, will top \$250 billion in 2014. And, according to the *Visual Networking Index (VNI)*, an industry benchmark report produced by Cisco, 3D and HD Internet video will comprise 46 percent of consumer Internet video traffic by 2014.



The time is most appropriate for a brief Q&A with Mike regarding his thoughts surrounding the satellite broadcasting industry...



Executive Spotlight: SatBroadcasting™

SatMagazine (SM)

Mike, the influence of IPTV, OTT, DTV, MobileTV, payTV and digital cinema (among others) has companies scrambling to ensure they accommodate the various technologies in play to satisfy an increasing number of customers. Given your expertise in the satellite and digital broadcasting environs, would you please define for our readers exactly what is meant by hybrid broadcast and media service models?

Mike Antonovich

That is a very complicated question, with many complicated answers! Still, I'll take a stab at it. In the beginning, there was FTA (Free to Air); mostly advertising supported television delivered by the "rabbit ears." And we liked it. All three/four channels of it. Then came Cable Television (CATV), which largely replaced the "rabbit ears" with a coax cable. CATV delivered dozens of FTA channels, and then along came the likes of CNN, ESPN and HBO to launch truly unique alternatives to the FTA and "TV network" model. And we liked it, all 60 channels of it.

Skipping a lot of history, we're now dealing with content delivered by television, PC, and mobile phone in literally hundreds upon hundreds of different forms of live, linear, non-linear and on-demand formats. Certainly there have been winners and losers in this evolution, but everybody has largely survived it and is making a living.

Subscription-based services seem to handle bad economic times better than ad-supported services, but everybody is still here, still viable, still competing for audiences and revenue streams. But if you "follow the money," it's still being made by the big media companies and mostly in the ancient

"old media" of FTA and CATV-delivered services. That is not changing anytime soon.

SM

There are enormous advertising budgets being applied to campaigns denigrating the efficacy of satellite broadcasting in favor of other content delivery methods. Do you see the influence of satellite-based transmission methods withering away, or are we in store for continued increase in capacity requests for content delivery?

Executive Spotlight: SatBroadcasting™

Mike Antonovich

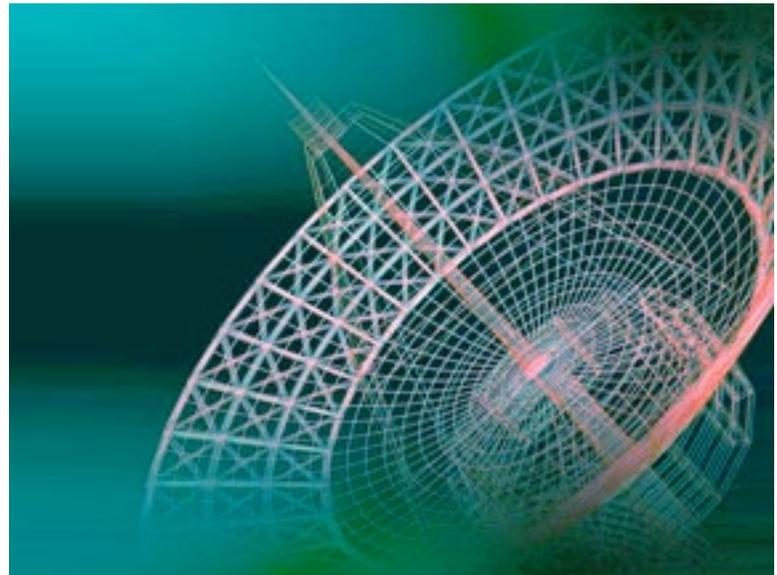
As Mark Twain might say today, “the reports of the demise of satellite transmission are greatly exaggerated.” Certainly news gathering from far corners of the world such as Libya and Fukushima would be impossible without satellite. And certainly Direct-To-Home (DTH) satellite distribution is a highly efficient and essential service for hundreds of millions of consumers around the globe. So, the business is safe for a while longer. Still, C-band is under regulatory assault in many jurisdictions and fiber will continue to erode news gathering and some limited forms of distribution, most notably high-bandwidth applications like HD, 3D and emerging Ultra HD.

SM

Do you see the continued use of satellite delivery to teleports (up and downlink), with the content then being pushed out to various transmission schemes (i.e., fiber, undersea cable, and so on), or will we see more and more content being delivered directly to service providers for web streaming?

Mike Antonovich

If you follow the money in the television distribution business, virtually all of it is still derived from linear television distribution over airwaves, CATV, DTH satellite and broadband. That is unlikely to change much in the next five years. In fact, for Global Crossing Genesis Solutions, just about 70 percent of our revenues are derived from the delivery of full-time linear channels to teleports for DTH and CATV distribution. And for most channels to most places, that isn't going to change.



However, when you start seeing programmers taking more advantage of the unique interactivity features that certain broadband and fiber deliveries will offer consumers, I think you'll see more unique “narrowcast” services being delivered separately to DTH, CATV and broadband to take advantage of unique feature sets of the receiver or cable box installed in the home. Those channels are more likely to be delivered on fiber rather than on satellite.

SM

Is dish reception becoming a technology of the past? Will the web replace most delivery methods over the next few years?

Mike Antonovich

Absolutely not. In the U.S., roughly 30 percent of the market receives service from the DTH providers DirecTV and Dish Network. They aren't giving up those subscribers without a fight. What also isn't well understood is how many millions of CATV subscribers get most of their channels almost exclusively from C-band satellites. I'd conservatively put that number as another 20% of the U.S. TV market. I see nothing on the technology landscape that is changing that picture within the next 10 years.

What bears watching, though, is whether the major media companies feel the same way. Within the next five years most of them will be negotiating next-generation satellite deals, where the satellite fleet operators want the surety of new 15-year end-of-satellite deals, but will the media companies want the same? Stay tuned, and buckle up!



Executive Spotlight: SatBroadcasting™

SM

With the increasing interest in 3DTV and 3D digital cinema, could it not be said that satellites will play an increasing role in content delivery of this type? However, with HD already capturing a great deal of satellite capacity, how can satellite operators (and manufacturers) prepare for the continued demand for capacity?

Mike Antonovich

I think the future of HD delivery over satellite is pretty secure, but regarding 3D and Ultra HD (very high bandwidth HD);

I think the jury is out. If, in fact, Ultra HD requires more than 40-50 Mbps of bandwidth, it won't fit on existing satellites. Even if it did, is it economical to devote an entire satellite to perhaps 24 Ultra HD channels? Is there an audience, an appetite and the revenue to support something like this? This is one area of vulnerability for satellite, as broadband and fiber-to-the-home can be scaled to support virtually limitless bandwidth. But these decisions and opportunities are still years away.

SM

In one or two years, where do you envision the satellite broadcasting segment of our industry? The IPTV segment? What should broadcasters be considering today to enable them to prepare for, and be able to satisfy, future broadcasting needs?

Mike Antonovich

In two years, you won't be seeing any dramatic changes. I don't think any web-based initiatives will be leaking away enough eyeballs from the successful linear television world to tilt the tables. Now, five years...is anybody's guess. Still, 10 or even 15 years from now, there will be many millions of consumers tethered directly, or indirectly, to satellite delivery. The slice of the pie will be smaller, but it will still be plenty lucrative to both satellite operators and television programmers.

A Tale Of Two Spaceports

By Jos Heyman, FBIS, Tiros Space Information

There have been a number of attempts to establish commercially operated spaceports. Most of these are based on existing space related facilities such as Cape Canaveral and White Sands. They indirectly profit from the existence of these facilities and their associated infrastructure, coupled to the desire of the owner of the facilities, *i.e.*, the government, to achieve an optimal utilization of the assets at these locations.

However, the establishment of a commercial spaceport outside these established facilities is a capital intensive undertaking with a significant threat of failure when considering the nature of the space launch market.

In this article, the author presents two case studies of such commercial spaceports. One of these is the *Kodiak Launch Complex*, which, at a casual and first glance, seems to be a success, whereas the other is the failed *Christmas Island Spaceport* in the Indian Ocean off the coast of western Australia.



Case 1: Kodiak Launch Complex

The **Kodiak Launch Complex** is located at Narrow Cape, about 70 km from the town of *Kodiak* on Kodiak Island, Alaska.

Operated by the **Alaska Aerospace Corporation (AAC)**, a state owned company, it is the USA's only high latitude spaceport providing optimal support to space launches to polar orbit, including circular and highly elliptical Molniya and Tundra orbits. It has an unrestricted down range launch azimuth ranging from 110 degrees to 220 degrees. Kodiak is the only U.S. facility that can launch high inclination (63.4 degree) missions without land over-flight and the requirement to resort to energy consuming dog leg flight segments. The current facilities, within the 3,717 acres on which the facility operates, consist of:

- *Launch Pad 1 and its Launch Service Structure with a 75 ton bridge crane; four work platforms adjustable in height by 1ft increments; and custom fitted work platform inserts to accommodate vehicles to 16ft in diameter*
- *Launch Pad 2, which supports the launch of long range ballistic target missiles and other missiles from a flat concrete pad*
- *Maintenance and Support Facility which provides 16,000ft² of ground level shop and a storage area divided into three bays as well as a machine shop, a customer storage bay and engineering office space for KLC staff*
- *Payload Processing Facility*
- *Spacecraft Assemblies Transfer Facility with a rail mobile structure servicing the IPF and Launch Pads 1 and 2*
- *Integration Processing Facility (IPF) supporting horizontal checkout and integration of rocket motors*
- *Range Instrumentation provided by the Honeywell Inc. designed Range Safety and Telemetry System (RSTS) that supports telemetry receiving and command destruct functions. AAC has two RSTSs, one for use at KLC and another for use at an off-axis site chosen to assure communications in the event of plume attenuation*



Kodiak Launch Pad 1

Focus

Mission	Date	Int. Des.	Launch vehicle
Starshine-3 and others	30-Sep-2001	2001 043A/D	Athena 1
STPSat-2 and others	20-Nov-2010	2010 062A/L	Minotaur 4/HAPS
TacSat-4	May-2011		Minotaur 4

Figure 1. Orbital launches from Kodiak

Mission	Date	Altitude	Launch vehicle
AIT-1 test	6-Nov-1998	715 km	Minuteman/Castor 4B
AIT-2 test	15-Sep-1999	1060 km	Minuteman/Castor 4B
QRLV-1	19-Mar-2001	163 km	Aries F47
BMDO radar target	9-Nov-2001	failed 10 km	STARS M-4
QRLV-2	24-Apr-2002	160 km	Aries F49
IFT-13c Target	15-Dec-2004	1000 km	STARS M-5
IFT-14 Target	14-Feb-2005	1000 km	STARS M-6
FT-04-1 Target	23-Feb-2006	1000 km	STARS M-7
FTG-02 Target	1-Sep-2006	1000 km	STARS M-8
FTG-03 Target	25-May-2007	failed 40 km	STARS M-9
FTG-03a Target	28-Sep-2007	1000 km	STARS
FTG-05 Target	5-Dec-2008	1000 km	STARS

Figure 2. Sub-orbital launches from Kodiak

FY	Ops Revenue	% Change	Total expenses	Profit/Loss
2005	16,914,593		18,515,333	-1,600,740
2006	16,892,115	-0.13	21,648,646	-4,756,531
2007	20,464,554	21.15	27,207,207	-6,742,653
2008	17,358,715	-15.18	11,605,297	5,753,418
2009	18,461,930	6.10	13,567,043	4,894,887
2010	10,599,790	-42.45	15,164,689	-4,564,899

Figure 3. Operational revenue and expenses 2005-2010

A third and fourth Launch Pad as well as a Rocket Motor Storage Facility are planned.

Launches

Since commencing operations only two orbital space launches took place from Kodiak with another planned for May 2011. (See Figure 1)

In addition a number of sub-orbital launches took place, most of which were for the **Department of Defense's Missile Defense Agency (MDA)**. (See Figure 2)

Financial Status¹

The financial situation of the agency, based on information published by the *State of Alaska Office of Management and Budget (OMB)*, indicates wildly fluctuating results, clearly associated with the number of launches that took place in a given year. In particular, the 2010 FY was a bad year which was caused by the delay in the only two planned launches to late of that year or to 2011.

The assets at KLC represent a current capital investment of US \$120,322,345.

Case 2: Christmas Island Spaceport

Australia has seen various examples of proposals for spaceports that never got anywhere.

During the 1980s, the *Australian Space Office* became involved in the **Cape York Spaceport** project which envisaged the establishment of a commercial launch site for Soviet *Zenit* launch vehicles in northern Queensland. This project also included the development of a seaport and an airstrip and was expected to commence commercial launches in 1995 with an eventual launch rate of five per year.

The project failed to materialize as a result of lack of financial sponsors and the project changed hands several times. It was also hampered by environmental and

Focus

aboriginal tribal concerns, while the general downturn in the space industry may also have been a contributing factor.

United Launch Systems International (USLI) of Brisbane proposed to build a commercial satellite launch at *South Gladstone* in Queensland. USLI, a consortium of Australian, Asian and European interests, hoped to use the Russian **Unity** launch vehicle to launch communications satellites into low-Earth orbit. The operations were specifically targeted to **Teledesic** and **Iridium** follow-up satellites, although in the longer term, scientific and Earth observation satellites could have been launched from the site. The Unity launch vehicle was being developed by the **State Rocket Centre** at Mias, Russia.

Proposal Details²

The third venture was the **Christmas Island Spaceport** on Christmas Island, an Australian territory in the Indian Ocean at **10 degrees 25'South, 105 degrees 43'East**.

Asia Pacific Space Centre (ASPC) Pty Ltd, a Sydney based Australian company that was incorporated in 1997 and had a majority of Australian as well as U.S. and Asian investors, was to develop the launch site and associated facilities on the southern end of Christmas Island at a site known as *South Point*. The spaceport would have been built within an existing mining lease on South Point and construction was expected to take 18 months.

Christmas Island was selected because of its geographic location. The island is surrounded by ocean that allows clear flight paths to the east and to the south so that both equatorial and polar satellites could have been launched.

APSC proposed to launch satellites for a wide range of commercial customers in the telecommunications, global positioning and remote sensing disciplines and did not intend to launch military satellites. Once fully operational, ASPC envisaged conducting 10 to 12 launches per year whereas the expected lifespan of the spaceport was set at 15 to 20 years, depending on market forces. Each satellite launch would have required approval of the **Australian Federal Government** in accordance with the *Space Activities Act 1998*.

NEWSFLASH weather
100% Antenna Reliability with Walton De-Icing Systems

No more outages thanks to Walton De-ice

We can always rely on Walton De-ice service and support

WALTON NEWS

WE'VE GOT YOU COVERED!

WALTON DE-ICE Original De-Icing Systems • Industry leading hot air de-icing systems.	Snow Shield Snow Shields • Passive and heated • .6 to 6.3m	Ice Quake The Ultimate Power-Efficient Vibrating De-Icer New Innovation!
---	--	--

Protecting Networks From Rain, Snow and Ice For Over 30 Years

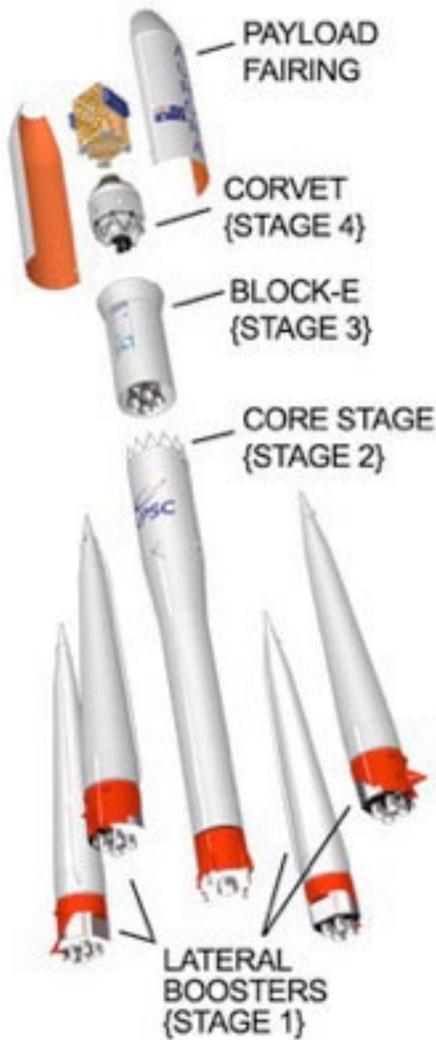
- The leader in quality and reliability - 30 years of field-proven experience.
- Superior customer service - bar none. Accept no substitutes.
- Turnkey integration, installation, maintenance and tech support.
- Proudly designed and built in the USA.

Walton Enterprises, Inc.
P.O. Box 1328
Riverside, CA 92502 USA



+1 (951) 683-0930
sales@de-ice.com
www.de-ice.com

Focus



On May 23, 2001, Russian and Australian officials signed an agreement to launch commercial satellites using Russian rockets from a new spaceport that was to be built on Christmas Island. The proposal involved the Russian *Aurora* launch vehicle. The first launch was envisaged for 2004.

Aurora Launch Vehicle

The center piece of the Christmas

kerosene RD-107 rocket motors built by NPO Energomash which were attached to the second or core stage

- Stage 2 or core stage, also to be built by Progress, was to be propelled by an NK-33 propulsion system and would also have carried the flight systems
- Stage 3, also called Block E, was to be developed by Energiya and would have used the well proven RD-0124 liquid oxygen/kerosene propulsion system that has been extensively used for the Soyuz launch vehicle
- Stage 4, also to be built by Energiya, was called Corvette and would have used the 11D58M liquid oxygen/kerosene engine built by NPO Veronezh

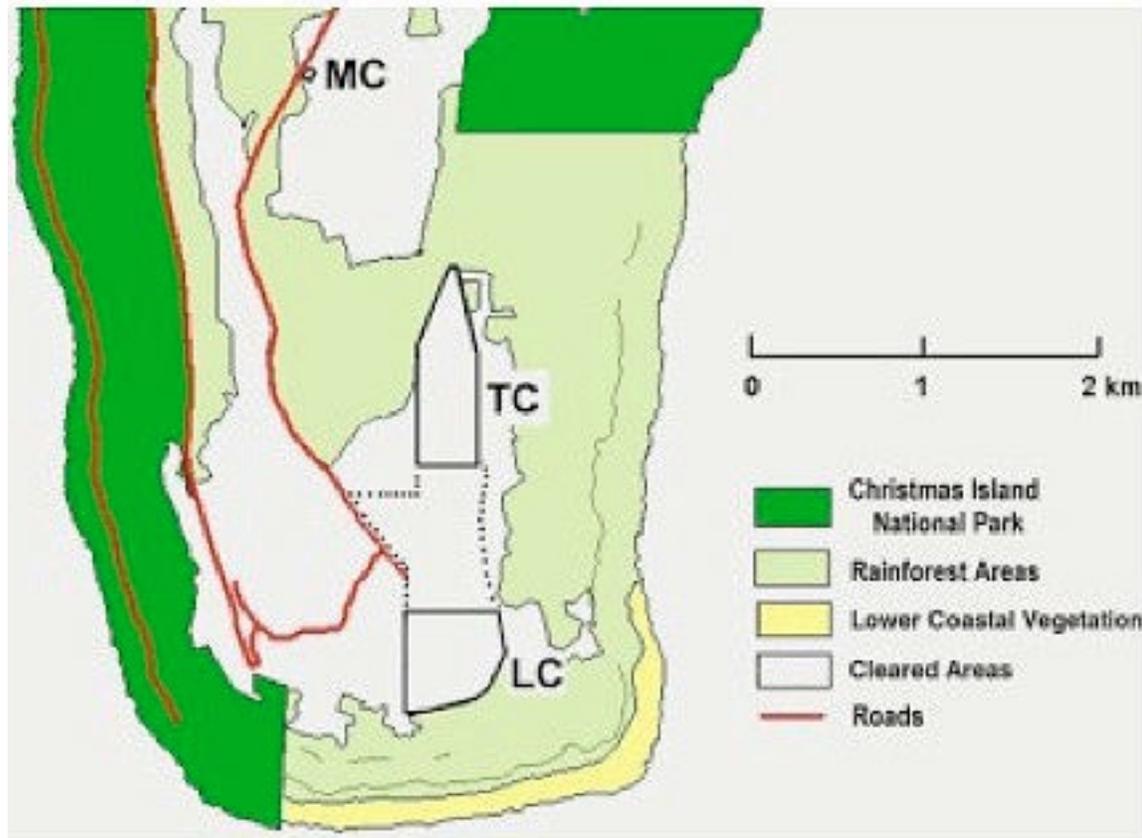
The payload fairing was, once again, by Progress. The Aurora launch vehicle would have been capable of delivering 12,000 kg payloads into a low-Earth orbit and 4,500 kg payloads into a geosynchronous orbit. The first Aurora launch was expected to take place from Baikonour in the third quarter of 2003. This was to be followed by further tests from Baikonour as well as from Christmas Island, with operational flights starting in 2004.

Aurora launch vehicle (APSC)

Island Spaceport proposal, the *Aurora*, was a three or four stage launch vehicle to be developed by **Energiya** and **TsSKB-Progress**. The three stage version was to be used for low-Earth payloads, while the four stage version was to be used for geosynchronous satellites with a mass of up to 4500 kg.

Stage details were:

- Stage 1, to be built by Progress, consisted of four liquid oxygen/



Map of Christmas Island Spaceport (APSC)

Christmas Island Facilities

The establishment of APSC would have provided a range of benefits to Australia:

- *The generation of export income from satellite launch operations*
- *Short term employment of in the construction phases and long term employment in the operational stages*
- *Improvement to the infrastructure on Christmas Island*

Moreover, APSC had committed itself to establish a space research center in Australia, which would have liaised closely with APSC and tertiary institutions in Australia.

The launch complex, covering an area of 85 hectares, was to consist of the actual launch site (LC), on the extreme south of the area. Initially, one launch pad was to be developed. However, there was space for another three pads. The technical complex (TC) was to have included the vehicle assembly building, a payload preparation building, storage for components, a liquid oxygen plant, and a fuel store. The site would also include workshops,

laboratories, a canteen and staff rest areas. It was located about 1.5 km north of the launch site. The mission operations complex (MC) was to be 2.5 km north of the launch site, where mission control, a viewing area, and a communications facility would be located.

The entire project would have also provided housing for 250 to 300 workers during the construction phase as well as permanent housing for operational personnel, to be built in the Irvine Hill area near the airport. Once operational, the spaceport was expected to 550 employees.

Flight Operations

Aurora launch vehicles would have been transported from Russia in specialized containers, while satellites were to be transported from their place of manufacture. Once on Christmas Island, the launch vehicle would have been assembled and the satellite added to it. The completed launch vehicle and satellite would then have been moved to the launch complex by rail, where it would have been raised into a vertical position. Three typical flight paths are shown in the

Focus



Artist impression of the Christmas Island Spaceport (APSC)

Why did the Christmas Island proposal fail? Launch services fall into, essentially, three markets: commercially-based launches into geostationary transfer orbit and subsequently transfer into geostationary orbit; commercially-based launches into low-Earth orbit; and, government-sponsored launches, including military launches, into either geostationary transfer or low-Earth orbit

At the time that the Christmas Island proposal was floated, the average demand for commercial satellites launched into a geostationary orbit for the next 10 years was expected to be an average of 20 per

accompanying diagram.

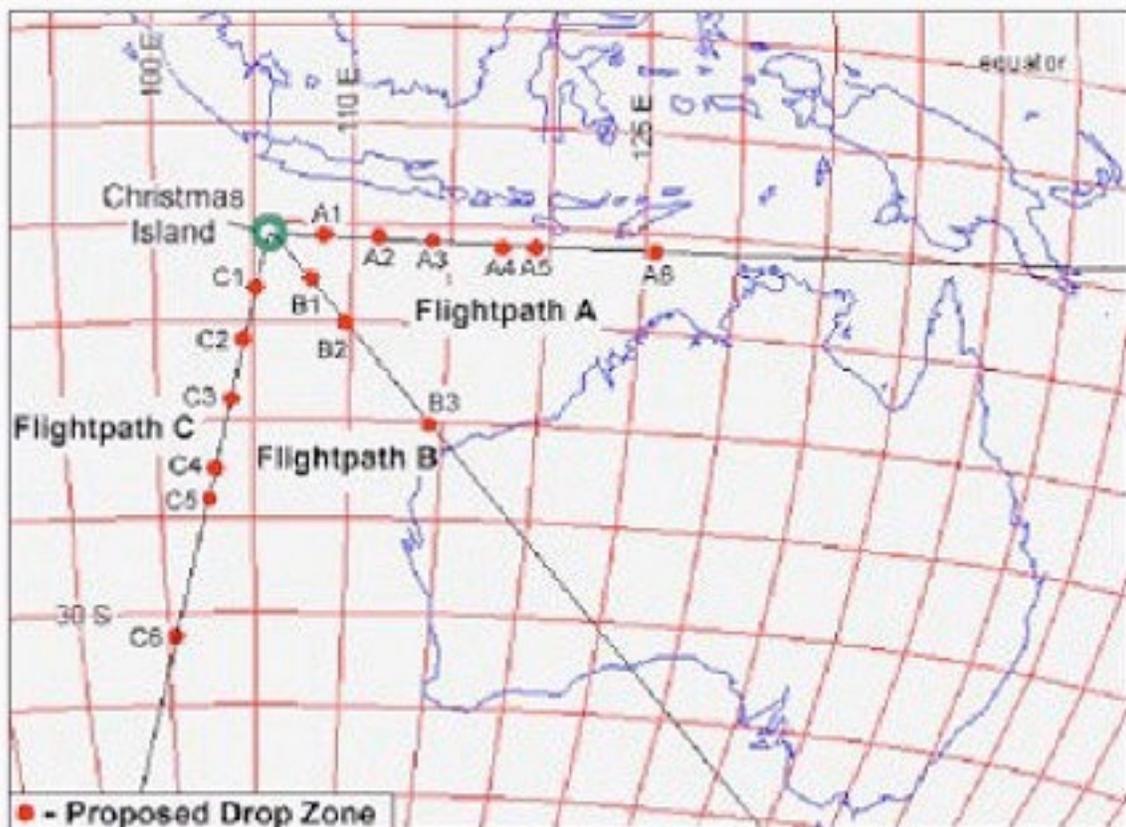
year³.

Flight path A was proposed for satellites to be placed into a geostationary orbit and routing would have passed between Indonesia and Australia, providing a minimum clearance of 40 km from all land for the first 4500 km of the flight.

On the 'supply side' were the launch services offered with the **Ariane, Delta, Atlas, Long March, Proton, H 2A** and **Sea Launch** launch vehicles, which provided an annual launch capacity of as many as to 76 flights⁴.

Flight path B would have been used for spacecraft intended to go into orbit with an inclination of 45 to 65 degrees, with a trajectory going over a very deserted area of the Australian mainland. A third trajectory, **Flight path C**, was intended for sun-synchronous orbit injections as well as polar orbits.

Each mission required a maximum of four drop zones for expended hardware and the rocket for each mission was to be configured in such a way that it would fall into open ocean.



Three flight paths and drop zones (APSC)

Assessment + Conclusion

Focus

In the low-Earth orbit commercial market, it was estimated that a total of 43 launches were needed for the 2001 to 2010 period, an average of four per year⁵.

On the supply side were the facilities offered by the lighter **Delta** vehicles, **Dnepr**, **Long March 2** series, as well as a number of launch vehicles in a flight testing phase (such as India's **PSLV**). The annual launch rate capability of these was about 20 vehicles a year⁶.

A direct comparison of these demand and supply figures is somewhat clouded by the absence of figures for government launch requirements in the two markets. However, it is highly unlikely that government requirements could have filled the obvious gaps between demand and supply.

In further considering the situation in the context of the Christmas Island Spaceport, recognition must be given to the emergence of other proposed launch vehicles services (at that time Kistler, Angara, Orbital), on the supply side. Some of these were developed with the low-Earth orbiting

telecommunication constellations, such as **Iridium**, **Teledesic** and **Orbcomm** — **Kistler** and **Angara** have either disappeared or have been substantially delayed.

APSC was obviously well aware of this gap, but they believed they could compete successfully in the market with a price of US\$ 15,000 per kg, as opposed to US\$ 20,000 per kg for other launch services⁷, *i.e.*, a 25 percent lower price than elsewhere. With 85 percent of the commercial market having satellites of 4,500 kg, a single launch would mean revenue of \$67,500,000 for APSC.

For launches into a low-Earth orbit, the 12,000 kg capability of the Aurora vehicle would be significantly over the mass of, for instance, an Iridium type satellite, which was less than 1,000 kg, indicating there could have been multiple satellites on a single launch.

At the time, **PriceWaterhouseCoopers** estimated that Australia (presumably APSC) could have expected to capture between 10 and 20 percent of a launch market that was to be worth up to



Christmas Island Asia Pacific Launch Facility, Australia

\$40 billion over the current decade⁸.

How realistic were the expectations of the sponsors? It seems they were at odds with the market predictions for launch vehicles.

In a statement made in December 20019, *David Kwon*, APSC's Managing Director, said that he expected 15 Aurora launch vehicles would eventually be launched each year from Christmas Island. Just put that in perspective: In 2001, 15 launches occurred from Baikonour, including several military launches; there were 17 launches from Cape Canaveral, including 6 Space Shuttle launches; there were 8 launches from Kourou. Also in 2001, there were 14 typical commercial

launches. Did *David Kwon* expect to capture the entire market? Did he expect Arianespace, Lockheed Martin, Boeing, Energiya and the Chinese to drop out of the market?

The 2001 market predictions that have been quoted in this article by Dr. *Bruce Middleton*, former Director of the Australian Space Office and, at the time, an independent consultant, were also reflected by the **Futron Corporation** in their October 2001 report '*The Space Launch Industry — Recent Trends and Near-Term Outlook*'. Also in March 2002, **Forecast International** in their study '*Commercial Communications Satellites: 2002-2011*', indicated that large spacecraft production levels would reach their lowest point by the middle of the decade whilst they expected that



The Christmas Island spaceport would have taken up a great deal of the island's real estate...

the low-Earth orbiting satellite market would remain in the doldrums.

So why was it the Russians were so actively pursuing this launch site development?

The hint is in one small odd statement made by Russia in relation to the Christmas Island proposal. They did not intend to put any money into the launch site development — their contribution to the project was a launch vehicle. As the Aurora launch vehicle was not much more than a Soyuz launcher with some new and recycled bits and pieces added to it, as well as a new name, the Russian investment, in monetary terms, would have been quite minimal.

A Christmas Island launch site would have allowed Russian rockets to carry heavier cargoes to higher orbits. Earnings from commercial launches have been a key source of revenue for Russia's space industry and heavier cargoes mean more income. It is worthwhile to note that the Russians will finally achieve their goal of an equatorial launch site when the first Soyuz launch vehicle is launched from Kourou, later this year.

Kodiak Launch Complex Opinion

With respect to the Kodiak Launch Complex there is, in the opinion of this author, a real chance that it will fail as a true commercial spaceport. In a realistic commercial undertaking, investors would expect to get a return on capital investment within about 10 years.

With the current capital investment of about \$120,000,000, as quoted by the Alaska Office of Management and Budget, this would mean an average profit of \$12 million per year (ignoring future capital investments and inflation), a level of profit that has not been reached in any of the six years of operation.

This indicates that the State of Alaska may have to subsidize the operations of the spaceport, unless new markets can be found and captured. The fact that, so far, the U.S. government, through the Missile Defense Agency, has been the only major customer, and that the current contract expires on August 31, 2011, has caused the Governor of Alaska to transfer the operations of the

AAC from the *Department of Commerce, Community and Economic Development to the Alaska Department of Military and Veteran Affairs* as of July 1, 2011.

Is this obvious attempt to strengthen the site's ties with the military sufficient? Based on the historic figures, a military contract at the same level as in previous years may sustain operations for some years at a low level. Fortunately, Kodiak has the advantage that it allows suborbital missiles to be launched into directions that are more difficult to achieve from other locations.

To make full use of the complex, more orbital launches of a commercial nature (including NASA launches) would be required. However, the complex has two major limitations that will prevent it from attracting a major share of the commercial market. First of all, the advantage of location that seems so useful for the military, limits commercial satellite launches to those that have to be placed in a polar orbit. Furthermore, there is the burdensome cost of transporting equipment, rockets and launch personnel to Kodiak. With the new launch vehicles such as the *Falcon 9* and *Taurus 2* achieving flight status and operating from Cape Canaveral and Vandenberg, the use of Kodiak does not seem attractive.

Euroconsult, a leading space consultant firm, has forecast that about 1,220 satellites will be launched over the next 10 years. Of these, 808 satellites will be funded by civilian and military government agencies, with about two-thirds of those being for civil or civil/military use. In addition, Euroconsult expects that 200 satellites will be launched into medium and low Earth orbits (MEO and LEO) during the period, of which 80 percent, *i.e.*, 160 communications satellites, will replace the first generation Iridium, Globalstar, and Orbcomm satellites. This seemingly leaves 20 satellites for other purposes¹⁰.

While none of these figures directly correlate to the Kodiak Launch Complex, they do provide, in the opinion of the author, a clear indication that, with the operational

limitations outlined above, it is highly unlikely that the complex will attract sufficient orbital launches to make it a profitable commercial undertaking.

References

- ¹ Performance – Alaska Aerospace Corporation 2010, Office of Management and Budget, omb.alaska.gov/results, at time of accessing
- ² Details obtained from the APSC website, apsc2orbit.com, at the time of accessing
- ³ FAA Associate Administrator for Commercial Space Transportation, 2000 Commercial Space Transportation Forecasts, Washington, May 2000, as published in Middleton, B.S., An Update on the Commercial Space Launch Market In The Next Decade, Canberra, March 2001, Table 1
- ⁴ Middleton, B.S., An Update on the Commercial Space Launch Market In The Next Decade, Canberra, March 2001, Table 2
- ⁵ Middleton, B.S., Table 4
- ⁶ Middleton, B.S., Table 5
- ⁷ Miles, A., Christmas Island Launch Center Gains Momentum, space.com, 6 September 2001
- ⁸ Press release, 24 June 2001
- ⁹ Western Australian Newspaper 21 December 2001
- ¹⁰ Euroconsult, Satellites to be Built and Launched by 2019, World Market Survey, as reported by <http://www.spacemart.com/reports> on 7 September 2010

A Case In Point

Communication Integration For Emergencies

The Missouri State Highway Patrol (MSHP) is an internationally accredited law enforcement organization with 1200 sworn officers, including officers from the Gaming and Drug and Crime Control divisions, and over 1200 uniformed civilians and support staff. MSHP is responsible for enforcing traffic laws on Missouri's 33,000 miles of state-maintained highways, as well as motor vehicle inspections, commercial vehicle enforcement, driver's license examination, criminal investigations, criminal laboratory analysis and research, public education, gaming enforcement, law enforcement training, and more. MSHP works in conjunction with state, county, local, and federal agencies in the coordination of emergency and non-emergency communications.

“Ensuring interoperability and data exchange between law enforcement agencies within a state, especially during a crisis situation, is the biggest challenge for law enforcement agencies today,” says Captain *Kim Hull*, director of the MSHP communications division. “Interoperability is critical for public safety success.” MSHP identified several statewide events and natural disasters where communication had been a problem. Due to disparate communication technologies, especially over the radio between state and local agencies, MSHP recognized a need for change.

To overcome this challenge, MSHP, MDepartment of Public Safety, Regional Homeland Security, and the City of Sikeston Department of Public Safety joined forces to collaborate and secure the necessary funding. Together they spearheaded comprehensive review to assess the need of the state to pave the way for an integratpublic safety unified communications platform.

Network Solution

Based on extensive research, the group selected Cisco to improve their interdepartment communications based on the company's industry leadership and ability to provide a solution that would change the way its public safety agencies operate, communicate, and collaborate.



Missouri State
Highway Patrol



A Case In Point

“When we looked at different vendors, everybody seemed to be relying on Cisco for their communications solutions,” said Chief *Drew Juden*, director of public safety for the **Sikeston Department of Police Safety**. “Everything that we saw and all of our research led us back to Cisco, as being the number-one provider of the type of communications we needed.”

The joint group worked with **Front Line Communications**, a communications vehicle fabricator, and **ICS**, a **Cisco** partner, on the creation of the new **Network Emergency Response Vehicles (NERVs)**. The vehicles act as a command center for on-the-ground disaster management, as well as a central processing center for communications. The vehicles all feature **TelePresence**, video surveillance, Wi-Fi, satellite communications, and IP telephony on-board. Through the **Cisco® IP Interoperability and Collaboration System (IPICS)**, MSHP is able to communicate with state and federal agencies, from local sheriff’s departments and fire departments to the U.S. National Guard.

Missouri now uses a fleet of five *Emergency Response Vehicles*, the first effort of its kind in the state. The fleet includes two larger trucks and three rapid response Chevrolet Suburban vehicles. “These vehicles provide satellite communication for telephone, video conferencing, and microwave feeds from a helicopter to the truck, back to the State Emergency Management Agency and other state and federal agencies,” said Hull. “Each department is able to communicate seamlessly with one another through an integrated platform.

Business Results

Through the implementation of the Cisco NERV, MSHP has made a significant impact on the citizens of Missouri and the emergency response community. Today, various law enforcement agencies are able to communicate their individual needs and data to each other to provide the appropriate assistance to citizens quickly, as well as supply situational awareness capabilities for state and local emergency management officials, and the Governor’s office.



In January 2009, the emergency response vehicles were put to the test when Missouri was hit with one of the most devastating ice storms in decades. More than 2500 utility poles and 400 lines were damaged, disabling all power and telephone service in southeast Missouri for over a month in some areas. MSHP moved the NERV trucks to a staging area where critical supplies, such as food and water, were distributed to citizens. These same vehicles were used to provide radio communications and video data across satellites to the *Missouri State Emergency Management Agency* in Jefferson City in real time, which assisted in the mitigation process.

“While many communications platforms can provide day-to-day functionalities, we needed an overall network strategy that worked for emergency responders 24 hours a day, 7 days a week, 365 days a year,” *Juden* said. “I can say without a doubt, that this last event that we had with the ice storm, communications was not an issue. It was not even considered. Everything worked flawlessly from IPICS to the Cisco phone system.”

A Case In Point

Missouri State Highway Patrol is now able to provide better service and security throughout the state. The citizens can rest assured that during their time of need, we have the assets that will benefit the community and their lives. — Captain Kim Hull, Director of the Communications Division, Missouri State Highway Patrol

In addition to emergency response, the vehicles are used at other large government and community nonemergency events throughout Missouri. At the 2009 Governor's inauguration, all five Emergency Response Vehicles were brought together for the first time, enabling a communications mesh network to be created. MSHP communicated with all the public safety agencies, including

Product List

Routing and Switching

- ◇ Cisco 2800 Series Integrated Services Routers
- ◇ Cisco Power Over Ethernet Switches Wireless
- ◇ Cisco Wireless technology, including outdoor mesh deployments

Voice and IP Communications

- ◇ Cisco IPICS 2.1
- ◇ Cisco Unified Communications Manager
- ◇ Cisco 7921 Mobile IP Phones
- ◇ Cisco 7965 IP Phones

the National Guard, at the event on a single net platform. This level of interoperability and increased situational awareness helped ensure the safest environment for the citizens and government officials of Missouri.

“Situational awareness allows on-scene commanders and commanders at the headquarters level, state emergency management level, and the Governor's office level to analyze the circumstances at the event and allocate the appropriate recourses needed to manage the scene,” said *Hull*. “This project has provided vehicles that have communication assets that are above anything that we've had before.”

Next Steps

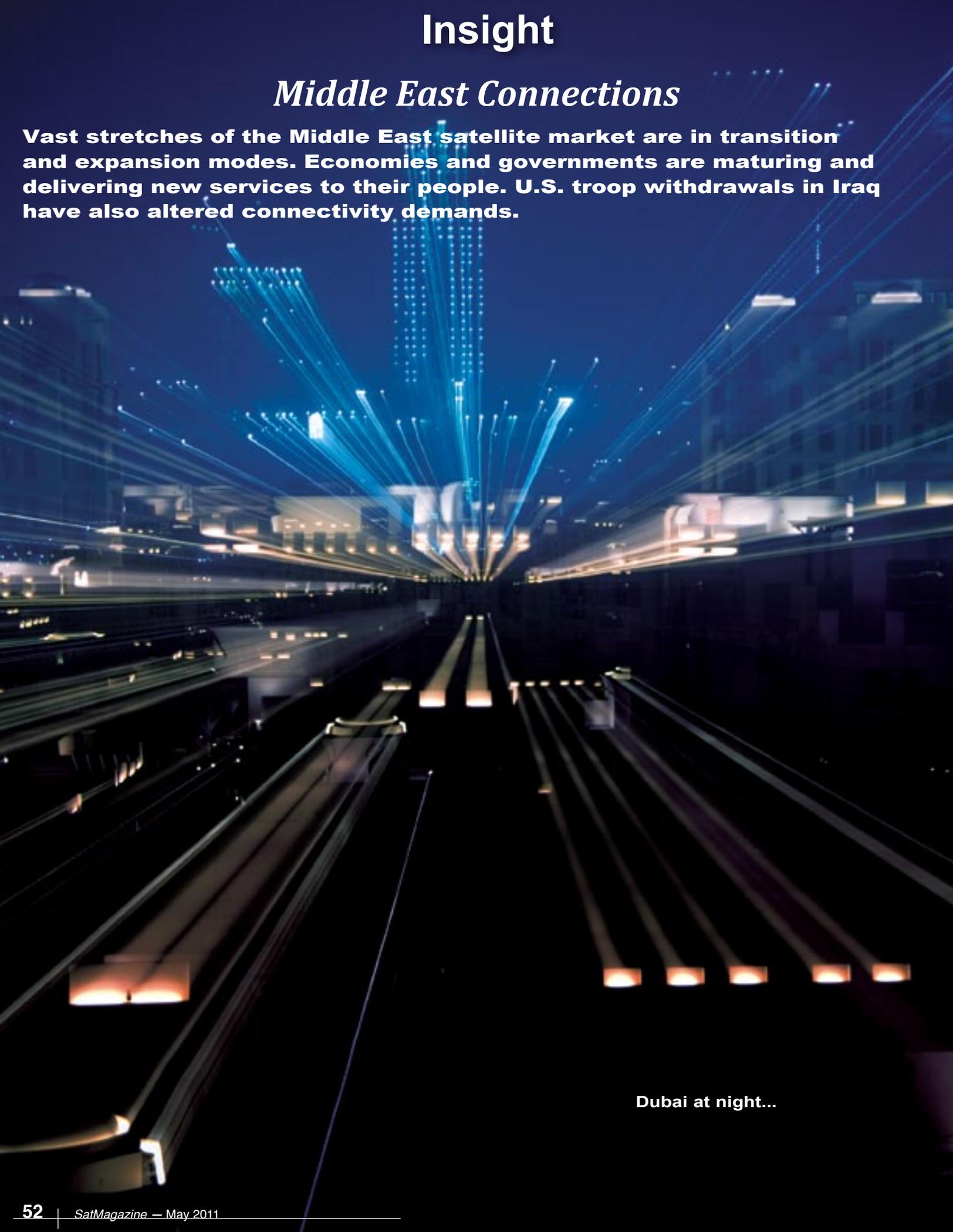
MSHP continues to expand their unified communication, collaboration, and emergency response capabilities throughout the state, from their headquarters to district offices. They are also upgrading the vehicles with a wireless video platform, which enables MSHP to setup wireless video cameras as far as a quarter of a mile away from the vehicle and receive real-time video feed back to the vehicle. “Missouri State Highway Patrol is now able to provide better service and security throughout the state,” says *Hull*. “The citizens can rest assured that during their time of need, we have the assets that will benefit the community and their lives.”

To learn more about Cisco's Safety and Security solutions, go to: <http://www.cisco.com/go/govsafety>

Insight

Middle East Connections

Vast stretches of the Middle East satellite market are in transition and expansion modes. Economies and governments are maturing and delivering new services to their people. U.S. troop withdrawals in Iraq have also altered connectivity demands.



Dubai at night...

Insight

“The flexibility of our satellite fleet has enabled a quick migration from imported IP-based connectivity via Asia or Europe to the deployment of VSAT networks delivering a wealth of communications capabilities within the region,” explained *Hussein Oteifa*, Senior Regional Director in the Middle East for **SES**.

“As the demand has shifted, we’ve been able to reconfigure our spacecraft and unify our resources to meet the changing needs of our customers and the marketplace,” noted *Oteifa*. “Whether it’s extending the reach of fiber and mobile phone services into remote places or enabling the rapid establishment of reliable data networks virtually anywhere in the region, the Middle East is increasingly counting on SES.”

“SES WORLD SKIES and SES ASTRA have pooled their resources to better serve the Middle East and Africa with advanced satellites and experienced people under the SES banner,” explained *Deepak Mathur*, Vice President of South Asia and Middle East Sales for SES. “Our One SES approach provides a single point of contact for our customers doing business across the region where both SES WORLD SKIES and SES ASTRA are enabling exciting applications,” he added.

“In a time of market and economic weariness, SES provides strength and stability,” explained *Oteifa*. “We are far more than simply a bandwidth provider. SES is here for the long haul with the satellites, technologies and peerless expertise to help our customers grow and succeed.”

The Capacity To Connect

Huge demand for satellite bandwidth is on the horizon in the Middle East. Innovators in Saudi Arabia, Egypt, Kuwait, Lebanon, Libya, Afghanistan and the United Arab Emirates, to name just a few, are using SES capacity over GSM backhaul and VSAT networks to both augment and create growth opportunities.

Telecom operators are developing regional and nationwide banking, education and emergency communications networks over VSAT. The systems will enable financial institutions, for example, with everything from email and internet access to ATM transactions.

“Leading providers, such as Lunasat, Saudi Telecom and others across the region, are reaping the benefits of VSAT networks: it’s quick to implement, secure and extremely reliable,” *Oteifa* said. “As a result, satellite is being strongly embraced in a wide range of industries in the Middle East, including oil and gas, financials, maritime, even education.”

Saudi Arabia is linking more than 1,000 schools to the internet via SES satellites. The sultanate of Oman also has plans to connect students at more than 500 schools using satellite-delivered broadband. “The educational benefits are limitless and we’re extremely proud to be playing such a vital role in putting a world of educational information at



the fingertips of tens-of-thousands of children,” said *Oteifa*. “This is absolutely an area where satellite will truly shine in the Middle East.”

Mobile phone operators are keenly focused on expanding their use of satellite-delivered GSM backhaul, as big city telecom markets approach the saturation point. “There’s very strong demand among a lot of regional telecom players who are leveraging satellite’s reach to extend their service areas and subscriber base into the rural areas of the Middle East and Africa,” said *Mathur*.

“SES offers a very advanced world-class global backbone infrastructure,” said Engr. *Saad Demyati*, VP of Saudi Telecom’s Wholesale Business Unit. “Saudi Telecom, being the leading provider of telecommunication services in the Middle East, values its important relationship with SES. Such a relationship permits Saudi Telecom to further

extend and diversify its network reach, thereby enabling it to offer high-quality and reliable innovative telecom services to its customers within the Kingdom of Saudi Arabia as well as in the Middle East.”

SES has an ambitious satellite fleet investment strategy aimed at ensuring enough capacity to meet the burgeoning regional demand. SES WORLD SKIES’ **NSS-5**, **NSS-6**, **NSS-7**, **NSS-10** and **NSS-12** satellites, along with SES ASTRA’s **ASTRA-3B** spacecraft, currently serve the Middle East. Four additional satellites will be launched in the next two years to bolster the bandwidth necessary to enable the connectivity evolution in Africa, India and the Middle East. **SES-4** and **SES-5** are both scheduled to initiate service this year, while **ASTRA 2F** and **ASTRA 2E** are expected to launch in 2012 and 2013, respectively.

SES is also a major financial backer of **O3b Networks**, a next generation satellite operator building an innovative fiber-speed Medium Earth Orbit satellite constellation. The network will combine the ubiquitous reach of satellite with the speed of fiber to deliver satellite internet and mobile backhaul services to emerging markets such as the Middle East and Africa.

The Expertise To Deliver

Capacity alone isn’t enough – not for a region tapping the full range and potential of satellite technologies and solutions. Service providers, operators and government agencies across the Middle East rely on SES and its broad offering of training and educational programs aimed at maximizing successful deployments and minimizing interference.

“The more our customers know about satellite, the more successful they’ve become at driving business and connectivity improvements across the region,” *Oteifa* said. “Expertise runs deep in our team, which is fully capable of arming our customers with everything from the basic to advanced satellite knowledge they need to launch, secure and manage their networks.”

Satellite interference is a major concern in countries such as Saudi Arabia, where the SES team is making significant progress battling the issue with educational efforts that have drawn praise industry-wide. “Even our competitors have taken note of our ability to reduce outages and their impact on satellite-delivered services in the Middle East and Africa,” explained *Oteifa*, citing piracy as another key problem facing the region. “SES has invested heavily in technologies and platforms that enable us to deliver secure video, voice and data regionally and globally,”

Poised For Regional Growth

The demand for flexible and reliable connectivity across the Middle East, Africa and beyond is driving the delivery of new and mission-critical applications. Like multinational corporations and early technology adopters, governments are latching onto an entrepreneurial spirit, thanks to satellite.

For example, Kuwait plans to link all of its embassies worldwide over a satellite-delivered VSAT network. The UN is set to tap VSATs to deliver connectivity to conflict areas in Palestine, Israel, Afghanistan and Darfur, among other places.

“We have consistently anticipated the needs of our customers by immersing ourselves in their operations,” said *Oteifa*. “SES has worked side-by-side with our clients in every phase of development and deployment – from engineering design and technology training to the reliable delivery of solutions tailored to meet their business demands and challenges.”

“We rely on SES satellites and people with the know how to help us deliver everything from IP trunking and backhaul services throughout Lebanon, Iraq, Afghanistan, Iran, Jordan and Saudi Arabia,” said *Peter Samaha*, Vice President of Marketing and Business Development for **Lunasat**, a leading provider in the Middle East and Africa. “In a market that has our teams scrambling to meet evolving demands, SES is great source of stability and flexibility that keeps us ahead of the curve.”

A Case In Point

Globetrotting Journalist Stays In Touch With BGAN

More than once, renowned photojournalist Randy Olson has found himself in a remote region of the world without adequate means of calling for help or transmitting large files when necessary. That's why he added BGAN from Stratos to his list of essential equipment. With BGAN, Olson can quickly set up a broadband office with voice and data communications — anywhere on Earth.

Remote Region Challenges

Randy Olson vividly remembers the first time he traveled on assignment to a remote part of the globe without any means of communication. “It was Arctic Siberia, the early 90s. I was with these wild Russian explorers, who floated us on pontoons down rivers where, if the wind changed, we would never have gotten back,” he recalls. “Of course, they didn't tell me that beforehand.”

What's more, only one helicopter pilot knew where they were. “If that guy had a heart attack or something...well, there were no options.”

Since then, Olson — an award-winning photojournalist who does advertising shoots for clients such as Toyota, and photography for magazines like *National Geographic* — has worked in nearly two dozen countries around the world, often in remote, inhospitable areas.



A Case In Point

“There are always safety issues when you get into these kinds of places,” he notes. “If something bad happens, if you’re in trouble or hurt or sick, you need to be able to call somebody to get you out.” Once, in Guyana, for example, a member of his party swelled up so badly from an injury they couldn’t move. Olson had to hike out to find help. That’s the main reason he began carrying a satellite phone.

Unfortunately, he adds, it was nearly impossible to send photos or email with a satphone. “My old satellite phone could transmit a little bit of data, but I’ve got 10MB of files. Just trying to send a short text email would take an hour. Frequently, it would get hung up and time out before sending the message. There’s no way I could send in photographs from the field.”

As Olson’s specialty is social documentary, normally he’s not under the urgent deadlines imposed on photojournalists covering breaking news. Nevertheless, there are times

when he needs to deliver photos to editors or clients from isolated locations. And if he’s worried his equipment might be stolen, damaged or confiscated, he needs to upload files to his server in Pennsylvania, just in case. “In Kamchatka several years ago,” he recalls, “I decided to send back a bunch of raw files from a hotel, before flying home. But the bandwidth there was so low, it took all night.”

What Olson needed, therefore, was the ability to set up a remote office anywhere in the world—with data and voice capabilities, and a reliable broadband connection to the Internet. For the past two years, **Inmarsat’s *Broadband Global Area Network (BGAN)*** service from **Stratos** has met that need quite nicely.

An “Eminently Portable” Broadband Office

Olson went looking for BGAN in 2007 for a big photo shoot in the Australian outback, where there was no Internet access. “I already knew about BGAN,” he



Olson in Ethiopia

A Case In Point

The BGAN terminal is compact enough to fit easily into a small backpack. It's eminently portable and easy to set up, yet it does so much — Randy Olson, independent photojournalist

explains. “I mean, BGAN is the only tool for spot news journalists trying to work quickly and get photos back from the dust of Iraq and places like that. In this case, Toyota had deadlines for advertising materials during the shoot. So I started calling around. Stratos was the nicest, most accommodating and economical BGAN provider I got on the phone. They’ve been very kind and supportive.” With BGAN from Stratos, he successfully transmitted large files from the field, and met his client’s deadlines.

Since Australia, Olson has used BGAN in remote areas of Africa and the Middle East as well. One assignment was in

one of the world’s largest and most forbidding sand deserts, where the dunes are taller than the Eiffel Tower. Broadband Internet? Cell phones? Not a chance.

Often, he’s away for months at a time. One year, Olson was on the road for 11 months. Normally he travels with just a translator and a driver. As an independent photojournalist, he says, “I prefer to work quietly and carry a small amount of unobtrusive equipment. So it’s great that the BGAN terminal is compact enough to fit easily into a small backpack. It’s eminently portable and easy to set up — yet it does so much.” Not only does BGAN enable Olson to deliver files from anywhere on Earth, but often he uses it for voice and email alone. “I probably use BGAN more for communication than for sending photographs,” he admits. “It’s all about staying in touch. When you’re a freelancer running a small business, you can’t just drop out for a couple of months. Sometimes I need to talk to picture editors, and plan the next shoot. My wife is also a photographer who travels on assignment around the world.



A Case In Point

We often bridge the gap between our wildly different locations with BGAN.”

Safety, of course, is his major concern. “There are still many places in the world where you can’t use a cell phone or get an Internet connection,” Olson concludes. “When I’m in the middle of nowhere for a month or two, with no other form of communication, BGAN is very, very useful to have. Recently, our car broke down in a very remote, desolate corridor on the Ethiopian border. But I was able to call my wife, who alerted a third party to our location.”

Stratos has worked closely with Olson, using **Stratos Dashboard** to ensure that his SIM card and Stratos Trench firewall rules are properly set to allow the secure communications he requires, and provide convenient alerts for his remaining airtime.

About Randy Olson

Randy Olson is one of only two photographers to hold the distinction of being awarded both “Newspaper Photographer of the Year” and “Magazine Photographer of the Year” by Pictures of the Year International (POYi), the largest photojournalism contest operating continuously since World War II. He has spent the last 18 years shooting primarily social documentary photography all over the world. A recipient of prestigious grants, awards and fellowships, Olson lives in Pittsburgh, Pennsylvania with his wife, Melissa Farlow, also an award-winning photographer. Visit their web site at www.olsonfarlow.com.

About Stratos

Stratos is the world’s trusted leader for vital communications. With more than a century of service, Stratos offers the most powerful and extensive portfolio of remote communications solutions including mobile and fixed satellite and microwave services. More than 20,000 customers use Stratos products and industry-leading, value-added services to optimize communications performance. Stratos serves U.S. and international government, military, first responder, NGO, oil and gas, industrial, maritime, aeronautical, enterprise, and media users on seven continents and across the world’s oceans. For more information visit www.stratosglobal.com.

BGAN Key Benefits

BGAN users can access email, corporate networks, the Internet, transfer files, make telephone calls, and transmit streaming IP data via satellite. Key benefits and features of BGAN include:

- ◇ *A range of small light-weight, highly portable and rapidly deployable terminals*
- ◇ *Ability to communicate from anywhere, even when terrestrial networks are not operational*
- ◇ *High-speed wireless IP data and circuit switched network*
- ◇ *Shared capacity IP data rates up to 492 kbps*
- ◇ *Guaranteed streaming IP data rates up to 384 kbps*
- ◇ *Simultaneous voice and data — on different channels*
- ◇ *Highly compatible with leading professional video applications and codecs including Clipway, Streambox, Quicklink, Livewire and Vpoint*
- ◇ *Optional guaranteed bandwidth*
- ◇ *Support for legacy applications and a platform for new IP-based solutions*
- ◇ *Support for supplementary services, e.g., call hold, call waiting, call forwarding, SMS card and voicemail*