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YEAR IN

REVIEW

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Editors' Note:

The annual YEAR IN REVIEW offers companies that comprise the varied industries within the SATCOM "space" to reveal to our readers their challenges and successes over the past year as well as the opportunity to prognosticate as to their thoughts for the year ahead.

To preclude any hint of favoritism shown to one company or another, all of the features are offered in alphabetical order. Those firms who appear within this issue's pages took the time and the interest—via their own words—to develop their articles. We hope they present to our global audience an accurate view of where the industry has been during 2014 and where the various market segments might lead during 2015. Direct links to each participating company's infosite are incorporated into the company names that comprise the titles of each feature.

We thank each and every executive and their talented team members for composing and allowing us to present their insights... we also thank our audience for their continued interest in SatMagazine and SatNews Publishers.

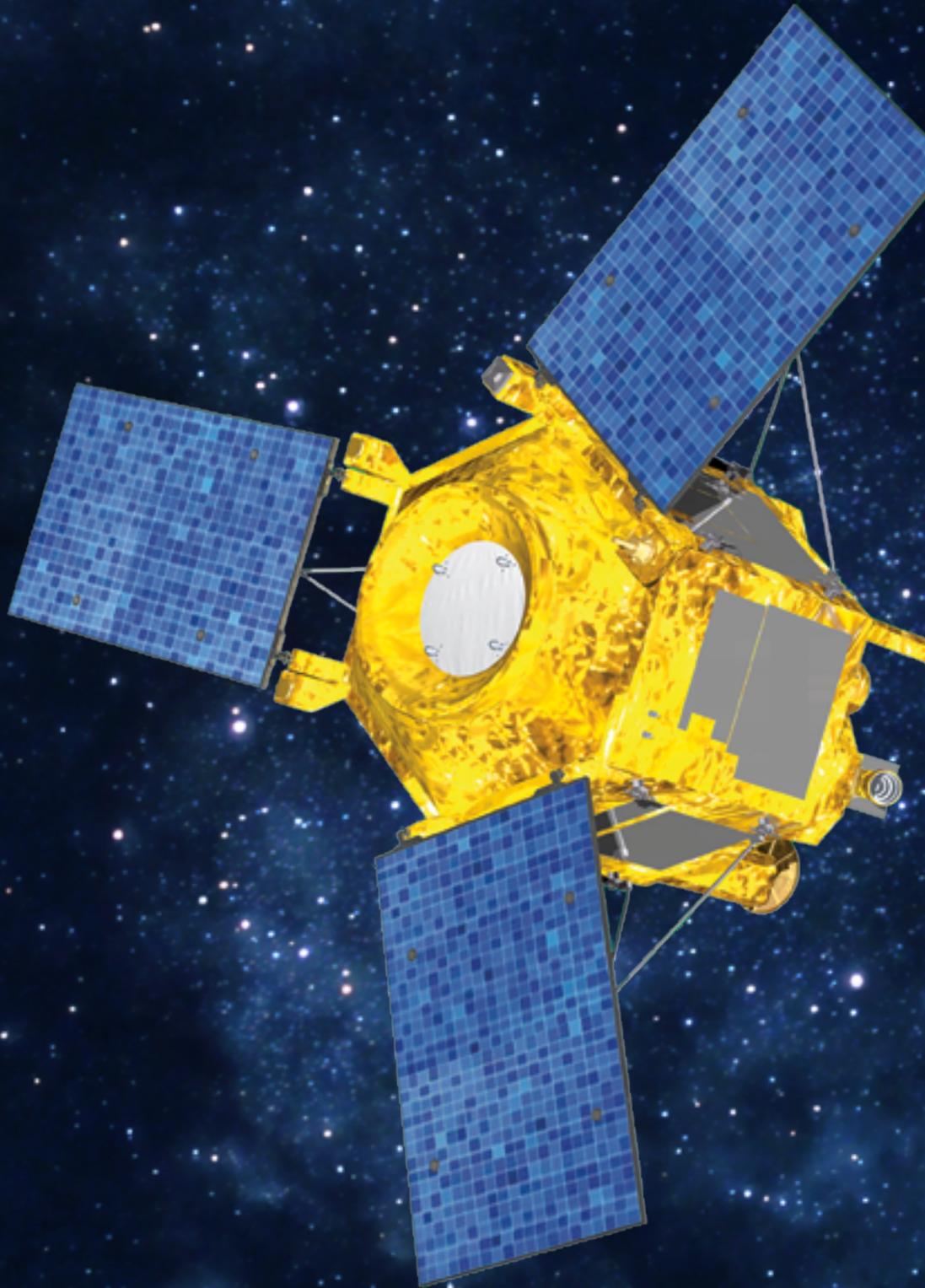
All our best — the editorial team.



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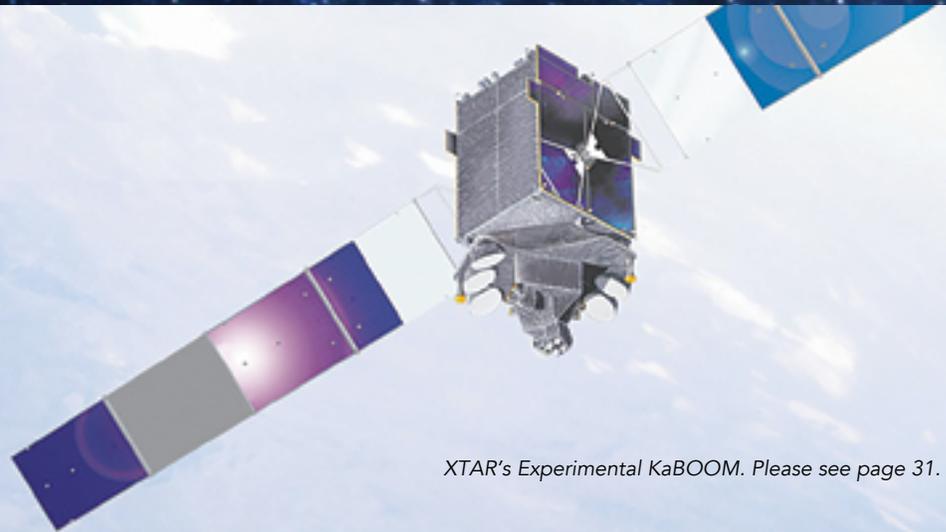
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JAXA's Hayabusa-2 Upcoming Asteroid Meeting + Moog Is On Board



The Hayabusa-2 is launched via a H-IIA rocket from the Japanese Tanegashima space complex.

The initial Hayabusa mission launched in 2003 and returned to Earth in 2010 with a sample from a small asteroid near Earth named "25143 Itokawa."

Moog Inc. Space and Defense Group provided critical hardware to the Hayabusa-2 satellite and H-IIA rocket that launched on December 3 at 1:22:04 p.m. (JST) from Tanegashima, Japan.

The launch vehicle and spacecraft RCS Thrusters were built by Mitsubishi Heavy Industries, Ltd. (MHI). The Electric Propulsion (EP) System was built by MHI and NEC

Corporation (NEC), and the spacecraft was built by NEC in Japan.

The Hayabusa-2 mission is JAXA's follow-on to Hayabusa to acquire a sample from an asteroid and then return that element to Earth.

MHI's H-IIA rocket includes the first stage gimbal actuator assembly with servovalves, built in Moog's Hiratsuka, Japan, facility. This facility also provides roll control thruster valves for the Epsilon rocket that is based upon the solid rocket technology found on the H-IIA.

NEC's Hayabusa-2 bus includes both chemical and electric propulsion. Moog supplies 24 thruster valves to control the flow of propellant to each of the 12 MHI rocket engines and two bipropellant torque-motor latch valves to provide isolation of bipropellants.

For the spacecraft's electric propulsion, two solenoid latching valves maintain isolation of xenon and six electronic pressure regulation valves contribute pressure and flow regulation of xenon to the electric thrusters.

In addition to propulsion components, Moog also provided spacecraft mechanisms to the satellite bus. A thruster gimbal assembly enables ion thruster vector pointing and attitude control for four ion engines.

The Asteroid Multi-band Imaging Camera (AMICA) on Hayabusa 2 contains a Moog filter wheel with eight positions mounted at the end of the telescope to cover different bands, seven of which are compatible with the Eight Color Asteroid Survey (ECAS).

Two types of high gain antenna pointing assemblies allow for the gimbaling of the antenna for communication from the spacecraft back to Earth.

The Hayabusa-2 mission will build upon the legacy of the original Hayabusa spacecraft. Moog provided the same components and subsystems to MHI for the original Hayabusa mission. The proven performance of Moog's contribution to the mission will assist in JAXA's goal to strengthen Hayabusa-2.

Hayabusa-2 is expected to arrive at the target asteroid "(162173) 1999 JU3" in July of 2018 and perform a survey for a year and a half before returning to Earth in December of 2020.

The Moog infosite: <http://www.moog.com/>
The JAXA infosite: <http://global.jaxa.jp/>



Artistic rendition of JAXA's Hayabusa-2.

ITAR Regulatory Environment Has Been Altered—Be Aware Of The Changes

The U.S. Commerce Department's Bureau of Industry and Security ("BIS") and the U.S. State Department's Directorate of Defense Trade Controls ("DDTC") recently published final rules to move most civil and commercial satellites and components from the U.S. Munitions List ("USML") to the Commerce Control List ("CCL").

These final rules represent important progress in ongoing efforts to reform export controls and remove unnecessarily restricted items from International Traffic in Arms Regulations ("ITAR") control. These changes were advocated by the satellite industry for years and were authorized by Congress and the President in late 2012 and early 2013.

According to Under Secretary for Industry and Security for the United States Department of Commerce, Eric L. Hirschhorn, in a speech given in 2013 in Colorado Springs, Colorado, the changes will affect four items, "Items transferred include, certain commercial communication satellites and lower performing remote sensing satellites; ground control systems and training simulators "specially designed" for telemetry, tracking and control of spacecraft controlled in 9A515; radiation hardened microelectronics formerly controlled in Category XV of the ITAR; and parts and components of satellite bus and payloads not listed on the USML."

Prior to this statutory shift, all satellites were controlled under the ITAR including those for commercial, research, and communications purposes. Moving these items to the CCL makes them eligible for less restrictive

licensing including some license exceptions under the Export Administration Regulations ("EAR"). However, some items will be subject to more restrictions, including special rules for exports to China and foreign-made items that incorporate US-origin components.

The final rules went into effect on November 10, 2014.

*Article by Shih-Kuei Chen, LLM,
Blakely & Justice, Longmont, Colorado*

We Can See More Clearly Now—SPOT 7 Becomes Azersky

Azercosmos” OJC, the national satellite operator of Azerbaijan, has signed a strategic cooperation agreement with Airbus Defence and Space to take over the rights to operate and commercialize the SPOT 7 high resolution (1.5m imagery products) optical Earth Observation satellite, which was successfully launched on June 30, 2014—the satellite is to be renamed as Azersky.

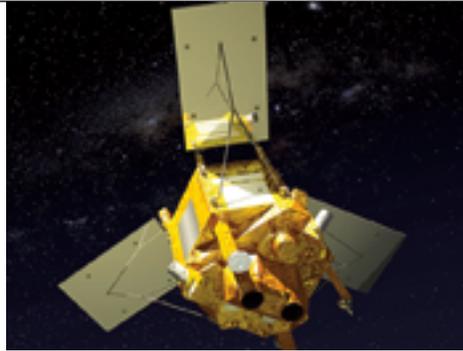
The agreement, which is an important step in the development of relations between Azerbaijan and France, was signed at Bakutel 2014 Telecommunications and Information Technologies Exhibition in the presence of His Excellency President Ilham Aliyev. Mr. President commenced commercial operation of Azersky by acquiring the first symbolic image from the satellite.

The long term strategic cooperation between the two parties also includes joint operations of Azersky of Azercosmos and the SPOT 6 high resolution (1.5m imagery products) optical Earth observation satellite of Airbus Defence and Space in a constellation to provide superior service.

Moreover, the ground segment to be constructed will allow Azercosmos to access images acquired from Pléiades 1A and 1B, very high resolution (0.5m imagery products) optical Earth observation satellites commercialized by Airbus Defence and Space.

This satellite constellation opens up opportunities for many applications, providing the latest images within an unprecedented time frame. The combined acquisition capacity of Azersky and SPOT 6 is equal to six million square kilometres per day—an area ten times the size of France. This means that every day, every point on the globe can be viewed in high-resolution by the Azersky and SPOT 6 satellites.

Azersky was successfully launched on June 30, 2014, on a PSLV Indian launcher and has a projected service life of at least 12 years.



Artistic rendition of the Azersky satellite, formerly known as SPOT 7.

During the next 1.5 years, more than 25 Azerbaijani professionals will be trained in France on optical satellite operations, product development, sales, and marketing of Geo-Information services.

This agreement also marks Azercosmos’ entry into the commercial business of Earth observation services, including Geo-Information services. This will strengthen Azerbaijan’s position among the limited number of countries rendering satellite services.

Rashad Nabiyev, Azercosmos CEO, said, “This agreement is an important step taken by Azercosmos to diversify our satellite services and bring additional value into the economy of Azerbaijan; and we are glad that Airbus Defence and Space is with us for this challenging journey.”

Another partnership agreement for Azerspace-1, the telecommunication satellite operated by Azercosmos, has been cemented into place with Gilat Satellite Networks.

The contract is for the use of Gilat’s SkyEdge II-c network for multi-application satellite managed services for Azercosmos’ customers.

“Our Azerspace-1 satellite reaches a customer base spanning Europe, Africa, the Middle East, Central Asia and the Caucasus,” pointed out Rashad Nabiyev, CEO of Azercosmos. “We appreciate the multi-application nature of Gilat’s SkyEdge II-c platform, which enables us to target a diverse set of markets including broadband, mobility and cellular backhauling.”



Erez Antebi, Gilat’s CEO, said, “We are proud to be working together with Azercosmos to bring advanced communication services to the Consumer, Enterprise and Government sectors.”

Azerspace-1 provides broadband and broadcast solutions to customers in Europe, Africa, Middle East, the Caucasus, and Central Asia. The satellite, to operate in orbit for at least 15 years, was launched in February of 2013 and is equipped with 36 transponders: 24 in C-band and 12 in Ku-band at 46 degrees East longitude.

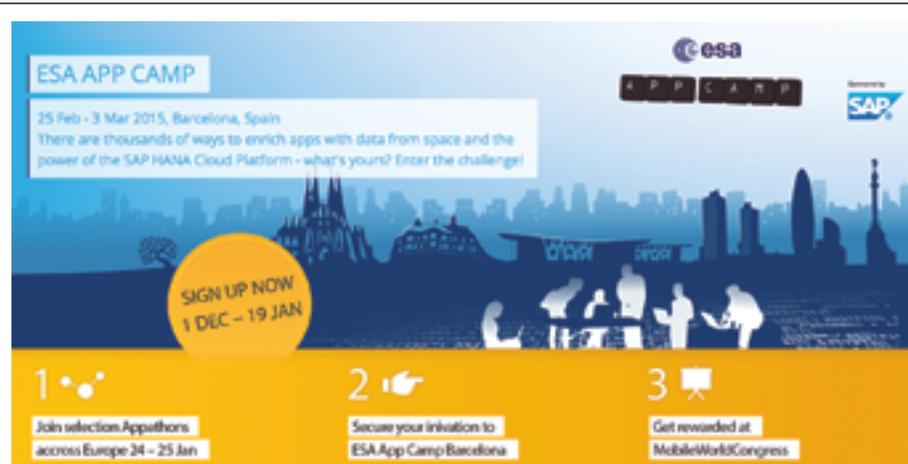
Strategic development plans for Azercosmos include planning for the launch of their second telecommunications satellite and the establishment of Earth Observation (EO) commercial business services during the upcoming years.

Gilat Satellite Networks Ltd. provides products and services for satellite-based broadband communications. Gilat develops and markets a wide range of high-performance satellite ground segment equipment and VSATs, with an increasing focus on the consumer and Ka-band market.

For further Azercosmos information, please visit <http://www.azercosmos.az/>

For more information, please visit Gilat at <http://www.gilat.com/>

Innovative EO Apps Behind The ESA App Camp Program



The ESA App Camp is inviting developers to Barcelona from February 25 to March 3, 2015, for an event set to culminate in an awards ceremony at the Mobile World Congress—the participants will be selected at six simultaneous Appathons across Europe from January 24 through 25, 2015.

From space, our planet's atmosphere, land, and water can be monitored for multiple application fields. This is where the ESA App Camp comes in: The App Camp challenges developers to create innovative applications that will make Earth Observation (EO) data accessible to a broad audience and create value in the process.

Participants in Barcelona will have access to the SAP HANA Cloud Platform that enables developers to build, extend, and run applications on SAP HANA in the cloud. With its unmatched capability to process big data in high speed and its built-in geospatial functionality, it is the natural choice for running EO applications.

Experience in integrating such data or using the SAP HANA Cloud Platform is not required to participate in the preceding Appathons.

Step one—Join Appathons across Europe
Anyone who is up for the challenge and wants to win an invitation to the ESA App Camp Barcelona is welcome to attend one of the six Appathons.

These events, which will be held at ESA Business Incubation Centers (ESA BICs) and partner locations, will offer developers the chance to meet with like-minded people and tackle some of the world's greatest challenges.

In short workshops, participants will gain insights into the SAP HANA Cloud Platform, the Earth observation program Copernicus, and a dedicated map API. They will also have the opportunity to obtain business support from the ESA BICs and the SAP Startup Focus Program.

Meanwhile, five challenges will inspire the participants to create the solutions of tomorrow. They will be organized into teams tasked with devising innovative application ideas and viable business cases in one of the following topic areas: Big Geo Data, Crowdsourcing Solutions, Environmental Protection, Food Security, or the Internet of Things.

A welcome package, food, and beverages will be provided. From students and professionals to company founders and freelancers, people of all skill levels are invited to participate. All developers need to bring along is a laptop and their next big idea.

The Appathons are free to attend, but participants must register on a first come, first served basis at <http://www.app-camp.eu>.

Step two—Work hard and impress the jury
After spending two days on development, each team will pitch its own innovative concept to a jury of experts.

The winning team of each Appathon will then be invited to the ESA App Camp Barcelona (with all costs covered) to compete for the grand prize, which will be awarded at the Mobile World Congress 2015.

Step three—Get invited to the ESA App Camp Barcelona—In vying against one another for five days in the Catalan capital, the Appathon-winning teams are sure to have plenty of fun while learning a lot.

Two cash prizes worth 5,000 euros each are waiting to be presented directly at the Mobile World Congress, which all ESA App Camp participants will receive tickets to attend.

The Appathons are being hosted by the excellent partners from the ESA Space Solutions network.

The ESA App Camp Barcelona is being organized by Anwendungszentrum GmbH Oberpfaffenhofen (AZO) on behalf of the European Space Agency and sponsored by SAP University Alliances.

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Agencies + Schools To Benefit From Hughes' Helping Plans

Hughes Network Systems, LLC, (HUGHES) has launched new upgraded broadband satellite Internet access plans for government agencies and rural K-12 schools.

Operating over the nationwide HughesNet Gen4 service, and employing affordable customer premise equipment, the new Business Internet (BI) Select and Access Plans feature download speeds from 5Mbps up to 15Mbps and are available now.

Ensuring that local, state and federal governments have the latest commercial technology available, Hughes is offering 1- and 2-year plans for the public sector.

Hughes Government Solutions



These plans are available for departments and agencies to purchase through the Hughes GSA Schedule and available state contracts.

All plans offer Express Repair Premium and ZoneAlarm free for six months. Additional

maintenance package options are available, as well as equipment purchase or lease.

“Government agencies need greater capacity for access to their applications and to better serve constituents,” said Tony Bardo, assistant vice president for Hughes Government Solutions. “And K-12 schools in rural America need high-speed Internet access to better equip their students for the realities of digital learning and on-line testing. Our new service plans and greater allocations during school and business hours are ideal for students, teachers, and all public servants.”

For more information regarding the new Business Internet Access and Select plans for government and K-12, please visit <http://government.hughes.com/>.

Kacific Is Island Hopping With High-Speed Broadband For Tokelau



Tokelau, composed of three small atolls situated north of Samoa, is a Polynesian territory of New Zealand with a population of just 1,400.

There is no airport in Tokelau, and a chartered vessel MV PB Matua, operated under an arrangement between New Zealand and Tokelau, is the only means of transport to and from the islands at present: the trip from Apia in Samoa takes over a day.

Despite its small size and remoteness, Tokelau is committed to thriving in a digital world. Although connectivity is expensive, the country has seen a pattern of moderate Internet usage in recent years and a rate of Internet penetration comparable to other, more populous Pacific countries.

Now with fast, low cost broadband from Kacific it will dramatically change the communication landscape of this territory. It will enable

- **Affordable, direct-to-premises access to e-Government applications provide better access to online resources for knowledge management and connectivity of assets including energy generation systems and transportation**
- **Provide high-speed broadband to passengers on-board the passenger vessels while en-route to and from Tokelau**

- **Improve the health, education and social wellbeing of Tokelauan communities**
- **Help improve monitoring of communicable diseases, enable remote diagnostics, and support training and e-health campaigns**
- **Primary and secondary students and their teachers will be able to access distance learning and curriculum resources from New Zealand**
- **Tokelauans will be able to communicate better with family members who have gone overseas to live.**
- **For the first time, all Tokelauans will be able to access television services.**

"When we designed our service we had in mind the need for it to be easily adapted to meet the needs of small, isolated, sparsely populated countries like Tokelau," said Kacific CEO, Christian Patouraux. "Tokelau is a textbook case for Kacific: the agreement with Teletok validates our approach, so we're delighted.

"The provision of affordable, accessible low-cost, high-speed broadband will enable Tokelau to make significant and rapid progress in key policy areas including good governance and the development of our people, infrastructure and economy," said Tealofi Enosa, CEO of Teletok.



"By supporting these four priority development goals of the Tokelau National Strategic Plan, it will fundamentally change every aspect of life in Tokelau," Tealofi added.

Kacific will deploy a single high power beam from its Ka-band High Throughput Satellite (HTS) to cover the three atolls. And will provide sufficient capacity to ensure a reliable and affordable service with ample room to grow and expand.

Tokelauans on all three atolls will receive equally outstanding service quality and will be able to enjoy high throughput speeds using only small (75cm to 1.2m diameter) inexpensive terminals.

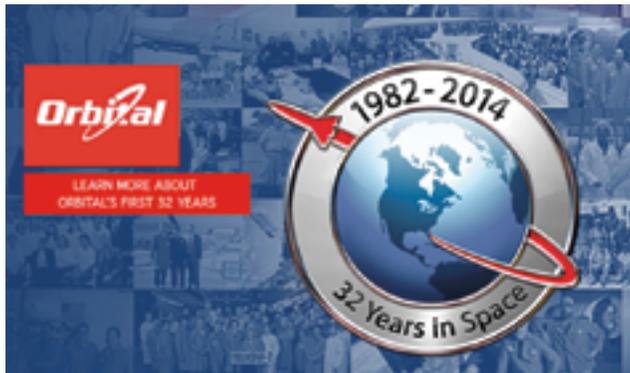
Kacific expects to launch its Kacific-1 satellite by early 2017 and to provide operational service shortly thereafter.

This agreement is the sixth that Kacific has signed since it announced its intention to provide a satellite-based broadband service, in December 2013.

For additional information, please visit <http://www.kacific.com/>

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The Bringing Together Of Orbital + ATK



Alliant Techsystems Inc. and Orbital Sciences Corporation have announced that the U.S. Department of Justice (“DOJ”) has unconditionally cleared the proposed merger of ATK’s Aerospace and Defense Groups with Orbital.

The U.S. Federal Trade Commission (“FTC”) informed ATK and Orbital on December 4, 2014, that the FTC and DOJ terminated the Hart-Scott-Rodino waiting period effective December 4, 2014.

As previously announced, ATK and Orbital have entered into a transaction agreement, whereby ATK’s Aerospace and Defense Groups will merge with Orbital immediately following the spin-off of ATK’s Sporting Group business to ATK stockholders as a newly formed company called Vista Outdoor Inc.

The companies anticipate completing the transaction in February 2015, subject to the satisfaction of remaining closing conditions, including the approval of both ATK’s and Orbital’s stockholders at special meetings scheduled for January 27, 2015.

Additional information concerning the special meetings and the transaction is included in ATK’s registration statement on Form S-4, which has been filed with the Securities and Exchange Commission and, once it is declared effective, the joint proxy statement/prospectus included in the Form S-4 will be mailed to ATK and Orbital stockholders who are entitled to vote at the respective special meetings.

The Orbital infosite may be accessed at <http://www.orbital.com/>

The ATK infosite may be accessed at <http://www.atk.com/>

ATK Aerospace Group



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An Elevated USDA Certification For CompassData



CompassData has announced that their CompassTA™ elevation accuracy software has received OCIO-ITS certification from the U.S. Department of Agriculture (USDA).

Certification allows 40,000 USDA users the opportunity to use CompassTA software for elevation accuracy verification of LiDAR point clouds, digital elevation models (DEM), and other raster data sets.

USDA certified the CompassTA software through the Office of the Chief Information Officer – Information Technology Services (OCIO-ITS) within the Device Deployment Services Branch.

Earlier this year, CompassData received DO-200A approval from the Federal Aviation Administration (FAA) to use its CompassAA™ software and ground control points (GCPs) to verify the accuracy of satellite and aerial imagery for the creation of certain aviation products.

CompassTA and CompassAA are software tools in CompassData's CompassV&V line of Verification and Validation products. Based on the popular Topo Analyst and Accuracy Analyst software tools CompassData purchased from Spatial Information Solutions (SIS) in early 2014, the rebranded CompassV&V products include CompassAA,

for orthorectified image verification, and CompassTA, for QA/QC of elevation data.

"This certification provides assurance to our current and future USDA clients they are using a data verification tool that has been thoroughly scrutinized and tested by their own internal auditing process," said Jeff Barker, CompassData product manager.

For 20 years, CompassData has performed custom GCP collection for clients in the geospatial profession and archived those points in a database for commercial sale to other end users.

The CompassV&V tools are used extensively with custom and archived GCP to verify the accuracy of geospatial imagery, surface and elevation models and many other spatial products.

Used by numerous U.S. federal agencies under the SIS brand names, CompassV&V tools are content enhancement solutions that automate map accuracy verification and eliminate manual processing, ensuring consistent quality control of geospatial products backed up by standardized reporting procedures.

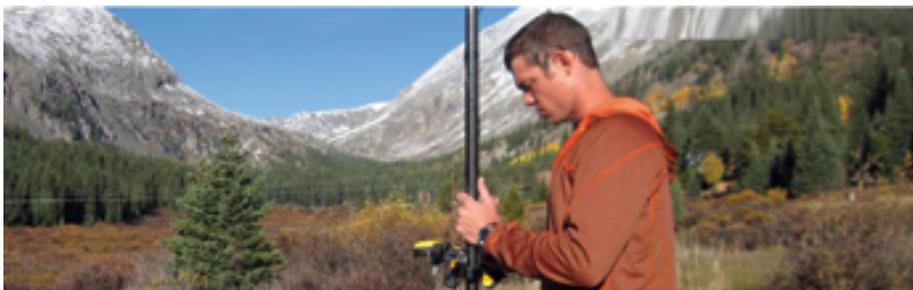
Both tools establish automated workflows and generate standards-based documentation delivered along with end products.

"Since acquiring and rebranding the CompassV&V tools, we have made administrative upgrades to enhance the user experience," said Barker. "Additional improvements are in the works."

Leveraging the CompassV&V software tools, CompassData has expanded its custom Validation Service using GCPs. This service is offered for clients who prefer, or are required, to have an independent third-party perform quality assurance and supply verification reports, CompassData has licensed professionals on staff that perform Validation Services using high-quality GCPs along with the CompassV&V tools.

The CompassData team can conduct this service faster and at lower cost than other firms that have to obtain their own GCPs.

Additional details are available at <http://www.compassdatainc.com/compassta.htm>



InfoBeam

Inmarsat Beters BGAN Via Citrix's Technology

Inmarsat has announced that Citrix, a leader in business mobility solutions, has been appointed as an Inmarsat Certified Applications Partner (CAP) for its Citrix CloudBridge™ application.

Citrix CloudBridge will initially support Inmarsat's award-winning BGAN (Broadband Global Area Network) service, which is used around the world and across a broad range of markets, including the oil & gas, energy, utilities, media and humanitarian sectors. The appointment of Citrix as an Inmarsat CAP for CloudBridge is part of the company's on-going strategy to establish a powerful and trusted relationship with the global applications and solutions community.

"Real-time connectivity is an important enabler of productivity and users frequently need to work in environments with high interactivity, rapid response times and unfettered access to multimedia content", said Nadeem Khan, Inmarsat's Global Head of Enterprise Applications Development. "However, not all applications and services are designed for use over satellite networks. Our work with Citrix is crucial in the delivery of optimized applications and services to our customers in remote locations around the globe. By working together, Citrix and Inmarsat have removed potential barriers to accessing applications for use over satellite, which ultimately offers an improved virtual desktop experience with built-in satellite optimization for end-users. Customers using Inmarsat's BGAN service will now be able realize the benefits that Citrix provides to enterprise users, including optimized real-time access to corporate applications, securely and globally, using satellite connectivity."

Chalan Aras, vice president and general manager, CloudBridge Product group at Citrix, said, "This represents the enhancement of an important relationship for both organizations and underlines the added value Citrix CloudBridge delivers

to enterprises that require the global connectivity offered by Inmarsat."

More info at <http://www.inmarsat.com/>

The Citrix infosite: <http://www.citrix.com/>

InfoBeam

Encrypted IP Video Satellite Broadcast Solution Delivered By Microspace



For more than 20 years, businesses have relied on Microspace Communications to distribute content for corporate communications networks.

Recently, one of Microspace's existing Fortune 500 financial information customers upgraded and expanded their network from 350 branches to 700 branches.

At the same time this expansion was occurring, Microspace also updated technology across the network providing a higher, more secure and cost effective solution. This new technology provides a cost effective way for financial information services clients to communicate with streaming content while protecting sensitive information during delivery.

Throughout the expansion from 350 to 700 locations, Microspace managed the installation of new equipment, the distribution infrastructure, and upgraded to an IP video network system, which provides a better product with higher performance while also reducing costs for our client.

For any company, doubling the number of locations would be a real communications challenge. For a financial firm, it's even more complicated given today's security requirements.

Microspace Communications Velocity® service paired with their newly installed Verimatrix encryption system provides secure and seamless communication to all locations.

"The ability to provide large amounts of information and a combination of various forms of video and data is an absolute necessity for our clients. This new expanded IP network provides a platform that includes the latest encoding, above industry standards encryption, easy management for all 700 locations with highly accessible viewing to multiple (desktops, TVs and mobile) devices for our customer," said Curt Tilly, Director of Enterprise Media, Microspace.

"Our clients look to us to provide turnkey, cost effective and secure solutions. This network expansion and upgrade demonstrated our expertise in handling all the pieces required to build a next generation platform," said Greg Hurt, Vice President of Sales and Marketing, Microspace. "Existing and future customers will benefit from the investment we have made in creating a true next-generation platform for secure real-time communications and content delivery."

For additional information, please visit <http://www.microspace.com/>

Identifying Interference Gains Assistance From VeriSat

VeriSat has launched SatGuard, a unique tool with patent-pending technology for identifying the source of adjacent satellite interference (ASI) and cross-polar interference (XPOL) caused by VSAT terminals.

By determining the ID of the specific terminals causing interference, the VSAT network operator can be informed to shut down the unwanted transmission. VeriSat has worked closely with SES to develop this tool to combat ASI and XPOL interference caused by VSAT terminals. SatGuard uses software radio technology and off-the-shelf hardware to capture and analyze the signals from the operational and interfered links. The system finds the terminal ID from the signaling information in the operational satellite links

and correlates this information with the bursts detected in the interfered signal. This information can then be sent to the VSAT Network operator where the necessary actions to stop the interference can be performed. SatGuard will enable satellite operators to measure the level of ASI and XPOL interference for each individual terminal, even when such interference is masked by other services.

VeriSat, together with SES, has conducted a series of successful tests on a live network to find the terminal IDs of interfering terminals. Tests show that interference levels as low as -10 dB SNR can be measured, corresponding to a level where the interference is no longer an operational problem. The technology will be enhanced in the coming months

and will allow nominal interference levels to be monitored for terminal line-up and commissioning applications.

"Interference issues caused by VSAT MF-TDMA systems are often time-consuming and complicated to resolve," said Chris Grogan, Senior Vice President of Customer Services Delivery at SES. "It was apparent that we needed a method of making that process more efficient and we started a dialogue with VeriSat earlier this year to find a solution. We are extremely pleased with the outcome."

For additional details, please visit the VeriSat infosite at <http://www.verisat.no/>

InfoBeam

SSL To Build HISPASAT's Amazonas-5



Artistic rendition of HISPASAT's Amazonas-4a satellite.

Space Systems/Loral (SSL) has been selected to provide a multi-mission communications satellite to Spanish satellite operator HISPASAT Group.

The satellite, Amazonas 5, will be used for a broad range of services in Latin America. With a high throughput Ka-band spot beam payload, the satellite will be used for broadband service in South America, Central America and Mexico. Amazonas 5 will also have a Ku-band beam for fixed satellite services, which will be used for television, corporate networks and other telecommunications applications in South America and Central America.

Amazonas 5 is based on the SSL 1300 platform that provides the flexibility for a broad range of applications and technology advances. Scheduled for launch in 2017, the satellite is designed to deliver service for 15 years or longer.

John Celli, president of SSL, said, "Amazonas 5 is the fourth satellite that we will build for HISPASAT, with two currently on orbit and another in backlog. We look forward to continued teamwork on this high performance satellite that will help HISPASAT broaden the availability of high quality communications in Latin America."

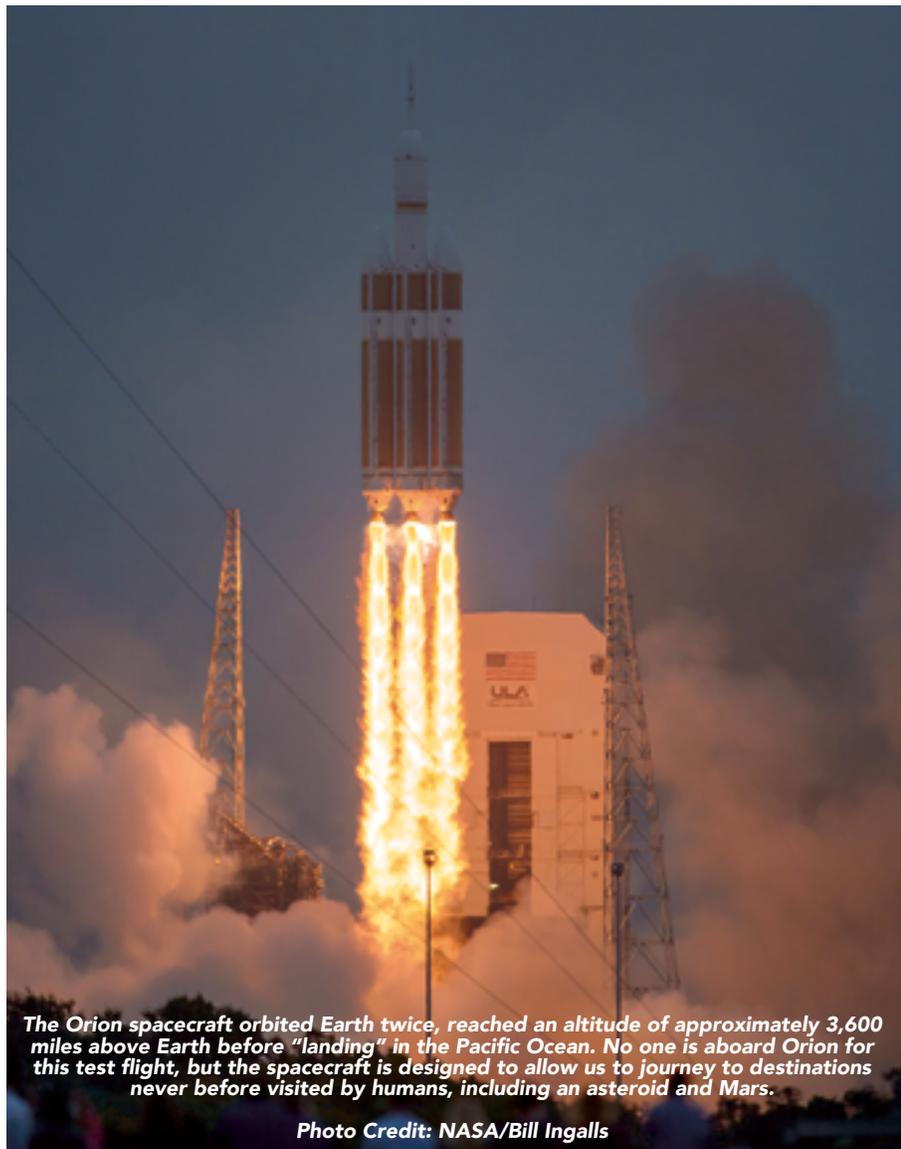
Carlos Espinós, chief executive officer of HISPASAT, said, "As the leader in commercial satellite manufacturing, SSL is well-positioned to support our current innovation and expansion initiatives by providing us with an outstanding satellite."

For additional information regarding SSL, please visit
<http://sslmda.com/>

The HISPASAT infosite is reachable at <http://www.hispasat.com/>

InfoBeam

Orion Off To A Super Start + Then Makes A Big Splash For Future Space Exploration



The Orion spacecraft orbited Earth twice, reached an altitude of approximately 3,600 miles above Earth before “landing” in the Pacific Ocean. No one is aboard Orion for this test flight, but the spacecraft is designed to allow us to journey to destinations never before visited by humans, including an asteroid and Mars.

Photo Credit: NASA/Bill Ingalls

Many consider the launch on Friday, December 5, 2014, as a major milestone in the U.S.’ efforts to build, propel and test a vehicle that is suitable for human travel into space—such has initially now been accomplished with the launch of NASA’s Orion spacecraft from Cape Canaveral in Florida.

Orion, built by Lockheed Martin, blasted away from Earth via a United Launch Alliance Delta IV heavy rocket at 7:05 a.m. The launch occurred after inclement weather on the original launch date of December 4 was responsible for an initial launch scrub.

Orion’s destination was 3,600 miles (5,800km) away, about 15x further than the distance to the International Space Station. Flight analysis was handled by the more than 1,000 sensors aboard the craft and a heat shield that measures 16 feet wide, protecting the craft through atmospheric re-entry.

The vehicle was designed and built to provide six astronauts a means of travel in space.

Some of NASA’s post-launch analysis will determine how well Orion withstood the harsh radiation and the extreme temperatures of space the vehicle traveled through, and if the craft and any humans within could survive journeying in the vehicle.

A safe splashdown into the Pacific Ocean for the capsule occurred after the two-orbit, four-hour flight. Now the in-depth analyses will be conducted regarding the aforementioned survivability issues, including Orion’s skill in unit retention after traveling back through the Earth’s atmosphere and the shock of an impactful ocean arrival. The previous occasion an astronaut travel habitat left Low Earth Orbit (LEO) was back in 1972

An ultimate goal for Orion? Mars is being discussed as one possible destination for human exploration; however, that visit remains many years away from fruition in the future.

Elliot Pulham, the CEO of Space Foundation, congratulated the entire Orion team and also said, “the world is once again on a firm course of space exploration that will get us out of Low Earth Orbit, taking humans back to the Moon and on to Mars and beyond.”

Editors’ Commentary

This launch is also a significant boost to the psyche of the U.S., whose space program has been in a miserable decline for many years, due to a lack of foresight by the government, diminutive agency leadership and political gamesmanship in DC. A successful Orion mission is certainly not a panacea for what has already been forfeited by the U.S. in terms of a commanding presence in space; however, any fresh start to return control back to the U.S. for astronaut travel is a good sign—someone, somewhere, has their act together, possesses the will to succeed, enjoys support talent that is overwhelming in its dedication and knowledge, all in spite of overwhelming budgetary and political odds against this mission and the ultimate goal of sustained astronaut travel.

Go ULA, go NASA, and go ORION.

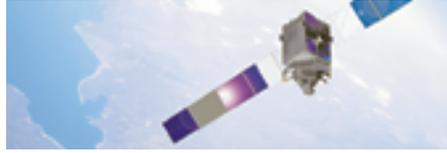
InfoBeam

XTAR's Experimental Systems Goes KaBOOM

XTAR, LLC, a commercial satellite operator delivering X-band services to government users, has been contracted by NASA's Jet Propulsion Laboratory (JPL) to provide X-band space segment for the Ka-Band Objects: Observation and Monitoring (KaBOOM).

KaBOOM is an experimental system to demonstrate uplink arraying of reflector antennas. Technologies developed in KaBOOM are expected to enable construction of a radar system whose primary goal is to track asteroids that have the potential to impact Earth.

XTAR will supply X-band space segment for a period of one year ending October 1, 2015. The capacity will be used along with other resources for testing techniques for phase-alignment of multiple large antennas.



NASA has several major goals for the KaBOOM interplanetary radar system, including protecting the planet through tracking and characterization of objects; improved detection and tracking of debris in Earth orbit; and instituting a rapidly available uplink capability for spacecraft emergencies. The X/Ka-band radar system also has applications for cost-effective space situational awareness.

"The KaBOOM program will allow NASA, and even the DoD, to track and characterize potentially hazardous objects," said Andrew Ruskowski, Chief Commercial Officer of XTAR. "The variety of applications which

could result from KaBOOM to affect space situational awareness and therefore protect humankind's safety is inspiring."

In addition to tracking objects, KaBOOM will generate data to fill capability gaps and address collection and operational needs for NASA and other agencies. For example, analysis of the data could aid in the orbit determination of some near-Earth objects mission targets.

In the NASA Authorization Acts from 2005 and 2008, Congress mandated that NASA discover 90 percent of all near-Earth objects 140 meters in diameter or greater by 2020.

Additional information may be gleaned at the XTAR infosite: <http://www.xtar.com/>

Ocean Surface Topography To Capture Jason-CS/Sentinel-6's Attention



Artistic rendition of the Jason-CS/Sentinel-6 satellite. Image courtesy of Airbus D&S.

The European Space Agency (ESA) has selected Airbus Defence and Space as the prime contractor to develop and construct the first Jason-CS/Sentinel-6 satellite.

The Jason-CS/Sentinel-6 is a mission to carry out high-precision measurements of ocean surface topography.

The satellite will measure its distance to the ocean surface with an accuracy of a few centimeters and use this data to map the topography globally, repeating the cycle every ten days. Observing changes in sea-surface height using such a high level of accuracy provides insights into global sea levels, the speed and direction of ocean currents, and ocean heat storage.

The measurements made are vital for modeling the oceans and predicting rises in sea levels.

The Sentinel-6 mission is part of the European Earth observation program Copernicus, and is a continuation of a program of global ocean-surface measurements made by satellites that began in 1992.

Weighing around 1 ton and flying at an altitude of around 1,300 kilometers, the Jason-CS/Sentinel-6 satellite will ensure that measurements are carried out on a continuous basis from 2020.

The satellite is designed to orbit for five and a half years, and operations will be overseen and managed by EUMETSAT in Darmstadt, Germany. Development of the satellite will be based on the highly successful CryoSat program.

“For this project we will rely not only upon the proven and efficient designs and processes applied to numerous Earth observation missions, but also, of course, upon the experienced Cryosat team of experts,” said François Auque, Head of Space Systems.

As with CryoSat, Airbus Defence and Space in Friedrichshafen will be the prime contractor for the space segment and heads the industry consortium on behalf of ESA.

Thales Alenia Space France will construct the main instrument, a radar altimeter, whose predecessor is already being used on CryoSat-2.

Further instruments are being constructed by NASA/JPL in the USA and provided by the American National Oceanic and Atmospheric Administration for the Jason-CS/Sentinel-6 mission.

Additional information regarding ESA is accessible via <http://www.esa.int/>

For more Airbus D&S information, please visit <http://www.airbusdefenceandspace.com/>

Advantech Wireless Is Getting To The Hub Of The Matter In Southeast Asia

Advantech Wireless has received a contract from a Southeast Asian Operator to supply its latest generation VSAT Discovery Hub platform to create a nationwide IP based communications network.

This contract also includes extensive training, installation services and multiyear factory support services. Advantech Wireless is providing two Discovery 100 Hubs. A fully redundant Discovery Hub will be operating in C-band on two separate Forward Links

(outbound carriers) and the world leading Advantech Wireless MCD (multicarrier demodulator) allowing future expansion up to 96 carriers without any change in hardware. The second Hub will be deployed in Ku-Band to operate simultaneously in Star and Mesh (direct remote to remote connectivity) mode. Advantech Wireless will also provide its powerful NetManager™ tool for network optimization, remote monitoring and control.

“Advantech Wireless has demonstrated our ability to provide turnkey solutions that maximize performance and minimize operational costs. We are extremely proud for the long standing relationship with our partner, who has now ordered its seventh Hub for operations in the Southeast Asian Region,” said John Landovskis, Vice President, PLM & Business Development, VSAT & Modem Products at Advantech Wireless.

More info: <http://www.advantechwireless.com/>

InfoBeam

A Commitment Increase For Emergency Comms By Thuraya

Thuraya Telecommunications Company has increased its commitment to emergency communications response with the donation of Thuraya satellite phones to the International Telecommunication Union (ITU).

Thuraya is providing the ITU with a supplementary stock of XT handsets to enable relief workers and first responders to connect and coordinate efforts during times of emergencies.

Thuraya's satellite equipment will enhance ITU's capacity in deploying mobile communications to assist countries in preparing for disasters and in strengthening response and recovery mechanisms. Thuraya will also provide ITU with preferential airtime rates and technical training support.

Thuraya provides mobile satellite-based solutions that are critical in supporting ITU



activities aimed at helping countries better respond to disasters and humanitarian crises. Thuraya's network has the unique ability to prioritize and increase signal availability over disaster hot spots. This feature is called Dynamic Resource Allocation which ensures that relief teams and victims get the connectivity they need without any congestion.

Thuraya XT is the world's toughest and smallest satellite phone. Certified with an IP54/IK03 durability rating, the phone is water resistant, dust and shockproof. Thuraya XT

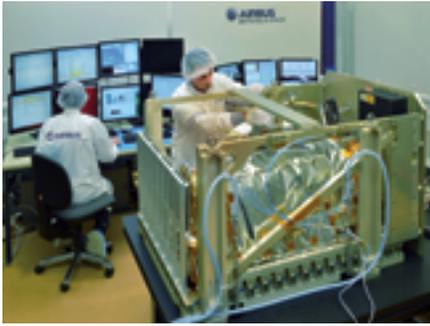
boasts full walk-and-talk functionality, can even work with the antenna stowed away and can be charged with a solar charger when power grids are down.

Thuraya Chief Executive Officer Samer Halawi said the agreement further extends the use of its satellite equipment for disaster relief. "At Thuraya, we strongly believe in our purpose to save and improve lives. We remain deeply committed to continuing our involvement in emergency communications programs, and to strengthening our partnership with the ITU. We provide reliable, cost-effective and rapidly-deployable mobile satellite services to NGO customers around the world, and are delighted to leverage our experience in our enhanced long term partnership with the ITU."

For further information, please visit <http://www.thuraya.com/>

InfoBeam

Einstein's Theory Of Relativity To Be Put To The Test By Airbus Defence and Space



Airbus Defence and Space is assembling the most precise "clock ensemble" ever for operation in space.

The photo may not look like a clock, but that's exactly what it is. By assembling the ACES (Atomic Clock Ensemble in Space),

Airbus Defence and Space is creating a "super clock" for the European Space Agency (ESA) that comprises two atomic clocks as well as laser and microwave links to the Earth.

ACES will run at a precision equal to 1×10^{-16} , which represents a loss of just one second every 300 million years.

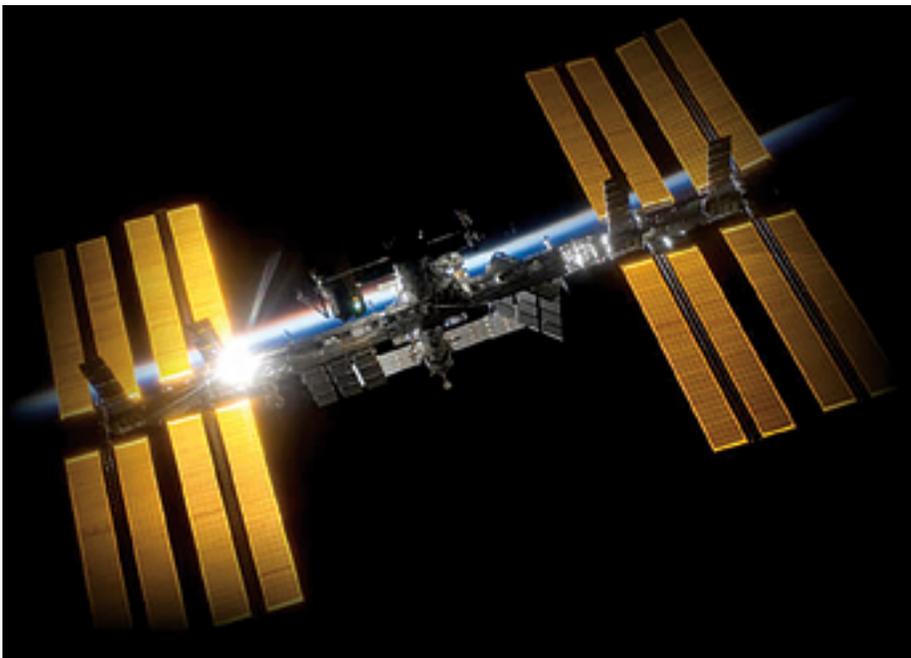
ACES is tasked with testing Einstein's general theory of relativity. As time is linked to gravity, it does this, put simply, by comparing the time recorded by the two space clocks with atomic clocks on Earth—even under different gravity conditions.

The ACES experiment payload will also help improve the precision and long-term stability of international atomic time (TAI) and coordinated universal time (UTC).

ACES is scheduled to be launched into space in 2017 and will be attached to the exterior of the International Space Station's European Columbus module.

For further information regarding Airbus D&S, please visit <http://www.airbusdefencespace.com/>

Boeing's Spectrolab—Life In A Cell... x4 Million And, Yes, This Is A Record...



Spectrolab provides solar panels for commercial, science, and military program solar arrays, for integration onto spacecraft by satellite prime contractors. Pictured here is a 51-foot, sixteen-panel solar array. Image is courtesy of Boeing.

Boeing's Spectrolab has now manufactured a record four millionth gallium arsenide-based space solar cells. These cells have powered more than 380 spacecraft flights and are providing power for the

International Space Station as well as hundreds of satellites and other spacecraft to keep our world connected with communications and information.

Spectrolab, the leading provider of space solar cells and solar panels, provides products to the commercial satellite industry, the U.S. Department of Defense, NASA and domestic and global aerospace companies.

"Spectrolab cells are providing power for the International Space Station, and hundreds of satellites and other spacecraft that help keep our world connected with communications and information," said Troy Dawson, president of Spectrolab. "Our extensive space solar cell experience, combined with continuing investments in the business and technology, continues to strengthen our competitiveness in both space and ground-based markets."

Since 1956, Spectrolab has continued to make technological advances, most recently creating a new solar cell wafer that is projected to reduce customer costs by up to 15 percent, through design and manufacturing improvements.

The Spectrolab infosite offers additional information at <http://www.spectrolab.com/>

By Werner Drews, Managing Director

Audio broadcasting certainly has not been immune from the sweeping changes that have been, and continue to, affect all parts of the media industry... as with television, radio has been coming to terms with new standards and new technologies that enable operators to re-consider the way they achieve their aims.

Many of the pressures that affect television also apply to radio; changes in consumption habits and platforms; the need to be more agile in business development; the need to identify and serve new audiences—these are all facts of life for broadcasters and operators of radio networks. So, too, is the drive to improve coverage, increase resilience, provide higher quality and reduce costs.

The gratifying thing about being a manufacturer serving this sector of the industry is that customers have so many different ways of achieving these goals. Almost every broadcaster or network operator goes about it in a unique way. It's fascinating to see how the big operators in our industry differ in their approach to solving what is essentially the same set of problems, and to then work closely with them to develop the optimum solution for each customer. It's one of our company's strengths that we have been able to adapt our technologies and products to the individual requirements of some of the most significant infrastructure projects in the industry.

In 2013, 2wcom embarked on several large projects with major broadcasters and media operators. Each of these projects was a response to the range of new opportunities afforded by technological

developments, and to commercial (and sometimes regulatory) conditions. One of the common features uniting them was the use of IP as one of the distribution technologies, in a variety of configurations, to meet some or all of the requirements of cost reduction, flexibility, redundancy, and regionalization. These projects have been rolling out through 2014 and most are now fully operational.



In France, TDF is the major operator of radio and television transmission services throughout the country, serving many different broadcasters. In designing its new platform, TDF had to consider the unique requirements of each of its broadcaster customers, and this meant that the technology we supplied them had to be extremely flexible. The FlexDSR units we provided allow TDF to accommodate each customer, whether the requirement is for satellite links, or IP lines, or both together in a backup solution. The FlexDSR was developed to support all the major IP protocols as well as satellite and ASI, meaning that TDF can deploy a single type of device to support all its customers right across the country, even though they may be using the technology in very different ways, as in the following examples.

Clear Channel Satellite exploits the FlexDSR's ability to connect to multiple sources and automatically detect and switch to the best quality source to implement an advanced redundancy strategy. FlexDSR's internal memory can



play out pre-recorded content when no source is available and this content can be distributed in the background via the IP channel on the satellite link.

This parallel IP channel can also receive standard IP traffic used to control the station and forward content to other devices in the station. If there isn't a physical network or the Internet connection fails, the FlexDSR network can be managed remotely via satellite, to implement file transfer uploads on the internal memory, play out jingles and regional or local advertisements via the scheduler, change presets or firmware updates, switch relays and so on—all with the built-in 2wcom Satellite In-Band Remote Control.

In Germany, Bayerischer Rundfunk has created a new infrastructure using 2wcom's FMC01, which combines Encoder and Decoder functions in the same unit and allows the broadcaster to send a complete FM MPX signal via E1 or IP for a point-to-multipoint distribution solution.

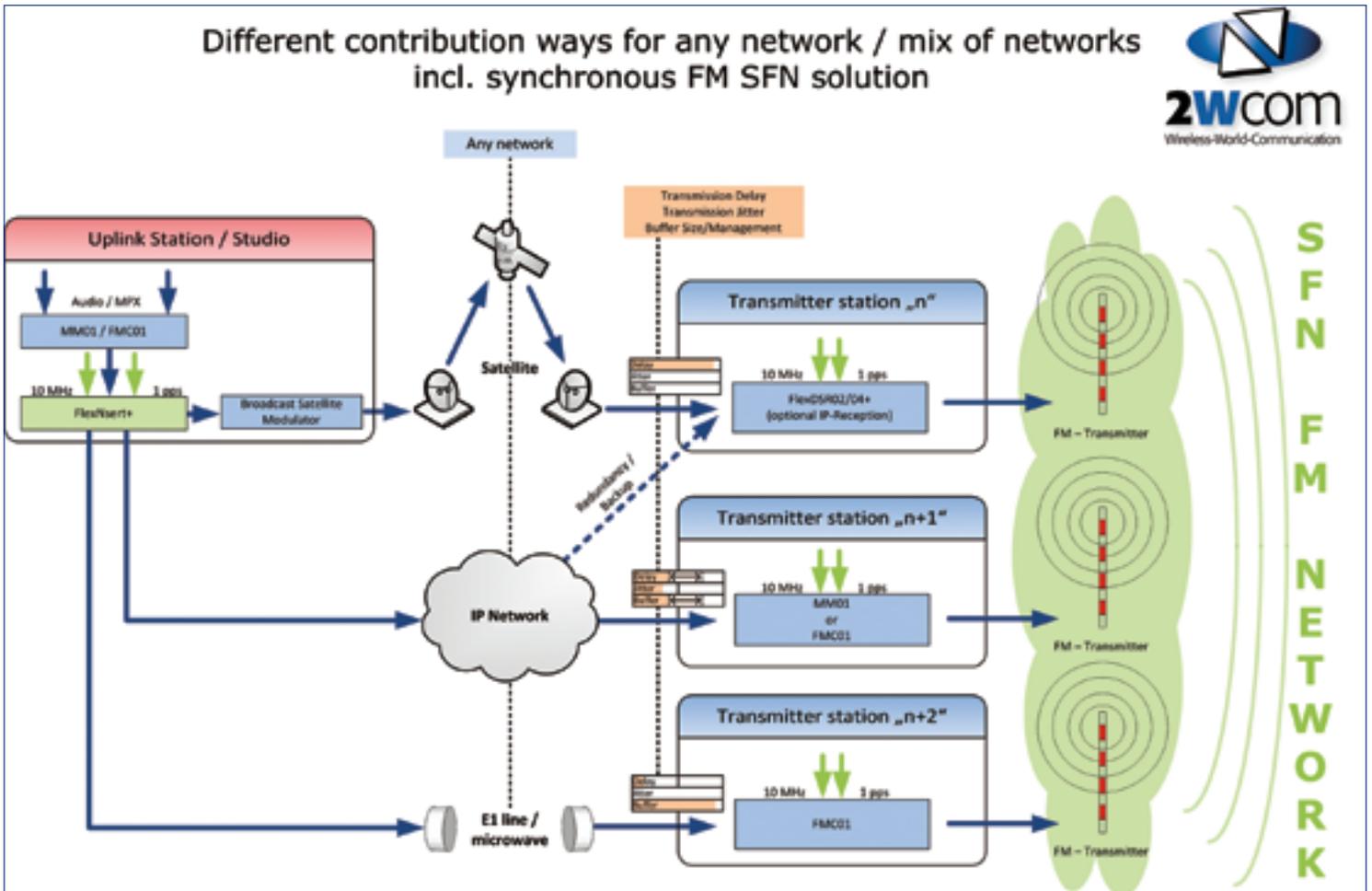
With the FMC01 installed, Bayerischer Rundfunk needs only one stereo generator and one RDS Encoder located at the central studio in Munich to generate the signal for each channel. All FM MPX signals for the broadcaster's eleven radio channels are generated there and forwarded via E1 to the transmitter locations using the FMC01 operating in encoder mode.

In anticipation of Norway's FM switch off in 2017, Norrking has been building a new national DAB radio network with DAB+ technology from 2wcom. The new network is used by Norway's national broadcaster NRK, with nationwide coverage achieved by landline connections to the network's main transmission sites, complemented by satellite distribution to 400 outlying transmitters reaching the remoter communities that are otherwise difficult to serve.

2wcom's FlexNsert DAB+ Distribution Inserter and FlexXtract DAB+ Distribution Extractor are deployed in the network's satellite headend system, and we believe this is the world's first network to provide DAB radio via a standardized IP delivery over Ku-band satellite payload.

The multiple capabilities of these units enable them to be used in a variety of ways, with different contribution and distribution technologies. They can provide a fallback capability, and with web-based monitoring and built-in satellite in-band control they are easy to operate and maintain remotely. But new formats and standards are adding to the diversity in radio, rather than reducing it. Lots of Countries are increasing their FM infrastructure or renewing it while others are planning on DAB+ digital radio.

Back to the future? The key for 2wcom is to continue to develop the most advanced solutions for all aspects of the radio market, as flexibility is vital to the industry at this point in its development.



Advantech Wireless

By David Geleman, Founder and CEO



Advantech Wireless provides wireless broadband communications solutions for commercial, critical infrastructure and government and military clients. Advantech Wireless designs turnkey satellite and terrestrial communications solutions that maximize performance and minimize operational costs, all with uncompromising quality.

With its customized approach, award-winning R&D and innovative engineering, Advantech Wireless empowers clients to achieve excellence in communication, all the while experiencing reduced CAPEX and OPEX overall.

David Geleman, the Founder and CEO, explained the reasons behind the firm's optimism.

"Year 2014 was of important significance as we grew our revenues 22 percent up as well as the bottom line. We completed 16 consecutive profitable quarters and our backlog is at its highest point in our company's history. This year exceeded all expectations with increased customer confidence in our innovative and cost-effective solutions. We expect to continue this trend in 2015.

"Our SapphireBlu™ Series of UltraLinear™ GaN based High Power Amplifiers was selected Teleport Technology of the Year Award 2014 by the World Teleport Association. This achievement became possible due to the remarkably high level of power and linearity performance that allows our customers to significantly reduce the cost of capital expenses and more importantly, at fraction of cost, compared to indoor Klystrons or super-linearized TWTs. For the first time in the history of satellite communications,

we are able to saturate all transponders of the satellite antenna and a single amplifier system per polarization.

"We were also extremely proud to have been selected to support the live transmission of the world's most important sport event of the year with our award winning 400W C-Band and 200W Ku-Band SapphireBlu™ Series GaN based HPAs. Millions of viewers were able to follow the transmissions of the biggest sport tournament in Brazil. For the first time we were able to experience worldwide tournaments and fast moving sporting events produced in 4K Ultra HD. This was an incredible experience and we are proud of being part of this worldwide achievement.

"Based on its recent analysis of the gallium nitride (GaN)-based devices market, Frost & Sullivan recognized Advantech Wireless with the 2014 North American Frost & Sullivan Award for New Product Innovation Leadership. Each year, Frost & Sullivan presents this award to the company that has developed an innovative element in a product by leveraging leading-edge technologies. The award recognizes the value-added features/benefits of the product and the increased ROI it offers customers, which, in turn, increases customer acquisition and overall market penetration potential."

On the VSAT product line, Advantech Wireless presented a game-changing terminal design, which is set to dramatically improve and simplify the provision of VSAT terminals for use with High Throughput Satellites.

"The patent pending Next Generation Discovery Adaptive Satellite Access Technology (A-SAT™) platform is revolutionizing the satellite communications industry," said Geleman. "Building upon the success of





our 96 carrier MF-TDMA multicarrier demodulator, we have developed the ground breaking technology of dynamically switching the access scheme (MF-TDMA or SCPC) used in a VSAT network, based on the traffic requirements at any instance in time to maximize bandwidth use. The A-SAT™ architecture combines the best properties of the MF-TDMA and DVB-S2 SCPC approaches in a single architecture, which can adapt its operation in real-time to the needs of individual terminals, their current link conditions and of the overall network.

“As a global company, we are committed to creating best in class technologies to meet and exceed our customers’ needs. Being on the forefront of innovation and excellence is what we are all about,” he added.

About Advantech Wireless

Reliable communication is essential to global commerce and security. Advantech Wireless makes it possible by designing smarter solutions to help people connect and businesses succeed. With our customized approach, award-winning R&D and innovative engineering, we provide the industry’s most advanced technologies, with the most economical total cost of ownership. We empower our clients to achieve excellence in communication, while experiencing reduced CAPEX and OPEX overall. Ultimately, our uncompromising quality and bolder thinking enable us to provide clients around the globe with smarter terrestrial and satellite communication solutions.

Under a new tagline **Smarter Solutions, Global Reach**, Advantech Wireless showcases its innovative solutions on its new, rebranded infosite: <http://www.AdvantechWireless.com>.



AeroMobile

By Jack Gordon, Marketing and Revenue Director

2014 has been an incredibly interesting and exciting year as we have seen awareness of, and demand for, inflight connectivity continue to grow. As a result of this demand, we have been working to update and improve our service and AeroMobile now has over 278 roaming partners in more than 130 countries.

In July 2014, the AeroMobile network was onboard over 13,000 flights and available to 4.6 million passengers—that's 55 million passengers over the year. What's more, since AeroMobile's launch in 2008, more than 21 million passengers have successfully connected to the AeroMobile network.

There have been a range of exciting milestones throughout the year that have helped us to reach this point. In February, Europe's largest airline, Lufthansa, received the landmark delivery of the first B747-8 to be fully line-fitted with the AeroMobile inflight mobile service. This delivery flight from Seattle to Frankfurt in February of 2014 was a particularly momentous one as it opened the path for all future B747-8s to be fitted with AeroMobile connectivity. Lufthansa also confirmed the airline would roll out mobile connectivity across its entire long-haul fleet of 100+ aircraft.

Another airline that has made a commitment to rolling out mobile connectivity is EVA Air. This year, EVA Air took delivery of three new AeroMobile connected Boeing 777-300ERs, with their first flights from Boeing's Seattle headquarters in the U.S. to Taipei in Taiwan occurring in

May of 2014. EVA Air is AeroMobile's second Asian airline customer following Singapore Airlines and we are expecting more to follow. In fact, we have a number of other Asian airlines scheduled to launch our service in the coming months.



Our service continues to prove popular with passengers on Etihad and Emirates flights, as these airlines continue to roll out AeroMobile connected aircraft. However, it's not just within the Middle East that we're seeing an increased demand for mobile connectivity. In the first six months of 2014, the total number of AeroMobile connected aircraft increased by 30 percent. Usage also shot up across the board when compared to the same period in 2013, with data seeing the highest increase, a massive 313 per cent, and the number of inflight texts increasing by 48 percent. With connections to the AeroMobile network up an impressive 56 percent, there's no doubt that inflight mobile connectivity is more popular than ever.

Throughout the year we have continued to see more and more passengers becoming aware of the fact that they can use their phones inflight to talk, text, or even tweet. With awareness, of course, comes higher demand. An AeroMobile survey in 2014 revealed that more than three quarters of travelers would use mobile-enabled Internet access while inflight. Almost half of the people questioned said they expect inflight mobile connectivity to become standard in the next few years—and we have to agree.





Southeast Asia is a key area of growth that we will be focusing on in the coming months. We have several Southeast Asian airlines scheduled to launch soon, including Thai Airways, Garuda Indonesia and a Malaysian airline.

In 2015, we will be working to ensure our customers have the best possible experience of the AeroMobile service. Satellite technology has come a long way over the past few years, enabling higher bandwidths and more services becoming available to aircraft. We look forward to the roll-out of 3G across our network in 2015, which will bring an even better experience for passengers using their phones inflight.

We will also continue to work to improve the availability and price of the service for our end users. Price and price predictability are important for the passenger. During 2015, I hope to see more attractive roaming packages available to the passenger and, consequently, even greater demand.

In the industry, we expect to see some interesting developments that will affect the future of inflight connectivity. We will be looking to see how the new rules issued by the European Aviation Safety Agency (EASA) impact public and airline sentiment toward the use of mobile phones in flight. In light of these new guidelines, each individual airline will have to complete safety assessments and establish its own policy regarding passengers using PEDs inflight.

We are also following the ongoing debate on whether the use of phones on planes in the USA will be approved by the FCC. We hope inflight mobile usage will eventually be allowed in the U.S. and that U.S. airlines will also be able to select which mobile services to offer their passengers.

2014 has been a busy and interesting year in the industry and for the entire team at AeroMobile and we're looking forward to seeing what 2015 will bring to our company and the industry.

Jack Gordon has 15 years' experience in the telecoms industry, spanning handset manufacturing with NEC and mobile operator systems with Telefonica O2. In 2011, Jack joined AeroMobile and was promoted to Marketing and Revenue Director in 2013. Jack is responsible for airline and passenger marketing, as well as extending the service through roaming partners and packages to drive continued growth for the company.

With airlines recognizing the growing need for passengers to stay connected at all times, we believe this trend will continue throughout 2015. We predict a 50 percent increase in the number of connected aircraft during the next 12 months. Before long, we expect that inflight mobile connectivity will be a hygiene factor for many travelers as inflight connectivity becomes fully embedded within the cabin experience. Keeping up with this trend will make 2015 a most exciting time for the company.

In 2015, AeroMobile will have new airline partners launching, and existing airline partners continuing, to roll out our service on additional aircraft. We operate globally and our service is currently active on more than 280 aircraft across 13 airlines—that equates to more than 500 flights every day that are equipped with AeroMobile connectivity.

The airlines currently offering inflight connectivity through AeroMobile are Emirates, Etihad, KLM, Air France, Lufthansa, Qatar Airways, Transaero, SAS, Singapore Airlines, EVA Air, Virgin Atlantic, British Airways and Aer Lingus, as well as VIP Carriers Comlux, Dubai Air Wing and Presidential Flight. We expect this list of airline partners will continue to grow throughout next year.



Airbus Defence and Space

By Erik Ceuppens, Head of Satellite Communications

At the close of 2014, Airbus Defence and Space had installed four times as many new maritime VSAT customers as 18 months ago, proving that the shipping industry is now truly embracing broadband connectivity at sea.

A growing understanding in the market is that satellite communication is not just a cost, but also an investment and, in part, drives our recent sales performance. Until five years ago, VSAT's primary use was vessels in specialized segments, such as cruise and ferry and offshore; however, the transportation sector has started to wake up to the opportunities of investing in VSAT. Though the primary driver for a transport ship selecting a VSAT system over an MSS solution was, most likely, crew welfare.

Today, the majority of our maritime customers are asking us to provide services that will enhance their operational efficiency as well. We have a huge maritime technology industry behind this, developing even more advanced telemetry and collaboration systems that are ushering in a new age of 'smart shipping.' The foundation for the modernization of ship and fleet operation are the companies involved in the provisioning of satellite technologies and services to make bandwidth available over the oceans—many of the efficiency benefits of this new technology rely on the IP connectivity that Airbus Defence and Space provides.

With such an influx of new users, we recognized early on that a simplified and more standardized approach to VSAT was needed to convince potential customers who may not have the in-house expertise to deal with complex communications networks. In parallel, we were committed to ensuring that our shipping customers always had the bandwidth they needed and were future-proofed, especially considering the forthcoming introduction of High Throughput Satellite (HTS) services.

Due to these considerations, in March of 2014 we launched AuroraGlobal, a quiet revolution in the world of SATCOM, which benefits our maritime, land-based and government customers. AuroraGlobal is the only complete multi-band satellite communications portfolio available today. The technology offers the full capabilities of Airbus Defence and Space's satellite services and infrastructure, with flexible solutions based on Ka-, Ku-, C-, L-, X- and UHF-band. By providing a transparent, highly flexible multi-band portfolio, we are in the best position for the on-going growth in bandwidth demand

from shipping as well as enterprise, humanitarian, mining and energy companies based on land along with government and defence agencies.

Starting with the introduction of AuroraGlobal, we launched a line of new maritime services. Pharostar Plus was offered to our service provider partners for their shipping customers, and WaveCall Plus, which is delivered to ships through our direct sales channel, Marlink. AuroraGlobal services come fully integrated with unlimited MSS back-up to provide a truly global connectivity service. 'Plus' services are designed to offer the most cost effective global VSAT available today: for one monthly fee, customers receive everything they need, including the best combination of airtime and hardware.

Our goal was to offer more for the same investment and in a more standardized format. 'Plus' service users benefit from double the broadband allowance for the same price as the incumbent services, or doubled throughput on premium services. For instance, Marlink offers up to 60GB per month on the WaveCall entry package, or double the download speeds and up to 256kb Committed Information Rate (CIR) on WaveCall Premium.

The service plans feature more data or throughput at a number of different levels, which offers the complete flexibility to meet any need in the shipping transport market. The fact that Plus services feature the possibility to migrate to next-generation Ku- or Ka-band HTS when they become available. This means that ship owners can enter the world of broadband, or immediately enhance their current VSAT systems, without waiting for the next-generation HTS, which, in reality, with our AuroraGlobal offering and Plus services, has already arrived.

This innovation in service provision is supported by continued innovation at the technical level. Included in all Plus services is our XChange communications management platform, which provides centralized VoIP, data and Internet access, and handles automatic fallback switching from MSS, ensuring global coverage for users. XChange also supports Internet Cafés on board vessels and enables the unique Bring Your Own Device (BYOD) solution. This latter technology allows the crew to use their own smart phones and tablets on board for full privacy and convenience.

During 2014, we made significant functionality improvements to XChange, such as the BYOD Solution, which combines the latest Wi-Fi technology standards and free apps to provide a simple-to-manage, cost-efficient, and convenient crew welfare tool enabling smartphone and tablets access to a vessel's VSAT and MSS (Mobile Satellite



Services) links. For operational use, we introduced Universal Remote Access, which provides secure remote access to computers on board a vessel from anywhere via XChange. Universal Remote Access meets the growing need from ship-owners, communications equipment manufacturers, SATCOM service providers and maritime service companies to easily access IT networks on board for maintenance and troubleshooting.

XChange is a core aspect of the simplification and standardization of VSAT for maritime users. Airbus Defence and Space has, so far, shipped 1,200 XChange systems, with more than 80 shipping companies currently using the product. As well as management of operational and crew communication, more than 70 percent of XChange installed vessels use it for switching between VSAT and L-band satellite terminals on board—it is highly relevant to our multi-band approach, and, in fact, the system comes standard with any services in the AuroraGlobal portfolio.



A recent example of an XChange user is United Arab Shipping Company (UASC), who has selected WaveCall Plus to provide reliable connectivity for its new build fleet of 17 advanced container ships. All 17 new UASC container ships—eleven 14,000 TEU (twenty feet equivalent units) and six 18,000 TEU—are designed to embrace ‘smart shipping’ in order to reduce fuel use and environmental impact. UASC is deploying various technology solutions to support this, including a web-based fleet management system and electronic document handling systems, in addition to enhancing its crew welfare offering. Combining Ku-band VSAT with L-band using the XChange solution, WaveCall Plus will ensure that UASC’s technical systems on board can provide the data and decision support needed to maximize both vessel and fleet efficiency, while at the same time improving crew services so they may stay in touch with family and friends on the phone, by email or other online applications.

WaveCall Plus provides the IP backbone for the technology and processes UASC is using to revolutionize the way it operates. Optimal vessel and fleet management can produce significant cost savings whilst the environmental benefits of consuming considerably less fuel oil speak for themselves. So in addition to helping UASC to improve its operations, WaveCall Plus will also support the company’s green credentials, positioning it as a quality service provider in the heavily regulated and highly competitive container ship market.

Of course, customer support is a vital element to ensure availability and uptime of our services in the AuroraGlobal portfolio, which is why in March this year we also launched a new initiative called the Field Service Alliance. This offering provides professional and cost-effective VSAT installation and

service support for maritime VSAT satellite service providers, and currently has ten strategically positioned member companies worldwide, ensuring quick response times for all major shipping ports. We will add qualified new members to the Alliance going forward in order to continually increase our global service coverage.

During 2014, we have also started a transition to the latest iDirect Evolution iDX 3.2 software and X7 modem for our maritime customers. The combination of software and modem enables us to support a wider range of bandwidth-intensive applications and improve the efficiency and throughput of communications systems, enabling faster data throughput and higher overall performance. We installed our first X7 modem on a cruise vessel in August and have followed this up by installing it across this particular customer’s entire fleet during Autumn. Feedback so far is positive and we expect X7 to be a key part of our service delivery going forward.

We launched a new service based on advanced technology from Newtec—Terralink—which is a standardized, high-quality broadband connectivity platform, featuring a range of services with dedicated bandwidth or guaranteed Committed Information Rate (CIR). Terralink enables services to run more efficiently than ever before over satellite and allows the same core platform to be used for customers of any size and network requirements.

Terralink uses a combination of three different satellite access technologies (TDMA, static SCPC, and dynamic SCPC) with no change of hardware. The most optimal bandwidth allocation technologies, including well known SCPC and MF-TDMA return technologies, are featured. With Newtec’s patented technologies that allow transmission changes without traffic interruption, Terralink offers the best of both worlds and enables services to run more efficiently than ever before over satellite.

We also expanded our service capabilities for land users during 2014. In August we announced a partnership with SES that will primarily serve Airbus Defence and Space mining and oil & gas customers in Australia through the new Perth based SES teleport facility. SES, one of the world’s leading satellite operators, is a strong teleport partner for Airbus Defence and Space. This partnership provides a local presence for the operation in Australia, with teleports in Perth and Adelaide. These teleports will provide the hub to deliver the new Airbus Defence and Space services, which use SES’ NSS-12 satellite and are designed to provide timely and highly cost effective C-band services to the energy sector in Australia. This includes services to Australian mining companies operating in Africa.

Heading into 2015, in the maritime industry we envision additional forward thinking companies viewing Smart Shipping as the best way to efficiently operate. Combined with vessels installing VSAT for the first time, and other vessels upgrading their existing VSAT, we expect the demand for bandwidth to continue to grow. We’re prepared to meet this on Ku- and C-band, while also ready to meet any customer requests to switch to new Ka-band platforms as they come online. This is the same for customers using our services on land.

Flexibility is vital and we’re committed to providing our technology to customers on the oceans and ashore. All in all, we feel that AuroraGlobal is feeding the market with what is needed now, while also offering opportunities and flexibility for the future.

By Mike Antonovich, Senior Vice President and General Manager, Americas—Senior Contributor to SatNews Publishers

As the frost has left the pumpkins and finds its way onto my windshield (there must be a better ice scraper than my AmEx card), 'tis the season for my annual reckless, feckless and fearless forecast regarding the future of our satellite television industry.

However, first, a recap on what I guessed right and wrong about the 2014 TV business. Last year, this SWAG'er-In-Chief (SIC) placed a bet that the traditional broadcast/programmers would be sitting on the fence in 2014 (which turns out to be true), while I expected to see major movement from the non-linear OTT players such as Netflix, Hulu and Amazon (well... so far, not true, but the blockbuster announcement of HBO and CBS creating their own OTT plays does presage *major* changes in the distribution landscape). The TV display manufacturers have certainly done their part, with UHD TV sets now widely available in every big box shopping outlet for fantastic prices. However, we all still seem to be content-starved—what's going on?

Not everybody took 2014 year off—ATEME and some of the other video compression experts in this business have been quite busy behind the scenes trying to perfect the UHD TV "virtuous ecosystem." The global television transmission chain is a highly complex neural network, and, with a lot of extremely hard work from many dedicated engineers all over the plane, preceded the ability for consumers to enjoy UHD TV in all of the technology's living room splendor.

Last year, we talked about some gaps in the standards, namely around single wire interfaces to bring raw UHD TV in and compressed UHD TV out. Done. Check.

Next, the technical geniuses have to make certain the industry coalesces around best practices and optimizes the performance of the all important (yet, relatively stupid) decoder chipsets that populate every TV, Cable and Satellite Set Top Box (STB) as well as every phone, phablet, tablet. Well... we're getting there. Great progress has been made, and ATEME has provided a great deal of expertise

to display and chipset guys and gals and software decoder folk to make all their stuff work and be as fully interoperable to the H.265 standards as possible.

A small apology to the chipset guys... calling chips "stupid" is like calling somebody's baby ugly. But, babies do get older and smarter.

Chips just get older. Only mass volume produced chipsets can truly fuel universal, ubiquitous deployment of UHD TV. So, isn't that chipset the cutest little thing you've ever seen?

The real smarts are in the complex encoder algorithms that eliminate redundant information (similar to every third word I utter) and translate complex picture changes into a language that allows the decoder chipsets to "paint" the picture screen dot by dot, pixel by pixel, in the most faithful and transparent means possible. This is as complicated as rocket science, only without the massive explosions and all that hydrazine punching holes in the Earth's ozone layer...

What progress have we seen? Lots, actually. For the last year, ATEME has supported the 24/7 UHD TV satellite channel established by Eutelsat. We're also providing the encoding for the UMAX 24/7 UHD TV terrestrial channel in Korea.

Some of you might also have seen the images from the Roland Garros tennis tournament or the Red Bull satellite demo at IBC2014—this UHD TV stuff works. While most of this content is converted from file and essentially played out like a video jukebox (in fact, this is the way most linear television services program everything save for live content). With file content, you can take the time to engage in multiple encode passes, which makes the video really, really good.

However, today's addressable audience remains largely engaged with those brand spanning new UHD TV's with built-in UHD TV/HEVC decoder chipsets.



These, as I write, are still less than 5 percent of all the new TV sets on sale today, never mind the hundreds of millions of TV sets already owned. Hag on, for relief is en route.

You will see millions upon millions of STBs start to pour out of Asian factories early in 2015. They will soon allow for commercial program channel launches of UHDTV content. Satellite channel bandwidth for HEVC on the industry's prime "cable birds" and DTH platforms will still be hard to come by, but for those of us who witnessed the launch of HDTV a generation ago... it's the same script.

Just like how the smart folks at the old PanAmSat "borrowed" the "neighborhood" moniker from Hughes Galaxy (a tip of the cap to Eddy Hartenstein) to create the "HD Neighborhood" on a well situated (but largely empty) Galaxy 13 satellite, it won't be long before somebody at Intelsat or SES jumps the starting gun and promotes the new "UHDTV Neighborhood." Nothing changes but the names. For the DTH platforms, it generally takes a new satellite launch with available capacity at an existing orbital location to start the party. Call me Nostradamus, but I'd be looking at the upcoming launch manifests to figure out where that first DTH UHDTV "neighborhood" will reveal first.

Where are the sports guys? Well, they haven't all been asleep at the wheel, either. Some industry stalwarts such as the European Broadcast Union have led the charge, transmitting three of the final FIFA World Cup matches in UHDTV over multiple satellites. ATEME supported this event, as well. The broadcast sports infrastructure still isn't quite complete, so our usual industry leaders have been laggards of late, and probably will be for another season.

In closing, here is the view from the trenches, or from behind the satellite benches—the holiday season will see big promo launches of UHDTV television sets, with at least enough compelling Hollywood content (on internal or external memory) to hold you through New Years Day.

First quarter will see some online launch of mainstream non-linear movies and episodic TV to give those early UHDTV adopters something else to

watch. The sports guys will continue to chase their tails like three-legged dogs until at least NAB.

Now for the disclaimer: The people in the know aren't talking. If I actually did know anything (hey... it could happen...), I probably couldn't tell you under NDA. Let's assume I'm wrong and you get to say, "told you so!" And the next time, you buy me the beer (although a single malt Scotch would also hold my attention.)

I wish you all a safe, happy and festive holiday season—one of the elements I truly love about this business is the singular constant.... **Change!**

Editor's note: This article was submitted to SatMagazine prior to the recent DirecTV news of their OTT launch of 4K movies and 4K capacity on their next satellite... seems as though Mike's reputation for boldly guessing the obvious remains intact... amazing.

In case you're interested, Mike Antonovich is a 30 year veteran on of the broadcast, satellite, fiber and video encoding industries. He is presently SVP & GM, Americas for ATEME, a global leader in high performance video encoding solutions for the contribution and distribution application that serve the media and broadcast industries. ATEME's standards based video encoding software powers leading media companies for DTH, OTT, IPTV, IDBS-T services. Mike is fully buzzword compliant and hardly ever cheats on his tax returns.



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AVASCENT

By Ian Christensen, Engagement Manager

an offers his analysis of the growing role of Export Credit Agencies (ECAs) in the satellite sector. This look at ECAs is especially relevant today, as government-sponsored ECAs have acquired a larger role in satellite financing over the past several years.

Driven by the active US Export-Import Bank (Ex-Im Bank), as well as France's Coface, ECA-backing of satellite deals is increasingly common—and poised to grow. ECAs, apparently, are here to stay in the satellite industry.

US Ex-Im Bank financing supports more than 60 percent of U.S.-manufactured commercial satellites, according to the remarks by Ex-Im Bank President Fred Hochberg at a February 2014 meeting of the Washington Space Business Roundtable. Financing for satellites was the fastest growing sector of activity within the Ex-Im Bank portfolio between 2010 and 2013. Reuters estimates that the Ex-Im Bank has provided \$4.8 billion in financing for satellite-related transactions since 2002.

The rise in prevalence of satellite transactions at Ex-Im Bank is emblematic of the increasingly visible role of ECAs in the financing of space sector transactions across the globe. ECA-supported transactions have garnered significant attention within the satellite industry in recent years. These deals attract attention for understandable reasons: they span the globe in their reach, and are tied to political issues of value creation and job growth. Notable ECA-financed space sector activities in 2014 include:

- *The US Ex-Im Bank has agreed to provide approximately \$150 million in loans to Bulgaria's BulSATCOM to support its purchase of the*

BulgariaSat-1 geostationary communications satellite from California-based Space Systems/Loral (SSL).

- *ViaSat has been approved for a US Ex-Im Bank loan for its purchase of the ViaSat-2 satellite from Boeing.*
- *France's Compagnie Française d'Assurance pour le Commerce Extérieur, commonly known as "Coface," signed a deal in July 2014 to provide \$225 million of export credit loan guarantees to Malaysia's Measat International to support the manufacture of the MEASAT-3b communications satellite. MEASAT-3b was manufactured in France by Airbus Space and Defense and launched on a French Ariane 5 launch vehicle. This transaction represented Coface's first satellite export credit deal; the organization has traditionally been involved in financing launch-related transactions.*
- *The United Kingdom's ECA, UK Export Finance (UKEF), provided reinsurance in support of Coface for the UK-manufactured subcomponents of MEASAT-3b.*
- *Canada's ECA, Export Development Canada, announced it will provide 123 million euros in financing to Spain's Hispasat. The financing will support the sale of a satellite to Hispasat by SSL, which is owned by Canada's MacDonald, Dettweiler and Associates Ltd. (MDA).*



Despite the attention received, ECAs play a limited role in financing transactions in the satellite sector. They are typically governmental or quasi-governmental agencies that provide government-backed loans, guarantees and/or insurance in support of those domestic businesses that choose to target export opportunities.

ECAs generally seek to provide financing necessary to help businesses turn opportunity into sales; and do not typically seek to recoup a market return on loans provided (instead seeking only coverage of operating costs).

Speaking at the 3rd Annual Space & Satellite Regulatory Colloquium held in October 2014, John Shuster, the former Vice President and Head of Structured Finance of the US Ex-Im Bank, described the role of ECAs as a “spare tire”—getting involved only when conventional finance means are unavailable. Commonly faced with deals that may be perceived as risky, ECA-financing typically requires strict governance rules and covenants in order to mitigate risk.

ECA activities are generally associated with broader government policy objectives. Governments across the world are increasingly seeking to use space capabilities to increase industrial competitiveness and create export activity for domestic companies.

For example, Japan has shifted its space policy to place greater emphasis on commercially relevant capabilities. The country has also instituted export control changes to loosen restrictions on Japanese military-related firms. These policy shifts support efforts of major manufacturers, such as Mitsubishi Heavy Industries (MHI), Mitsubishi Electric Corporation, and NEC, to increase their share of global markets in satellite manufacturing and launch services.

Elsewhere, in March of 2014, International Launch Services (ILS) and the recently established Export Insurance Agency of Russia (EXIAR) announced a partnership through which EXIAR will provide export credit guarantees and insurance to support companies procuring satellite launches from ILS. This partnership was established in direct reaction to the success Coface and Ex-Im Bank have experienced in the satellite sector. However, unlike those agencies, EXIAR does not provide direct lending.

As lenders of last resort, ECAs often interact with prospective satellite operators from emerging markets which may be unattractive to traditional financiers. Globally, the trend of increasing numbers of new, and prospective, satellite operators associated with emerging markets suggests a likely increased future role for ECA-financed activity. Two examples from 2014 highlight this trend:

- *In Azerbaijan, Azerspace-1, the government supported satellite operator, plans to issue an RFP before the end of 2014 for the manufacture of its second geostationary communications satellite, Azerspace-2.*

Its first satellite, Azerspace-1, was partially financed by a loan from the Ex-Im Bank. Prior to requesting bids for the second satellite, Azercosmos completed a technical and market feasibility study funded by the U.S. Trade and Development Agency (USTDA). USTDA, while not an ECA, also has a mission of promoting U.S. exports, and through the feasibility study, seeks to support U.S.’ opportunity to supply the Azerspace-2 satellite. It is likely that Azerspace-2 will be a target of interest for the Ex-Im Bank.

- *In Bangladesh, the government is evaluating plans to field the country’s first geostationary communications satellite, Bangabandhu-1. In 2014, Bangladesh received proposals from six multinational banks or investment firms to provide financing for the project. Included in this group were proposals from two ECAs: the US Ex-Im Bank and the Japan Bank for International Cooperation (JBIC).*

It is highly likely is that ECAs will be a long term enabler of satellite transactions for several years to come. While ECA activity in recent years has been centered around agencies in North America (Ex-Im Bank and Export Development Canada) and Europe (Coface), expect other countries’ ECAs to become more active in the satellite sector. Russian, Chinese, and Belgian ECAs have been active in the past and other countries with strong space sectors, such as Japan, are just beginning to link space activities to export promotion.

As ECA activity in the space and satellite sectors expands, it would benefit from closer links between national export promotion and space policies. For example, in the U.S., satellite related activities at Ex-Im Bank and USTDA could be more closely tied to broad space diplomacy activities undertaken by other U.S. agencies through a forum such as the existing Presidential-level National Export Initiative (NEI).

In Japan, efforts to increase international market share would benefit from more clearly defined links between space policy and the activities of the JICB. Linkages of this nature would help associate ECA activity with a strategic context, in addition to their existing market context, and advance their ability to contribute to achieving both economic growth and space policy development objectives.

Avascent is a leading strategy and management consulting firm serving clients operating in government-driven markets. Working with corporate leaders and financial investors, Avascent delivers sophisticated, fact-based solutions in the areas of strategic growth, value capture, and mergers and acquisition support. With deep sector expertise, analytically rigorous consulting methodologies, and a uniquely flexible service model, Avascent provides clients with the insights and advice they need to succeed in dynamic customer environments.



AvL Technologies

By Tony Wilkey, Vice President, Sales and Marketing

2014 has been a special year for AvL Technologies, Inc. (AvL). The company continued to thrive with solid revenue and new business and also celebrated the 20th anniversary of operations. Founder, owner and CEO of the company, Jim Oliver, is proud of the accomplishments of the company and the team members.

This year, AvL experienced a special milestone—the delivery of our 20,000th transportable, auto-acquire satellite antenna system. Many years will pass before another company can make that claim—the level of quality, breadth of standard product solutions and dedication to customer service that AvL offers will continue to break records. The company is also well known for providing product customization to meet a client company’s specific needs and performance requirements.

AvL continues to thrive as a privately held U.S. company, specializing in the design, development and production of mobile/transportable satellite antennas and positioner systems. With corporate headquarters based in Asheville, North Carolina, and regional offices located in the U.K. and China, AvL is able to offer superior service and support to customers around the world. AvL provides systems integrators with positioner and complete antenna system products, product development, and services that maximize the technical and commercial benefits for their customers to meet their cost, performance, quality and reliability requirements.

New product launches in 2014

As in recent years, 2014 witnessed AvL’s success in fielding a number of new, exciting and “bar-setting” products. In addition to producing healthy volumes of established, standard antenna products, AvL also introduced, produced and fielded...



- A new, best-of-breed antenna controller—the Model “AAQ” Embedded Antenna Control System—that will enable AvL antennas to operate in the most sophisticated networks using the highest-performance modem technology
- Various new, light and ultra-light, manual-point flyaway antennas, from 60cm to 2.4m in diameter
- A new, 2.2m linear-polarized C-band antenna with extreme cross-polarization optimization, allowing the service provider to maximize satellite throughput
- A new, high-performance 4.6m flyaway antenna that can be transported in “man lift-able” transit cases and deployed by four persons in two hours
- Various 2.0m and 2.4m SNG antennas with totally automated, 3-piece collapsible reflectors, enabling truck operators to provide service on the smallest of vehicles



- *New, carbon-fiber reflector manufacturing technologies, allowing AvL to offer lighter, more cost-effective "Ka-band ready" rugged antenna systems for the military or oil-and-gas applications*
- *A new, multi-band platform with up to eight remotely selectable, receive-only feeds covering numerous commercial frequency bands for an international communications interference monitoring and regulation group*
- *Numerous Ka-band high-throughput platforms for the NASCAR race teams, revolutionizing the video and data backhaul capability during the racing event*

New opportunities in 2014 and beyond

As of 2014, AvL's addressable markets include the military, emergency response organizations and agencies, broadcasting companies and oil/gas exploration firms. Each of these unique industries have benefited heavily from the advantages of connectivity over satellite.

Entering the year, we shared concerns with others in our industry regarding the effects of sluggish global economies, as well as sequestration and drawdown that could be more than in 2013—not only in U.S. military procurements, but also in federal agency and state/local government opportunities.

Indeed, overall military budgets and deployments have been reduced, as projected. Likewise, budgets for emergency response agencies continued to receive more scrutiny and broadcasters continued to be challenged by corporate pressure to extend the life of existing assets and delay major capital expenditures. The effect of these economic pressures has been



profound, as reflected by the higher than normal level of restructurings, consolidations, mergers and sell-offs across the industry.

However, the thirst for satellite bandwidth continues to be stronger than ever and will likely continue down that path for years to come. Budget reductions are forcing operators and equipment manufacturers alike to develop technologies and capabilities that will continue to increase throughput while reducing the cost per bit.

A good example of this trend is occurring with the High Throughput Satellite (HTS) offerings (and demand) that are increasing by leaps and bounds. A recent study announced that global HTS capacity would triple over the next three years, to 1,720Gbps. In response to this trend, AvL has been working with several HTS service providers to develop and certify satellite-specific high-throughput antenna configurations.

Our best-of-class vehicle-mount antennas range from 85cm to 1.2m, including our ever-popular Model 1280KV Ka-band product. As mentioned previously, AvL is garnering much attention from the NASCAR industry for the initial fielding of high-performance Ka-band platforms prior to the 2014 race season. These unique antennas are installed in limited space on top of the car "haulers"—actively supporting the critical, secure communications link (high-definition video, voice communications and data) between race teams and their remote engineering centers before and during the race event. Providing speeds of 15Mbps down and 10Mbps up, these small Ka-band terminals provide many times more capability over the same aperture size than their Ku-band predecessors and are credited with making the difference between winning and losing for racing teams.

We also started development in 2014 of a new family of transportable terminals that will support a new fleet of Ka-band satellites operating in a Medium Earth Orbit (MEO). MEO Ka-band offers HTS technology with reduced latency over traditional geosynchronous (GEO) capability, due to reduced orbit path length. AvL's effort supporting the service provider behind this new constellation will yield a new class of transportable terminals requiring significantly more dynamic tracking capability but with the advantage of dramatically reduced latency.

As we reflect on the generally good results of 2014, we must now look at the challenges and opportunities that we will face as an industry in 2015. As we have seen in recent months, the world remains unstable and unpredictable. However, here is a certainty—the world will continue to thirst for more and better communications capability—good news for those of us in the satellite industry.

Tony Wilkey is responsible for U.S. Sales, Marketing and Customer Service for AvL. He earned his Bachelor's degree in Mechanical Engineering from Georgia Tech in 1981 and his Master's degree in Mechanical Engineering from Stanford in 1983. He has worked his entire career in the satellite industry, most recently with ViaSat, Inc., before joining AvL in 2008.

Boeing Satellite Systems International, Inc.

By Mark Spiwak, President

2014 has proven to be one of execution for Boeing's satellites businesses. In just 10 months' time, the company launched five satellites and signed contracts for three satellites and one hosted payload.

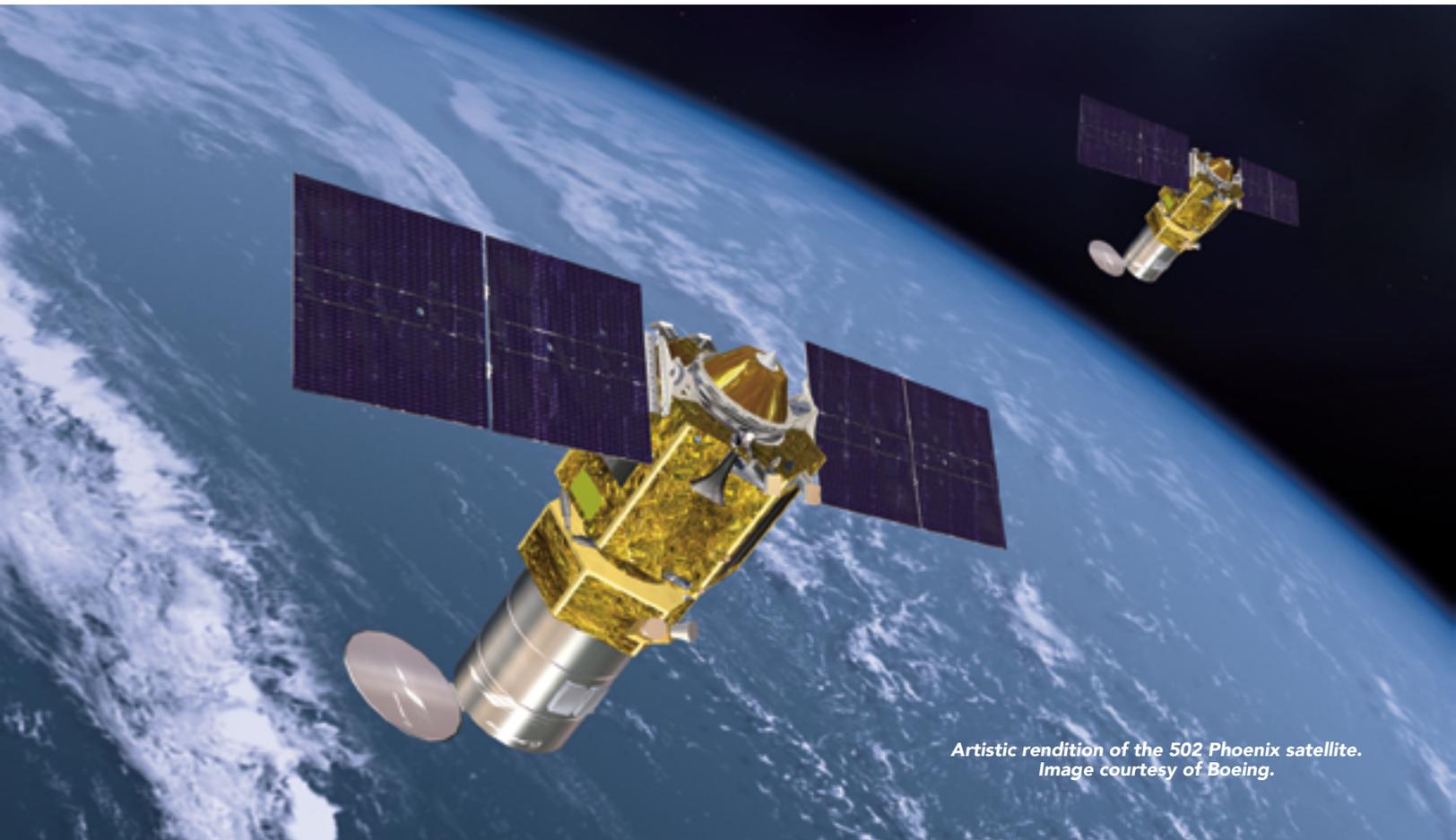
Boeing also demonstrated the feasibility of using commercial satellites to transmit protected waveform communications for the military, and its Spectrolab subsidiary developed industry's four millionth space solar cell. And, the first order a new line of small satellites, the 502 Phoenix, was received, meaning that Boeing's production line now includes satellites ranging from 0.5 to more than 18 kilowatts of payload power.

First to launch was the second in the Tracking and Data Relay Satellite (TDRS) series, TDRS-L. Built for NASA, TDRS-L joins the others in the TDRS network that NASA uses in support of vital missions, including the International Space Station, studying Earth's changing climate, and looking into deep space with the Hubble Telescope. TDRS satellites relay signals to and from Earth and the International Space Station and other space assets. TDRS-L is the fifth from Boeing. This was followed in rapid succession with the launch and delivery of four Global Positioning Satellite (GPS) system satellites, representing one-third of Boeing's contract for 12 satellites. With the launch of the fifth, sixth, seventh and eighth in the series,

Boeing's fourth-generation of GPS space vehicles are improving system accuracy, signal capability and performance for users worldwide. All 12 GPS IIF satellites were built using Boeing's advanced production processes, with each spacecraft ready to launch on request by the Air Force.

Boeing also continues to work with the Air Force to improve the efficiency of final checkouts before launch and on-orbit, ensuring each GPS IIF enters operation smoothly. This approach supports the Air Force in maintaining a robust launch tempo.

Intelsat returned to Boeing in July for a ninth Boeing 702MP satellite, Intelsat 35e Epic. Intelsat's EpicNG satellites are designed to address wireless and fixed telecommunications, enterprise, mobility, video and government applications that require broadband infrastructure. A complementary high throughput overlay to the Intelsat fleet, the Intelsat EpicNG platform will utilize multiple frequency bands and other features to enable customers to meet specific needs. The high degree of flexibility of the Intelsat EpicNG platform will allow Intelsat's broadband, media, mobility and government customers to use their existing hardware and realize greater cost efficiencies. In February Eutelsat announced that it was ordering a hosted payload from Boeing, which will be added to the Eutelsat 117 West B satellite, which is



Artistic rendition of the 502 Phoenix satellite. Image courtesy of Boeing.



**Artistic rendition of the Intelsat-35e Epic satellite.
Image courtesy of Boeing.**

a Boeing 702SP. The hosted payload will be used by the Federal Aviation Administration (FAA) to augment its Wide Area Augmentation System (WAAS).

The WAAS payload will provide coverage to reference stations in Canada, Mexico and Puerto Rico, as well as the continental United States and Alaska, improving GPS signal accuracy to seven meters from 100 meters. Commercial airline and general aviation pilots can use this extremely accurate information for more direct flight paths and precision approaches to airports and remote landing sites. WAAS is the sixth order for Boeing's next-generation hosted payload since 2009, and the first to be included on an all-electric satellite.

Boeing's satellite unit is also supporting the United States Air Force as it seeks to validate the use of existing on-orbit space assets to send protected military satellite communications. In November, Boeing announced that it had proven its new anti-jamming communications technology is capable of operating as either a ground-based user terminal or satellite-based networking hub, enabling the military to send and receive secure communications at a significantly lower cost by using existing terminals and satellites. The anti-jam technology uses a protected tactical waveform, which shields signals from interference by adversaries or cyber-terrorists. This demonstration complements previous on-orbit demonstrations over the ViaSat-1 and the sixth Wideband Global SATCOM (WGS-6) satellites, showing the ability to operate anti-jam waveforms over existing commercial and military spacecraft.

Boeing's subsidiary, Spectrolab, also achieved a major milestone in 2014 with its 4 millionth germanium-based space solar cell, making it the world's highest-volume producer of multi-junction solar cells and the first company to ever achieve this production milestone. Spectrolab solar cells have powered more than 380 spacecraft flights in 23 years. Spectrolab, the leading provider of space solar cells and solar panels, provides products to the commercial satellite industry, the Department of Defense, NASA and domestic and global aerospace companies. Germanium is the material commonly used to create solar cells. Extensive space solar cell experience, combined with continuing investments in the business and technology, continues to strengthen Spectrolab's competitiveness in both space and ground-based markets. Since 1956, the subsidiary has continued to make technological advances, most recently modernizing their factory to create a new solar cell wafer projected to reduce customers' costs by 10 to 15 percent through design and manufacturing improvements. But perhaps the most strategic achievement this year by Boeing was the

first order for the 502 Phoenix small satellite, the third new satellite design announced by Boeing in just four years. The first order for two of these satellites by HySpecIQ of Washington DC was placed in September. The satellite will carry the commercial remote sensing industry's first high-resolution hyperspectral payload, capable of providing spectral imaging fidelity that far exceeds what is currently available.

Hyperspectral imaging is an information-rich technology that uses spectral color bands to identify objects and materials in an image. More than 200 spectral colors in the visible and shortwave infrared spectrum are collected to uncover diagnostic spectral patterns not visible to the naked eye. The technology provides valuable data and enables the delivery of information products to key markets, including the global oil, gas, mining, agriculture and environment monitoring industries, as well as U.S. government agencies and partner countries.

With this addition to Boeing's satellite portfolio, the company now has satellites that range in power from 0.5 to 18+ kilowatts. Specifically, the 702HP, introduced in 1997, first launched in 1999, which operates in 8 – 18+ kilowatt range; the 702MP, introduced in 2009, first launched in 2012 – just 29 months after contract award -- operates in 6-12 kilowatt range; the 702SP, introduced in 2012, first will launch in 2015, operates in 3-8 kilowatt range; and the 502 Phoenix, introduced in 2013 and operates in the 0.5-3 kilowatt range.

As the company continues its pursuit of innovative technologies that are affordable and extend the mission possibilities for all customers, it will also prepare for at least 10 satellite launches in 2015. The satellite business mission statement, "to make our customer's mission our mission," will continue to lay the foundation for what promises to be another busy year at Boeing.

Mark Spiwak is president of Boeing Satellite Systems International Inc., President of Boeing Commercial Satellite Services Inc., and vice president of Commercial Satellite Systems for Network & Space Systems within Boeing Defense, Space & Security. He was named to this position in 2014 and is responsible for general management of all Boeing commercial satellites, ground systems and services contracts. He currently has oversight for the ABS, Inmarsat, Intelsat, MEXSAT, Satmex, SES and Viasat programs.

Spiwak has nearly three decades of engineering, management, leadership and business development experience supporting commercial and government customers. Most recently, Spiwak was the program director for Wideband, Strategic and Protected Tactical MILSATCOM programs, including the Wideband Global SATCOM (WGS) multi-satellite program. WGS is the DoD's highest capacity communications satellite system serving US and allied partners. The system provides broadband connections to all theaters of operation and remote locations worldwide.

Spiwak was also the director of NASA & NOAA unmanned Earth and Space Science Programs responsible for the Geostationary Operational Environmental Satellite (GOES) N, O, and P series of satellites, the Tracking and Data Relay Satellite (TDRS) series, and other earth and space science projects.

Spiwak began his career at Boeing's satellite business in 1985 in the design integration laboratory. Subsequent assignments have included director of Strategy and Technology Development, director of Commercial Business Development, and director of the Cost Estimating Organization.

Bridge Technologies

By Simen K. Frostad, Chairman

No one in our business should ever complain about being bored—to be involved in conceiving, designing, manufacturing and selling technology for the satellite and media industries is to be in a constant state of change and development. It's like trying to anticipate and react to (or even help shape) massive tectonic shifts that occur millions of times faster deep in our planet than they do at near the Earth's crust.

This makes the passing of a mere 12 months quite exciting. However, a year is, in some ways, an artificially short sample of time. This time period is unable to encompass the continuing shifts and trends that may only be detectable after a longer interval of time.

As we look back at the close of 2014 against the background of large regional installation wins with satellite operators in Europe and MENA, Bridge Technologies can see that some of the movements that were once trends have now reached their maturity and have become standardized; other new trends are emerging, while still others don't even deserve to be called trends yet... they are more like whisperings on the wind, where the most inventive minds are hard at work changing the standards into even more revolutionary technologies.

In fact, there's a dialog of inventiveness between those who create the technologies the industry relies on and those who put those technologies to use. This dialog is unpredictable and is really where the most interesting 'trends' are born, as manufacturers find their technologies being used by customers in unexpected ways and react to those uses through the development of new technologies. These, in turn, prompt users to invent unforeseen applications, and on and on it goes.

In this context, the availability of IP as an alternative to satellite in some applications could be seen in a negative light for the satellite industry, but in fact the way many broadcasters have responded to the potential of IP

is by creating new opportunities that involve satellite. The move towards decentralized infrastructure and multiple backup options is one way wherein broadcasters and operators have combined IP and satellite to achieve new benefits in terms of robustness, flexibility and cost.



At Bridge Technologies, we've been in a conversation with one of Europe's largest satellite operators to develop products that enable a new approach to infrastructure design and use. The introduction of our VB273 Intelligent Switch was the first in a new line of products that use the advanced analysis capabilities developed in our monitoring systems, to bring a new degree of utility and autonomy to redundancy switching. Having a more intelligent redundancy switch helps operators to make some far-reaching changes.

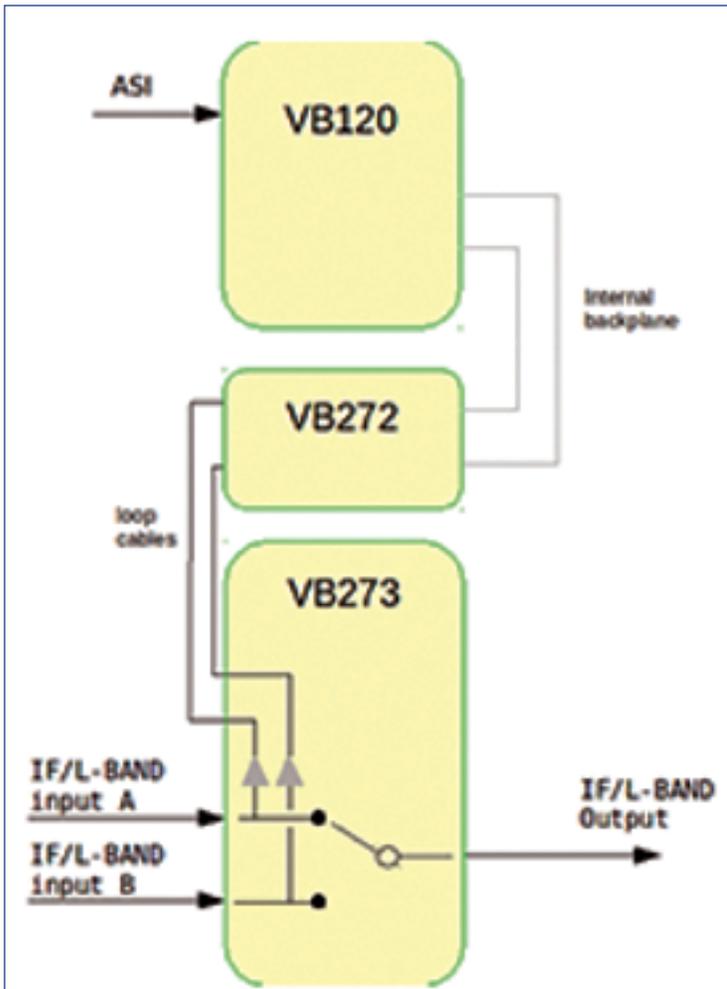
With greater in-built intelligence, the possibility to decentralize the infrastructure is now possible: instead of the control center monitoring how each modulator is performing and then doing triggered redundancy switching, operators can now deploy a more or less autonomous intelligence at each decentralized antenna site. The switched redundancy path can operate with a degree of independence from the central facility, resulting in the increased overall redundancy of the system as a whole. Failure in the central system will not affect data elsewhere in the production pipeline.

Redundancy switching is provided by the combination of full-blown ETR290 analysis, a high-performance RF monitoring capability, and a decision engine that compares error condition results against user-defined rules. The greater scope and subtlety of the analysis available allows a much more nuanced and flexible automated assessment of operating status and conditions.





Bridge Technologies' VB273 Intelligent Switch.



Simplified block diagram showing signal flow within the 2:1 redundancy switcher. Diagram courtesy of Bridge Technologies.

While conventional redundancy switching tends to be triggered by much cruder conditions, such as a complete loss of signal, operators can now base switching on the detection of more complex errors. For example, if CAS (conditional access) verification is lost on one of the production chains, the redundancy switch can automatically check the redundant chains to see if the problem exists there, as well, and switch to one of them if CAS is intact. Switching is, therefore, available on the basis of services (such as CAS) as well as on simple hardware operation.

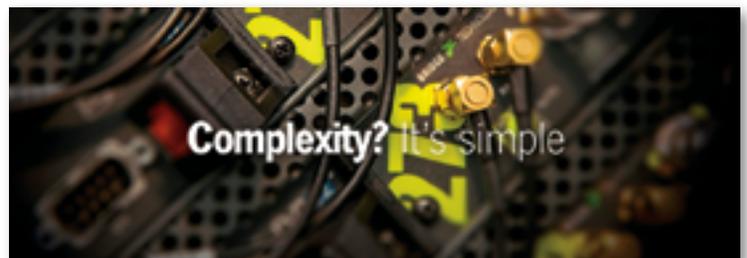
In the decentralized model, data is transported from the central production system via gigabit fiber out to the antenna, where duplication is built into the infrastructure, and there are also redundant IP chains. The structure is modular and, if the operator wants to change configuration, that can be done in a modular way and remotely—without installing more equipment, or patching in hardwired changes. For the operator, this means less reliance on specialized skills and the ability to make more or less immediate changes remotely by uploading new configurations.

In keeping with the aim of decentralized resilience, an autonomous ability to override settings and make changes at any transmitter site gives the operator the option of overriding the network's default redundancy arrangements. Control switching from the central NMS is possible, or by intelligent automated switching, or by a completely manual override at the transmitter site.

A decentralized infrastructure that uses satellite and IP in a number of configurations is theoretically more complex than an all-satellite setup. It's a recognizable trend that operators now want to bring together all available technologies to achieve savings and operational efficiencies, and this complexity has to be handled carefully.

At Bridge Technologies, our major theme for 2014 has been complexity and simplicity. What we mean is that complexity (especially operational complexity) can create critical drag on an organization's business, while simplicity is almost always more efficient. What we have been working on in 2014, even more so than in previous years, is the refinement of our products in order to give users the power to deal with complexity in a simple way. The VB273 is not a simple product by any means, and it's being deployed in some extremely complex infrastructure designs, but the VB273's capabilities make it simpler for operators to handle such complexity.

In 2015, we'll be taking this theme further with some sophisticated developments in data visualization that will expand on our existing presentation layer technologies. The path our industry seems to be heading is that the people who work in this environment are being asked to absorb and act on greater volumes of information, oversee more services, and apply more decisions. For manufacturers, supporting businesses by presenting key information in easy-to-understand ways is vitally important.



BringCom

By Fabrice Langreny, Founder, President and Chief Executive Officer

As we reach the close of 2014, BringCom can reflect on the challenges that have been successfully met for a mid-sized, international, satellite service provider, such as the slow erosion of current satellite customers as they move to fiber and the continuing competition from large private equity satellite industry rollups who are more eager for market share than a concern for margins.

During 2014, we had to contend with larger integrators and satellite carriers losing their core business due to U.S. Government funding uncertainties. Once active military operations cutbacks resulted in excess bandwidth costs that needed to be covered and making the decision that our markets were the place to be, as well as considering services from new Ka- and MEO satellite entrants who have yet to prove the viability of their services in BringCom's markets.

That being said, BringCom's business has grown and internal resources have grown to accommodate satellite, fiber and wireless network infrastructure to reinforce BringCom's position as a leader in supplying innovative telecommunications solutions to governments and corporate customers who operate in Africa and other challenging regions of the world.

With the continuing economic growth and corresponding increase of corporate VSAT applications within the continent of Africa (i.e., broadcast applications, corporate private networks, cellular backhaul, access to remote areas), BringCom made a strategic decision to expand its capabilities in

Africa and, in particular, at the Djibouti Teleport, all during 2014. The company worked with SES to install and service 9 meter antennas in order to add NSS-12 Ku-band coverage to current Apstar 7 Djibouti Teleport service offerings.



Additionally, BringCom worked with a number of leading satellite equipment and service providers to implement and maintain hosting and monitoring services. This was in addition to the large bandwidth aeronautical services BringCom has been supporting since January 2013. In conjunction with our Sterling, Virginia, teleport, the Djibouti Teleport improvements allow us to support commercial and government applications over the African continent as well as the Middle East.

During the fourth quarter of 2014, the Djibouti Teleport was also connected to BringCom's recently announced MPLS Network. The initial PoP was established in Djibouti with termination in London, U.K. The Republic of Djibouti's strategic geographic position and extensive submarine fiber optic cable connectivity positions the region and BringCom for the establishment of a successful Pan African and worldwide MPLS network.

BringCom has focused marketing activities toward the commercial sector, in particular the enterprise market, promoting services to the oil and gas (West Africa), health care (Northern Africa) and financial (East Africa) industries.



These efforts leverage our network of associates in Zambia, Djibouti, Algeria and maximize our increasing coordination with dedicated agents operating in more than 25 countries in Africa.

Our success begins and ends with the success of our customers. This requires an understanding of the daily, real-world operational constraints they face. BringCom is well known for possessing in-depth knowledge of local business environments, having been an operator and supplier of telecom services in Africa for more than ten years. BringCom and its agents are in a unique knowledge/experience position to provide optimum solutions to challenging customer needs. The company understands what is required to establish, operate and maintain successful telecommunications networks in Africa and other remote regions.

As a telecom enabler, BringCom has continued to develop the engineering skills within the operations department to support all aspects of the telecommunications networks deployments. BringCom's Network Operations Centers (NOC) in Djibouti and the United States have deep expertise in IT, security and multiple wireless technologies. This allows the company to handle real-world installations, the monitoring and troubleshooting our customers require for their entire end-to-end circuit. With the addition of these engineering skills and continuous training, BringCom is in a position to better understand any client's applications and ensures our service supports our customer's successes. Bringcom also provides real-time visibility of purchased circuits and offers value-added services, such a traffic filtering, shaping and usage prioritization and other specialty services, if desired.

In 2015, the company's focus will remain on Africa, with this continent's economic growth forecasted to remain between 5 and 10 percent per year, with population growth projected to double within the next 30 years. This

growth results in increasing intraAfrican and international commercial and governmental communication requirements—BringCom will support these activities, whether in oil and gas (O&G), manufacturing, mining, social services, financial industries or other sectors.

We will introduce new value-added services, such as a mobile GSM rapid deployment solution and disaster recovery satellite services, to fiber users, as well as expand our MPLS network with additional POP's in East, South and West Africa and increased satellite coverage of our U.S. and Djibouti Teleports.

Plans have also been established and implemented to enhance the training and capabilities of BringCom's local staff and agent network to better serve customers. Telecommunications will continue to be an enabler for Africa's economic success, and BringCom will be a vibrant player addressing this unprecedented growth by supplying satellite, microwave, and fiber connectivity within Africa as well as to the rest of the world.

Fabrice Langreny is the founder and implementer of BringCom's growth and vision as a leading telecommunications' services provider. Mr. Langreny created BringCom in 2004 and positioned the company as a unique provider of satellite, integrated fiber, and microwave solutions to challenging applications for commercial and government customers.

Prior to founding BringCom, Mr. Langreny was Chief Operating Officer at DiscoveryTel, where he was responsible for the company's carrier and satellite operations. Before joining DiscoveryTel, Mr. Langreny was Vice President, Corporate Development and Strategy at SkyOnline.

Mr. Langreny has a Master of Science degree in Electrical Engineering from the E.S.I.E.E., Paris, as well as an MBA in Finance and International Business from the University of Maryland.



C-COM Satellite Systems, Inc.

By Drew Klein, Director of International Business Development

There can be little wonder that C-COM was listed as one of Canada's fastest growing companies in 2014 (PROFIT 500)—the company broke new ground this year, receiving a series of important approvals from satellite operators for its New Generation iNetVu® Auto-Acquire antennas.

Leading the Ka-band VSAT trend of developing smaller and faster performing antennas, C-COM Satellite Systems gained further credibility with its game-changing, top-of-the-line technology. The product continues to be globally renowned for its reliability, robustness, and cost-efficiency, while providing critical access to information and remote communications in the harshest environments. The iNetVu® reseller network continued to expand over the last 12 months, bringing the total number of active worldwide partners to approximately 700, in more than 104 countries. New partners were added in Africa, Asia and Europe—in countries that have never seen the company's automatic antenna line.

The company realizes that it can't do much without a loyal partner base, one that is well trained and supported on complex mobile VSAT systems. C-COM technical advisors travel the world to offer training at trade shows, provide support in the field to end-users, and offer demonstrations to existing and potential customers alike. The ultimate goal remains to continually improve not just the product line but the services and support offered.

Perhaps the most challenging feat of the year was the completion of multiple type approvals by major satellite operators. In 2014, the company received four new approvals, enduring the rigorous testing processes of Eutelsat, Viasat and Avanti. C-COM remains the only antenna manufacturer in the world with approvals on the same product (iNetVu® Ka-98) with three different operators: Eutelsat, Avanti and Yahsat.

At the same time, C-COM is the only company with both a Driveaway and Flyaway antenna approved on ViaSat's Exede™ network in the USA. C-COM now boasts a total of eight antennas that are approved on the

world's largest satellite operators, a testament to the sturdiness and accuracy of the product.

In January, C-COM received significant new orders from its largest Russian reseller, Altegrosky. These antennas were used for oil and gas (O&G) exploration in Russia by one of the world's largest oilfield services companies. Altegrosky has been supplying iNetVu® auto-deploy antennas to many customers in the energy market, and many other important customers. Efficient and effective resellers like Altegrosky help C-COM to maintain its position as the world's premier choice for oil & gas VSAT communications.

Satellite-based cellular backhaul for disaster recovery and emergency services was the most important vertical in 2014. In February, the company learned that the ViaSat approved 75cm Ka-band antenna had been used during the Super Bowl, but not for traditional SNG.

Deployed Communications and Technologies (DCAT) from Pennsylvania provided a complete turnkey system that delivered high-speed broadband connectivity into New Jersey TRANSIT's Emergency Operations Center. The one-button, auto-deploy antenna system mounted on the roof NJ TRANSIT's portable Communications On Wheels (COW) trailer delivered a solid 15Mbps downlink and 5Mbps uplink (with peaks reaching more than 26Mbps).

Over the summer, a number of iNetVu® antenna systems were deployed to assist with communications following a massive earthquake in China. Unisat, one of C-COM's largest resellers in China, and their customer, China Mobile, deployed iNetVu® mobile antennas in the earthquake affected region of Yunnan to re-establish cellular communications and provide emergency services.

Shortly thereafter, in nearby Japan, iNetVu® systems were deployed in the Western part of the country to assist with emergency communications in an area hit by major landslides. Japan Satellite Communications (JSC) deployed a significant number of



mobile cell towers to the disaster areas which were very difficult to access. Using the same model following the Great Tsunami of 2011, which serves as the country's benchmark from which all satellite-based disaster recovery and emergency response is based, JSC, C-COM and Softbank Mobile once again provided quick communications relief to affected customers in the area.

Broadcasting was also a significant vertical in which the iNetVu® was put to good use. Several of the company's classic 1.2m Ku-band antennas were used in Brazil to broadcast from the World Cup—the largest soccer tournament on Earth. Simultaneously, one of C-COM's most significant dealers in the U.K., Primetech, deployed the New Gen Ku/Ka convertible 98cm system roadside during the Tour de France. Needless to say, C-COM's product line could be found at nearly all of the world's biggest events.

Smaller, but equally meaningful broadcasted events, such as the SPAR Woman's Day Road Challenge 2014 in South Africa, the biggest Woman's race in the World with more than 25,000 participants, were covered using iNetVu® antennas. The event was captured, compressed, edited and streamed, in a combined effort from StreamiT 360, Avanti, C-COM, and Saab Grintek Technologies. Saab Grintek, C-COM's largest partner in Africa, and recipient of 'Dealer of the Year' Award in 2013, has deployed hundreds of iNetVu® systems throughout the continent. The company is a diverse integrator, focused on any project that requires remote communications, whether its mobile banking, telemedicine or even helping to Save the Rhinos!

For example, The Great Limpopo Transfrontier Park, located in Mozambique, South Africa and Zimbabwe, is using iNetVu® vehicle mounted antennas to monitor and prevent the poaching of rhinoceros. Using multiple communication products, including C-COM's Yahsat-approved Ka-98H antenna, the unit provides constant video contact between the protected areas and the park's operational center. Any disturbance or potential breach of the region is recorded and can be responded to with great speed.

Park Rangers have the ability to monitor activities in the park in real-time, day and night, and intervene as required, as well as record the action for eventual prosecution of the poachers. Saab Grintek has provided the technology, experience and knowledge to outfit the local Rangers and put poachers in the area on notice.

In the autumn, C-COM announced that the company had entered into a partnership with Newtec, a company that designs, develops and manufactures satellite ground equipment and technologies. C-COM's proprietary iNetVu® antenna technology was integrated with Newtec's MDM3000 IP Satellite Modem series for the VSAT and broadcast market. It is fully compliant with Newtec's Sat3Play® broadband platform and the Newtec Dialog® SATCOM platform launched earlier this year. These systems will be promoted for Communications-On-The-Pause (COTP) applications through both company's sales and distribution channels. The combination of the highly acclaimed iNetVu® mobile antennas and the innovative Newtec technologies is expected to open up new opportunities, specifically in the SNG market, for both companies.

Late in the year, C-COM announced the most exciting development in the company's history: the design of a Low-Profile, Land-Mobile SATCOM-On-The-Move (SOTM) Ka-band antenna, expected to arrive in the market late in 2015. Jointly developed by C-COM and ViaSat, and in conjunction with the filing of a patent for a unique phase shifter with long time partner University of Waterloo, C-COM will soon step into a new market with much larger expectations. These revolutionary 'Always-On' systems expect to deliver technologically advanced, low cost, Ka-band COTM products, delivering broadband satellite based communications while in motion and Internet anywhere at all times.

Stay tuned for more news on this developing story and other inspirational tidbits from C-COM, one of the world's leading mobile satellite antenna manufacturers. We wish the entire satellite community a prosperous and healthy 2015!

Drew Klein is the Director of International Business Development for C-COM Satellite Systems, Inc. where his main focus is the management of the Sales and Marketing team. Drew acts as a liaison between C-COM's technical and support staff and the company's global customer base. Drew earned a Bachelor of Science with Honors degree from the University of Waterloo and was the Valedictorian of his graduating class.



Cobham SATCOM

By Casper Jensen, Vice President, Maritime Business

Change has continued apace at Cobham SATCOM during 2014 as we close out our integration period, bringing the Sea Tel, SAILOR, EXPLORER and AVIATOR brands together under a single umbrella.

The first part of the integration, which started shortly after Thrane & Thrane was acquired by Cobham in 2012, was focused on ensuring our customer bases in the maritime, land and aeronautical markets were still fully supported in terms of sales and servicing, but with this complete, in 2014 we have been focused more internally, concentrating our efforts on securing the efficiency of our extensive development and production facilities.

To this end, we have opened a new 'super-factory' in Pandrup, Denmark, which is responsible for the majority of our maritime and land antenna and equipment manufacturing. This is a state of the art facility with higher capacity to meet the current and predicted future demands for our equipment for use at sea and on land. Our aeronautical SATCOMs antennas continue to be manufactured in Cape Town, where our manufacturer base of expertise in this sector resides.

We have also established a clear line in the organization of our product development structure. Our site in Concord, California, has become the Cobham SATCOM competence center for large VSAT and bespoke Land and Maritime solutions and Maritime TVRO, while our R&D center in Lyngby, Denmark, is the Cobham SATCOM competence center for medium and small antennas, including Ku- and Ka-band VSAT and L-band.

We believe our new structure reflects the various strengths of Cobham SATCOM's maritime brands clearly. Sea Tel leverages its legacy as a VSAT pioneer to develop systems for high-end, complex networks with focus on specialized oil & gas vessels and platforms, while the unique standardized technology developed for SAILOR products serves a higher volume market such as shipping, fishery and to some extent yachting.

2014 was a strong year in terms of sales in the maritime sector, where we have recorded 10 percent growth in maritime sales. We have been involved in some significant oil & gas and cruise & ferry projects, where the strengths of Sea Tel's bespoke VSAT offering have been key, but our SAILOR standardized VSAT has performed well too. For instance, SAILOR 900 VSAT was selected as the antenna for the Seasat A/S designed SATCOM solution for 45 Maersk Supply Services ships, following the signing of a contract between Seasat A/S and A.P. Moller Maersk.

The complete VSAT solution is centered around Seasat's ready-to-use rack, which houses all below-deck equipment in a rugged 30 HE steel rack, providing Internet access to the ship and crew—as well as Voice over IP telephony. The solution features global Ku-band VSAT coverage with automatic handover between satellites. Maersk selected the system to meet the Increasing Charter and Crew demand for fast and reliable Internet, which is becoming so prevalent in the maritime industry and also for use of its ERP system.

A good service requires high quality equipment, a proven Satellite provider and second to none service support. Together with Seasat, we have been able to provide this to Maersk.



The smaller end of the maritime market remains important to Cobham SATCOM, with SAILOR being a highly respected brand in fishing, workboats and yachting. In April, we introduced a new SAILOR solution, which was the first available for the new Inmarsat Fleet One service. SAILOR Fleet One enables data connectivity up to 100kbps and a single voice line. Its capabilities offer significant communications functionality for recreational and fishing users. The Fleet One service is provided through the Inmarsat-4 satellite constellation, the same award-winning network used by the world's leading ship operators, utilizing the low cost SAILOR Fleet One terminal.



Cobham SAILOR 900 VSAT.

SAILOR Fleet One is designed to the same high quality standard as the SAILOR FleetBroadband product line—a fact more than 40,000 end-users have experienced so far. The antenna is light and easy to install, and connecting to the below deck equipment is simple enough that keen owners can handle the installation and maintenance themselves.

We also went small in land this year, with the development of EXPLORER 510, which is the smallest BGAN terminal on the market. Launched at IBC 2014 and featuring a unique new, compact design and focus on wireless connectivity, the ultra-portable EXPLORER 510 BGAN terminal is set to be a game changer for professionals who demand reliable and easy-to-use satellite communications when operating in the field. At 197mm x 197mm x 40mm, EXPLORER 510 is smaller than a standard laptop and weighs less

than 1.4 kg. The compact, contemporary design and low weight makes it an ideal tool for field communication on its own, or as a companion alongside the EXPLORER 710, which delivers on-demand streaming rates at 650 kbps. EXPLORER 510 offers reliable performance globally for simultaneous high quality voice and broadband access at speeds up to 464 kbps, so it provides the flexibility and bandwidth needed for users in the field from a wide range of industries.

Cobham SATCOM's in-house development team has focused on wireless connectivity, with WLAN as the primary interface on EXPLORER 510. To fully embrace this, we developed a whole new way of connecting to and operating EXPLORER 510, via the innovative EXPLORER Connect App. With the EXPLORER Connect App users can use their own smart devices (and contacts) to make calls or easily access the Internet. The EXPLORER Connect App with a SIP softphone is available for Android and IOS. Inclusion of a USB host in EXPLORER 510 ensures users can choose their preferred wired interface also.

The EXPLORER Connect App is compatible with our most powerful BGAN solution, EXPLORER 710, which also had developments during 2014. We introduced a new software version that enabled the integration – or 'bonding' – of two EXPLORER 710 BGAN terminals, which doubles the streaming bandwidth available on Inmarsat's HDR service. The result is the ability to stream live video and audio at over 1mbps, whilst still using highly portable satellite terminals. The new bonding software will be installed on all new EXPLORER 710 terminals and was also made available as a free software upgrade for existing users of Cobham SATCOM's flagship BGAN solution in June 2014.

In the air, our focus has been on the forthcoming introduction of Safety Services. In September, Cobham SATCOM reached an agreement to equip Hawaiian Airlines' fleet of Boeing 767-300 aircraft with its AVIATOR SwiftBroadband satellite communications systems. The agreement represents an important milestone for us in the development of the next generation product family, AVIATOR S, as the system will be used for Safety Services data as well as for the provision of an IP pipe to the cockpit.



The new Cobham SATCOM contract will serve to demonstrate how the AVIATOR products can provide high speed IP data services and voice communication not only for the cockpit, but also other domains of the aircraft. Installation of the Cobham systems on the Hawaiian fleet is a significant step forward in the process of approval for SwiftBroadband as a safety service by the aviation authorities, which is a requirement for the operation of the AVIATOR S series. This technology demonstration, under FAA supervision, will pave the way for other airlines and equipment manufacturers. It will eventually allow the fast, efficient transfer of ACARS data messages over the SwiftBroadband link, as well as flight deck safety voice services and IP connectivity to the flight deck, enabling other flight operations and cockpit services.

Hawaiian's B767s will be retrofitted with Cobham's current generation AVIATOR SwiftBroadband SATCOM hardware, which includes an IGA-5001 intermediate gain antenna. The system is capable of providing both voice and data communications with the addition of many enhanced features such as immediate aircraft tracking information and Ethernet ports for connecting devices like Aircraft Interface Devices (AIDs) and Electronic Flight Bags (EFBs) for the pilots to obtain real-time information including graphical weather updates. The connectivity will facilitate dynamic routing to favorable winds and away from unfavorable weather.

These enhanced features will become the centerpiece of Cobham's AVIATOR S product family, which is designed specifically to leverage Inmarsat's new SwiftBroadband Safety service and will ensure a system configuration that can meet the requirements of all aircraft types. AVIATOR S will be available in 2016 to coincide with approvals for FANS 1/A services over SwiftBroadband.

In parallel to our work on Safety Services, 2014 has been a strong year for Cobham SATCOM in the aeronautical market. We have experienced double digit growth, thanks in part to the integration of the expertise of the AVIATOR (ex. Thrane & Thrane) team with the ex. Omnipless team in Cape Town. Together they form Cobham SATCOM's strengthened aero business unit, and are doing a fantastic job in developing new technologies and working with aircraft manufacturers and airlines to have them tested and installed.

Looking to 2015, we see only additional growth on the horizon. The demand for high-speed connectivity continues to expand across all of our markets. This will drive the demand for new satellite services which we will be ready to enable with our antennas. Next year will certainly be interesting, with new High Throughput Satellite (HTS) services expected to be available.

Cobham SATCOM has been preparing for this eventuality, with new Ka-band antennas and field conversion kits already designed and in the market. A certain percentage of customers may not be prepared to wait for these services though, and many satellite service providers have developed new services and packages designed to rival HTS, so we still expect good performance from our portfolio designed for current generation services during 2015 and beyond.

Crystal Solutions

By Roger Franklin, Chief Executive Officer

2014 has been a particularly interesting year, both for Crystal and the satellite industry as a whole. The company has grown rapidly and we expect such to continue over the coming months and years. Our company growth has closely paralleled the growth, globally, in the video and satellite industries.

Satellite networks are increasing in complexity with satellite uplink facilities experiencing more demands than ever before—consumers are accessing more content across a diverse set of consumption channels. With many OTT (Over The Top) video services launching across the globe, traditional broadcasters must meet consumer demand by offering service on as many platforms as possible in order to stay relevant and competitive.

During 2014, we witnessed a sharp rise in TV Everywhere. As a result, broadcasters must create and manage several versions of each asset and distribute this content across various platforms. There is a growing trend for personalization of services, such as translation or subtitles in local languages, regional commercials, unique graphics, crawls and ratings, and, of course, targeted advertising.

An increase in managing various formats requires multiple content control requirements downstream, resulting in increased complexity. As a result, we launched Crystal Solutions Connect™ to solve the problem of handling multiple distribution paths and the associated variety metadata to effect downstream personalization functionality.

2014 was a significant year in the world of satellite interference. Crystal Solutions' continues to be involved with the Satellite Interference Reduction Group (IRG) and assisted with the group's Carrier ID initiative. This initiative gained a great deal of momentum this year. While the new Carrier ID technology was standardized in 2013, 2014 has focused on implementation of the technology across the globe.



Another important milestone in 2014 was the introduction of a Carrier ID database by the Space Data Association (SDA), just in time for the Football World Cup in June. The SDA announced at a meeting in Washington, DC, that the database is freely available to all satellite operators, not just members of the SDA. Access to the database by all is important to ensure that it contains as much information as necessary to reduce the effect of RF Interference.

The largest satellite operators are populating the database and will continue to do so throughout 2015. To allay any concerns, it is important to understand that the only information in the database is a unique identifier and the name of the satellite operator to which that identifier belongs—the individual operator must store uplinker contact information in their own, internal databases.

With Carrier ID gaining momentum, attention is now turning to the tools and technology needed to detect and ensure it is truly effective. Many broadcasters and uplinkers already have the capability and simply need to activate Carrier ID in their newer modulators. Others will need to plan for a technology refresh in the coming year so they'll have the technology available, especially if they operate an SNG truck.

At the Satellite 2014 show in March, Crystal launched the Crystal Solutions CID Detection System, which allows uplinkers and SNG fleet operators to ensure they are correctly transmitting Carrier ID. This is important to satisfy the FCC mandate that goes into effect in June of 2016. The system provides an overview, enabling automatic verification, and accurate identification using readily available off-the-shelf equipment.





CRYSTAL SOLUTIONS'
**Carrier ID
 Detection System**

**FCC mandate by June
 2016**

The system supports automatic background Carrier ID detection allowing satellite access operations to identify carriers and populate the central CID database, as well as their own database, without disrupting or prolonging existing access procedures.

In 2015, we expect these aforementioned trends to continue. The complexity of satellite and video networks will further increase and a greater need for intelligent control and automated monitoring solutions will be required for business success.

Big Data is the "hot topic" of the moment, with a strong belief that collecting and analyzing enough data can predict the future. This past year has seen its importance increase, reflected in the use of metadata of various sorts.

The trend of inserting metadata in video content will be increasingly important over the coming months and years, with the expectation that all content providers will insert and validate metadata. Inserting metadata enables new business and revenue models the ability to accurately analyze and validate that metadata, and recover from errors quickly, and is crucial to ensuring and protecting this new revenue source.

For video content providers, inserting metadata creates new business and revenue models. The more information gathered about consumers' viewing habits, the more the provider can deliver consumers with better value, and advertisers better returns on their investments. This enhanced capability will ultimately result in more revenue for video providers.

At Satcon 2014 in November, Crystal launched the new Video Metadata Analyzer (VMA). This technology ensures metadata accuracy by capturing and logging video metadata, such as SCTE 104 and SCTE 35 messages, along the transmission path.

At Crystal Solutions, we continue to innovate and expand our products, services and solutions to meet our customers' current and future demands. We look forward to announcing a number of new enhancements in the year ahead.

2015 promises to be an exciting year as Crystal Solutions continues to expand our growing global footprint.



Crystal Solutions Spectrum Monitoring and Recording (SMR) offering.

DataPath

By David Myers, President and Chief Executive Officer

For DataPath, Inc.®, 2014 represents a year of rebirth and re-emergence in the market. In July, Rockwell Collins sold its satellite communications systems business, which it had acquired from DataPath back in 2009.

An Atlanta-based private investment group, composed of some of the original DataPath founders and early investors, re-acquired the business, thereby establishing a privately owned company and bringing back the DataPath brand. The move is part of a long-term strategy to invest in and reposition the company for market expansion.

With a history dating back to 1991, DataPath has evolved with the satellite communications industry. The core of the company revolves around engineering expertise and life-cycle support for satellite terminals ranging in size from .45m tactical man-portable units to 1.2m vehicle mounted auto-acquire systems to 16m+ master Earth stations for teleports. In addition to custom systems development, DataPath manufactures the SWE-DISH® line of rapid deployment portable satellite antenna products.

Today, DataPath's installed base exceeds 4,500 terminals worldwide across the government and broadcast sectors. In addition to satellite antenna systems, DataPath also provides a range of services related to remote communications. These include contract manufacturing, cyber security services, 24 x 7 network management, and field operations with more than 100 of the company's 300+ employees deployed at customer locations all over the world.

With the revival of the original brand name also comes investment in new products and markets. The focus is on remote, austere or at-risk environments, where communications is a critical element of mission performance. This includes government, broadcast, emergency response, and industrial markets.

For many in the satellite industry, the ubiquitous "dish" symbolizes the answer to any prospective need for remote communications. However, customers are increasingly seeking multi-modal communications solutions that can

seamlessly switch between different types of physical links—satellite, cellular, fixed wireless, or terrestrial.

Today's end-user is not asking the question, "How do I get satellite communications?" The real question is, "How do I get the best communications connectivity, for wherever I happen to be at the moment?"



Custom developed mobile communications command vehicle.

At DataPath, the key to supporting this emerging market expectation is our MaxView® software, an integrated network management solution that controls satellite terminals in the field, as well as everything that connects to them, from power generators to network appliances to remote sensors. MaxView can monitor every individual device, as well as provide overall network level diagnostics, for satellite, terrestrial and wireless connections. Customers benefit from a complete end-to-end solution, all managed from a single console.

FIELD PROVEN SOLUTIONS

- SATELLITE ANTENNA PRODUCTS
- CUSTOM ENGINEERED SYSTEMS
- CONTRACT MANUFACTURING
- FIELD INSTALLATION & SERVICE
- NETWORK MANAGEMENT SOFTWARE
- CYBER SECURITY SOLUTIONS

WHEN YOUR MISSION GOES OFF THE BEATEN PATH

COUNT ON US
FOR YOUR REMOTE COMMUNICATION

As we look ahead to the future, DataPath will increasingly focus on architecting complete network solutions for its clients, rather than only providing satellite related products and services. This requires updates and additions to our current product lines, as well as more emphasis on integrated network management. The result is a solution's capability tailored to the complete end-to-end requirements of today's remote communications markets.

The company is already preparing two new product launches for 2015. The first item is the QCT90, a new product in DataPath's SWE-DISH line of portable satellite terminals. The product is a high-performance unit weighing less than 40-lb, with a quick fold-away 90-cm reflector. The military-grade, carbon fiber and machined aluminum system is self-contained including the antenna, modem and RF transmitter and can be easily stowed in a single backpack. The new QCT90 meets the increasing need for ruggedized, small foot-print SATCOM systems designed for rapid deployment and short duration operations by one- or two-person teams.



*New QCT90 (Quick Case Technology) antenna
from the SWE-DISH product line.*

In addition, a significantly updated version of MaxView is in development and planned for launch in mid-2015. The product will include an improved user interface, new network analytics, and an expanded library of device drivers to support remote sensors and other network enabled appliances.

A pleasant surprise has been to see how quickly word-of-mouth about DataPath's re-emergence has spread throughout the industry. Bringing the DataPath brand back has been a tremendous springboard for the re-launch as a private company. Being privately-owned provides DataPath customers and partners with a number of advantages.

Our priorities have returned to customer service, responsiveness and product innovation, without the pressure to manage to quarterly stock-market expectations. By leveraging our 20+ year history, new financial backing, and engineering innovation, DataPath has set its sights on being one of the most trusted names in remote communications.

Our customers will benefit from an organization that is passionate about delivering solutions engineered for mission performance, combined with a commitment to exceed expectations for customer service.

EchoStar Corporation (EchoStar)

By Anders Johnson, President, EchoStar Satellite Services LLC

For EchoStar Corporation (EchoStar), 2014 marked a year of growth and the launch of new business initiatives.

EchoStar started the year by announcing the December 2013 acquisition of 100 percent ownership of Solaris Mobile Ltd., a next-generation mobile satellite services (MSS) operator based in Dublin, Ireland. Solaris Mobile is one of two European Union licensees of mobile satellite service with a complementary ground component (S-band). In connection with the acquisition, EchoStar entered into an agreement with Solaris Mobile to provide MSS capacity on a new, next-generation MSS satellite to support a wide range of innovative services across the European Union.

In March, through a strategic agreement with DISH Network (NASDAQ: DISH), EchoStar assumed ownership of five satellites that it had previously managed for DISH Network: EchoStar I, EchoStar VII, EchoStar X, EchoStar XI and EchoStar XIV. We expect to generate approximately \$145 million of incremental revenue from the new satellites in 2014.

One of the most exciting developments in our fleet came in September when we announced that, through an extension of our strategic partnership with SES S.A., we have contracted to build the EchoStar 105 satellite, which

will also be known as SES-11. The satellite is expected to launch in Q1 2017 and will be located at the 105 degrees west orbital location.

The EchoStar 105 satellite, with a payload of 24x36MHz Ku-band transponders, will replace the AMC-15 satellite, where we have offered comprehensive coverage of the United States, including Alaska and Hawaii, since 2006. The acquisition of EchoStar 105 renews our commitment to the fixed satellite services market in North America, and allows us to provide increased capability and improved coverage to meet the evolving demand from our customers for enterprise, broadcast and government services applications.

In addition to EchoStar 105, our EchoStar Satellite Services subsidiary is managing three new satellite projects; EchoStar XVIII, EchoStar XXI and EchoStar XXIII. EchoStar XVIII, expected to launch in Q4 2015, is a Ku-band BSS satellite being constructed on behalf of our customer, DISH Network, for their direct-to-home service. EchoStar XXI, an S-band satellite that will be dedicated to the aforementioned Solaris Mobile venture, is slated to launch in Q1 2016. Finally, EchoStar XXIII, scheduled to launch in Q3 2016, is a high-powered, Ku-band BSS satellite designed for multi-mission flexibility.





Artistic rendition of the EchoStar 105 satellite.



Artistic rendition of Space System/Loral's 1300 satellite platform.

EchoStar's Hughes subsidiary also has two satellite projects underway; JUPITER™ 2/EchoStar XIX and the Ka-band payload on the EUTELSAT 65 West A satellite. JUPITER™ 2/EchoStar XIX will be the world's highest capacity broadband satellite. A Ka-band satellite with more than 150Gbps throughput, the launch is planned for mid-2016.

Hughes Network Systems do Brasil, through a 15-year agreement with Eutelsat do Brasil, the Brazilian affiliate of Eutelsat Communications, has contracted for the entire Ka-band capacity connected to the Brazilian service area on the EUTELSAT 65 West A satellite. This satellite, slated to be launched in early 2016, will provide Hughes the opportunity to deliver a broadband service to consumers and businesses in Brazil.

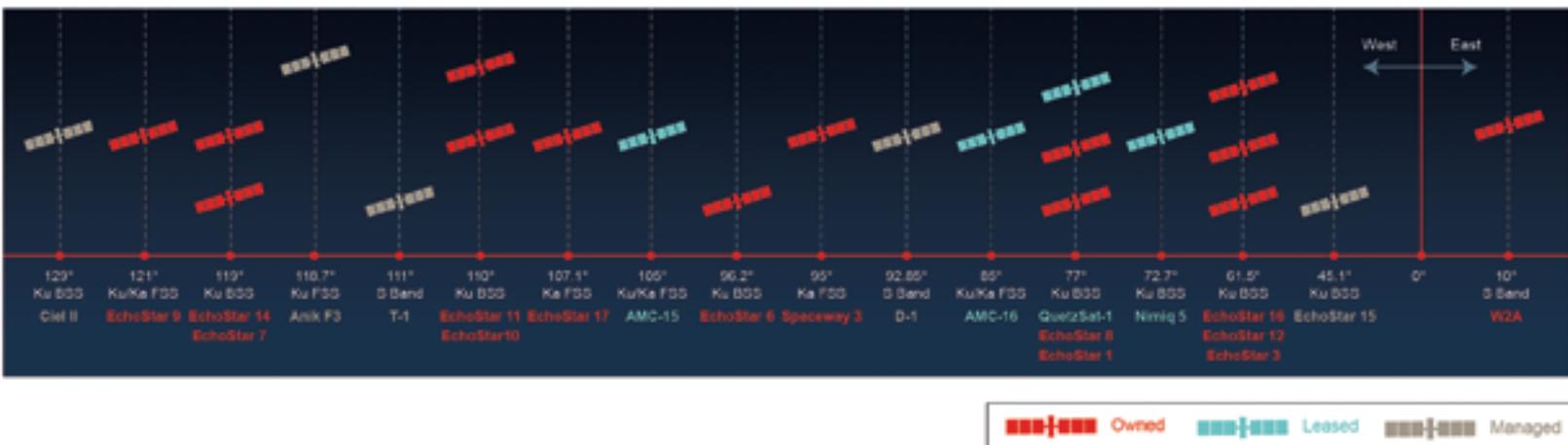
Starting in Q4 2015, we will have approximately one launch per quarter through the beginning of 2017. This is an unprecedented number of new satellites for EchoStar to bring online in such a short period of time, and we look forward to the challenge and opportunity it will afford us in continuing to expand our satellite-related business in 2015 and beyond.

EchoStar Corporation (NASDAQ: SATS) is the premier global provider of satellite operations and video delivery solutions. EchoStar's wholly-owned subsidiary, Hughes, is the world's leading provider of satellite broadband services, delivering network technologies and managed services in more than 100 countries.

Headquartered in Englewood, Colorado, with additional business units worldwide, EchoStar is a multiple Emmy award-winning company that has pioneered advancements in the TV and satellite industries for nearly 30 years, consistently delivering value for customers, partners and investors. Over the last three decades, EchoStar's contribution to video technology has had a major influence on the way consumers view, receive and manage TV programming.

EchoStar's consumer solutions include HughesNet®, North America's #1 high-speed satellite Internet service, DISH Network's highly acclaimed Hopper® DVR and Joey® product line, Sling Media's Slingbox® products, and EchoStar's line of advanced digital video set-top box products for the satellite and terrestrial viewer markets.

Anders Johnson serves as President of EchoStar Satellite Services L.L.C., a subsidiary of EchoStar Corporation (NASDAQ: SATS). Mr. Johnson was previously at SES where he served as Senior Vice President of Strategic Satellite Development. Mr. Johnson holds a BS Degree from the New York Institute of Technology.



EMC Satcom Technologies

By Payam Herischi, President, Network Systems and Chief Commercial Officer

EMC SATCOM Technologies, a division of Emerging Markets Communications (EMC), is constantly developing and improving satellite communications technology, with an excellent recent example being the enhancement of the SatLink® product family.

Through the acquisition of STM, EMC SATCOM obtained the DVB-RCS2 leading SatLink® family of VSAT networking products and promptly set to work on enhancing the system to provide faster, more efficient networks at considerable cost savings. As part of this development, SatLink was optimized for seamless integration with EMC SATCOM's other products, including the Noise Reduction System (NRS), HD Connect video solutions, SpeedNet Zero Latency Browser, and Power Booster, each of which provide first-in-class operation when integrated with SatLink. The latest upgrades have been rolled out in several networks throughout 2014 and customers are experiencing immediate improvements in performance.

EMC SATCOM Technologies' most celebrated achievement for SatLink® in 2014 was the completion, release, and rollout of the new and improved SatLink® system. With the upgrades, SatLink now provides the simplicity and spectrum efficiency of MCPC/SCPC networks, as used for large high-capacity, dedicated trunks, combined with the exceptional dynamic flexibility and the outstanding multiplexing efficiency of its TDM/TDMA capabilities. The technology enables large network operators and end-user organizations the ability to choose the network structure best-suited for any given customer or part of their satellite communication infrastructure.

The SatLink system, a full-featured product line with a wide range of Hub and VSAT products, now serves TDMA and SCPC needs concurrently. Furthermore, the SatLink Network Management System (NMS) implements tools to assure Committed Information Rates (CIRs) and Service Level Agreements (SLAs) for a diversity of end-user applications and operating environments, including fixed and mobile VSATs, all sharing the same Hub and carriers dynamically, in either mode. Optimizations for integration with existing EMC SATCOM Technologies products enable seamless, highly efficient solutions.

Large network operators now are able to serve mission critical government and corporate networks with multiple VPNs secured by AES-256 encryption and independent IP addressing, on the same core infrastructure with residential broadband for public Internet access, all without compromises. Each type of

customer organization can be managed and secured separately with their own encryption keys, guaranteed capacities, QoS policies, etc. Their own Virtual Satellite Network (VSN) can be independently managed either by the customer's staff directly or by the network owner-operator.

There is no loss of spectrum efficiency or IP throughput from using SatLink's TDM/TDMA, which offers the most dynamic and efficient sharing of timeslots, with negligible overheads vs. dedicated carriers. IP throughputs up to 150Mbps, per VSAT, are supported with basic spectrum efficiencies indistinguishable from MCPC/SCPC. SatLink networks, therefore, deliver a lower total cost per MHz by using statistical multiplexing even when traffic load fluctuations per site are moderate.

By combining SatLink with EMC SATCOM's dual-patented NRS (Noise Reduction System), bandwidth cancellation allows all TDMA carriers to use the same spectrum as the TDM carriers.

The NRS Technology eliminates the need for separate satellite capacity in the forward and return channel by enabling both directions of transmission to share the same satellite bandwidth capacity. It can be installed at existing sites without requiring changing the current modem and can handle multiple outbound carriers and unlimited inbound carriers up to the size of the aggregate of outbound cancellation within a single NRS unit.

When SatLink® is combined with EMC SATCOM's Power Booster, signal strength can be increased in order to reduce antenna size requirements facilitating the most efficient and cost-effective solutions for maritime and other mobile applications. Development of Power Booster was driven by EMC SATCOM's desire to provide even better efficiency and lower costs without compromising quality. Our engineers had to undertake some out-of-the-box thinking to bring about a solution that can enable small antennas to perform as though they were much larger.

The technology works in the following manner. Two remote station antennas receive the corresponding downlink signal which are identical. Following LNB / LNA and down-conversion, the signal is passed to a receive diversity combiner (Power Booster). The diversity combined signal contains the same



NETWORKS IN 120+
COUNTRIES WITH
150,000 VSATS
DEPLOYED ACROSS
THE GLOBE

information and has the same bandwidth and frequencies as the downlink signal but with increased power. This is done by aligning the replicated signals by frequency and phase and generates a power-boosted signal. Diversity combining improves the received signal to noise ratio by as much as 3dB.

For HD Connect, EMC SATCOM's trusted HD video on demand and telepresence service, SatLink can provide the flexibility and reliability that is crucial to video communications, which is a rapidly growing aspect of usage communications networks. The HD Connect™ HD Video Conferencing on Demand (VoD) platform can connect any customer's office in the world with high quality, reliable HD video services using either our video exchange, the existing customer Video Network MCUs, public Internet, or AT&T's Telepresence Exchange. The service can be either fully managed concierge "hands-off" scheduled video meeting service or provide bandwidth on demand (MPLSVoD) that can integrate with the customer video network system and policies.

The EMC SATCOM VoD delivers the best and uncompromised video conferencing or telepresence experience giving the participants the richness and fidelity needed to pick-up the subtleties of person-to-person interaction shortening the trust cycle. The HD Connect™ System extends video conferencing networks to anywhere video communications is needed allowing remote workers to concentrate less on travel and more on the work at hand.

SatLink has also been optimized for flawless integration with SpeedNet, EMC SATCOM's award-winning SpeedNet Zero Latency Browser, to provide end-users with the fastest possible Internet browsing experience on a satellite connection. SpeedNet is a satellite-based, proprietary browser, thin client that guarantees on a per-user basis 100Mbps download and upload speeds for all HTTP and HTTPS traffic that remains within the Cloud. Instead of the need to manage separate firewalls, all sites can be managed by one single firewall with common policies and significantly increased security.

Several customers were quick to embrace the new SatLink® system in 2014. For existing customers, EMC SATCOM Technologies provided a diverse range of solutions with the new system, including turnkey system upgrades to the new software, adding new hubs, backhaul solutions, and providing optimized mobile and transportable solutions. In the banking sector, Bank Rakyat Indonesia (BRI) selected EMC SATCOM Technologies to increase the performance and reliability of its online banking and internal applications. The solution, based on SatLink®, supports BRI's thousands of locations and automatic teller machines



Pictured:
Top, EMC's SatLink 2910 VSAT
Bottom: EMC's Power Booster

(ATMs) throughout Indonesia. The SatLink® system is capable of efficiently managing traffic on secure networks, in addition to improving connectivity, by offering Adaptive Coding and Modulation (ACM) on both the forward and return links. ACM functionality on both links delivers higher spectral efficiency, as well as superior rain mitigation techniques, that play a critical role in keeping links available in the hardest geographic locations.

BRI's large-scale connectivity requirements align with the capabilities and strengths of SatLink® technology, enabling scalability, stability and efficiency within the network. Financial institutions, with numerous remote locations and massive data processing, such as BRI, benefit from the design features of the SatLink® portfolio.

EMC SATCOM Technologies has several additional upgrades in progress and is actively expanding the customer base for these high quality systems, refined to meet the needs of multiple market segments. With the positive response seen thus far, EMC SATCOM has proudly welcomed SatLink and will continue to keep the system at the leading edge of satellite communications technology. Looking ahead to 2015, there is much more in the works for SatLink® systems as well as new, groundbreaking technologies to come.

Payam Herischi is the President and CCO of Emerging Markets Communications, USA and General Manager of EMC MENA. Previously, he held the COO position at EMC and managed Global Services at Hughes. He has more than 20 years of experience in the Satellite Telecommunications industry and has worked in Engineering, Operations, Product Development, Program Management, Business Development and Sales. In the past several years, Mr. Herischi has focused on starting and expanding satellite telecom services in the international market, especially in Africa and the Middle East, positioning and strategizing entrance and service offerings in each country/region. Mr. Herischi holds a B.Sc. in Applied Physics, Masters in Management of Technology from the University of Minnesota, International Business Management from Georgetown University, and Management of Innovation from University of Maryland, and is a Ph.D. candidate at ISM.



ETL Systems

By Ian Hilditch, Managing Director and Chief Executive Officer

Defying the UK recession and doubling the UK headquarters size ETL Systems—a global designer and manufacturer of RF distribution equipment—had an extremely successful 2014.

Figures from Northern Sky Research (NSR) reveal that the combined satellite manufacturing and launch industry generated nearly \$35 billion globally in 2013 and, in the past year, more than 100 new satellites were ordered, more than 100 were launched and transponder growth continued to expand.

With an average growth rate of 20 percent for the last five years, ETL has witnessed solid growth, as well, and our turnover rose to GBP 9.5 million for 2013/2014. We are also continuing to expand after opening our U.S. office last year, and 2014 also marked the unveiling of new facilities at our U.K. headquarters.

Our purpose-built factory in the UK has doubled in size, reconfirming our commitment to investing in the future to further benefit customers. Our two new buildings provide a larger production and test facility, additional office space as well as a fitness suite, gym and canteen, under the name ETL Springs, for our 80-strong team of employees.

This year we also further expanded our global presence by announcing the opening of a new Middle East headquarters to meet growing demand in the MENA region. The Middle East office is based in Dubai and is headed by electronic engineering expert, Mather Al-Ali, who brings more than 18 years of sales experience in Middle East markets to the company.

More than 25 percent of ETL's total sales come from the MENA region, with the broadcasting and government SATCOM markets proving to be particularly successful. ETL's most recent projects in the region include

an L-band Vulcan Matrix for beIN Sports Channel and two Vortex L-band Matrix Systems for du and Abu Dhabi Media Company. Other projects include variable gain Alto amplifiers to Etisalat and ND SATCOM for the Al Jazeera Network solution provided by Media Group International.



During 2014, we also launched several exciting new products, including a range of RF over fiber equipment called the StingRay series. The first design was launched at CABSAT 2014 in Dubai and SATELLITE 2014 in Washington.



This high density design in 1U, 2U or outdoor enclosures houses hot-swap transmit and receive RF over fiber modules and is designed to be used for short distance links between satellite dishes and the teleport.





Specialists in RF custom design and build

The StingRay is the most compact unit of its kind on the market and we designed this product with the focus on excellent module to module isolation, helping satellite teleports with transition distances up to 10km.

StingRay also offers hot-swap power supply units (PSU), local as well as remote control and helps the teleport engineers to design fiber links within budget.

We also launched a new Components Mounting System, called the Scorpion, as part of our new line up of RF equipment. Designed with flexibility at its core, this 1U 19 inch chassis accommodates a range of two, four and eight-way passive L-band splitters and combiners in any combination. ETL's in-house engineering team designed the CMS unit to be a simple, versatile solution by giving users the choice to install the same or a mixture of components.

The release of the Scorpion accompanied other new component products that were/to be released to the market in 2014. We now have a huge range of RF components, which include Ku-band and Wide band passive splitters and combiners, both of which are available in two-way, four-way or eight-way, with 50Ω impedances and SMA connector types, offering consistently excellent RF performance.

We also signed new international contracts with influential players in key market segments. At the start of the year, we were selected by America's leading global security and aerospace company, Lockheed Martin, to provide multiple, 16-module Alto AGC Amplifier systems to its Information Systems and Global Solutions department.

Following this contract, our international growth in trade continued when, in March of 2014, we were selected by Boeing to support Inmarsat's GX services for the government markets. A range of ETL's RF systems now supports the first of three Global Xpress® (GX) satellites.

Also in March, we announced a partnership with Globecom, a leading global provider of managed network communication solutions. We now provide RF signal distribution systems to Globecom, including Vulcan and Victor matrices.

All of these new partnerships highlight our success in the U.S., with 40 percent of turnover coming from successful U.S. sales. This has been a most successful year for us and we look forward to developing our product range, growth and international presence yet further in 2015.

We wish all of our customers and partners the best for the year ahead.

With an MA in Engineering, Economics, and Management from Oxford University, Ian joined ETL as Managing Director and CEO in June 2003, after arranging a management buy-in. As a serial entrepreneur, he has a wide range of experience of running and growing companies, with particular focus on the business development and finance.

Prior to ETL, Ian ran an engineering business involved in air pollution control, which he sold in late 2001. He became Vice President and Senior Director at Continental Illinois Bank before moving into entrepreneurial pursuits.



Expandable RF routing for Satellite Teleports



Finding a single qualifier for the year 2014 would be a challenge in an industry that is much more diverse than one may think. Overall, it would likely be difficult to simply call it a great year, as early indicators suggest a limited revenue growth for the sector. One cannot consider it as a bad year either, as certain segments and players have still performed well and a number of investment projects have been progressing. Let us have a look at some salient features of the last few months.

Likely moderate revenue growth for satellite operators

This year should be another year of slow growth for satellite operators on a consolidated basis. Revenues posted by the top three operators (Intelsat, SES and Eutelsat) for the first nine months suggest a growth of less than 1 percent. Even if regional operators have tended to post higher growth rates in recent years, the overall industry performance should remain limited.

The rationale for that slow growth has already been presented and includes a mix of:

- *No growth in historical largest satellite markets (North America, large parts of Europe)*
- *Overcapacity in certain areas such as Africa due to the recent surge of capacity supply and in the case of Africa to the recent spread of fiber networks, which results in pressure on capacity pricing*
- *Lower demand from the US government for military communications, which has not been fully compensated by other verticals*

Still, while data is not yet available, our review of different regional and national markets in the course of the year suggest that the growth in capacity used remains at least as high—or even higher—than the current revenue growth, with a mix of leases on regular and HTS satellite systems.

HTS progressively moving from the investment to the business phase

HTS systems have dramatically increased their reach this year. HTS supply has increased by 50 percent outside of North America and Europe, and each world region will have at least two operators offering HTS capacity by the close of the year. In Latin America, HTS supply has more than tripled. This matched the announcements of full payload leases on two Eutelsat satellites.

In parallel to geostationary satellites, O3b could start commercial operations in the summer, following the launch of its second batch of satellites. Although HTS systems still represent a limited part of the overall capacity leases and revenues, their share should rapidly increase.

Reducing transmission costs a strong priority, but it will impact revenues in the short term

Repeatedly, a number of satellite operators, service providers and manufacturers have emphasized the need to reduce transmission costs in order to maintain the competitiveness of satellite solutions and to open new growth opportunities.

This supports the interest for optimized solutions, from high throughput payloads to electric propulsion, lower cost launch services. This also triggers the launch of new systems as operators try to penetrate new markets. The combination of multiple entry strategies and of the availability of new satellite assets has started to result in a higher volatility in pricing conditions.

Still a robust year for satellite orders

Satellite procurements remained high in 2014, with 18 GEO comsats ordered at the end of October, and likely up to 22 by year-end (vs. 24 in 2013). While satellite orders remained stable in recent years, the nature of the orders has changed, with more diversity in terms of operators, of payloads, and of financing schemes.

experienced another launch failure, while Falcon 9 had three launches for two Asian operators.

The spectrum challenge

This year has seen a new rise in the tensions on the use of spectrum. The claim of telecom operators for the use of C-band has reached a new level, and lobbying efforts have taken place by a number of industry stakeholders in preparation for the World Radiocommunication Conference (WRC) 2015. Both the preparation activities of the terrestrial and satellite industry have become more organized, and intense discussions have started with regulators in the different world regions.

Some thoughts for the year 2015

Anticipating short term dynamics can be as challenging as identifying long term structural trends. A few important facts should, however, have a significant impact on the industry.

- *Available capacity from HTS systems will further increase by around 20 percent, with growth of regular capacity supply also standing at around 8 percent. Considering global operators, Inmarsat should have completed the deployment of its Global Xpress Constellation, while the first EPIC satellite of Intelsat should also be in orbit. The NBN satellites should also start serving the Australian market.*
- *Larger capacity supply could contribute to a new growth in demand, also boosted by new generation terminals and the availability of higher spectrum efficiency. However, the next year should still be challenging for satellite operators, as pricing conditions and economic models will remain under pressure.*
- *Few transactions took place in 2014, with most of them targeting small size service providers. More might however take place in 2015, as a number of companies will aim at rationalizing their activities and/or reaching a critical size. A first event could be the potential sale by the Airbus group of part of its SATCOM services as stated by the group following its recent strategic review.*
- *The outcome of spectrum decisions during WRC 2015 will have a strong impact on the industry. It could impact the middle term usability and then investments in the C-band, but also create a reference case suggesting that the same threat could apply to other frequency bands.*

Government-backed satellite operators continue to emerge in Asia, Middle East, Africa and Latin America, while the 40, existing, privately-owned GEO comsat operators renew and/or expand their fleet size and fleet coverage. High throughput payloads multiply, rather on multi-mission satellites than on dedicated HTS, and flexible payloads start to become affordable for commercial operators with some forms of digital processing. In order to allow for lower, individual capex, what we call "CondoSat" has also multiplied, with funding and capacity sharing by two operators.

Competitive changes for satellite manufacturing and launch

Competition experienced change in 2014 for the manufacturing and launch of GEO comsat. Order taking is still dominated by the North American satellite integrator MDA/SSL, with the two European integrators closing in, those being Airbus Defense & Space and Thales Alenia Space. While Orbital Sciences Corporation (OSC—currently being merged with ATK) booked its first two HTS orders, Boeing and Lockheed Martin are busy delivering multi-satellite orders for commercial operators (Intelsat and Inmarsat) and the U.S. government, respectively. Mitsubishi Electric had its second commercial order outside Japan in 2014 with the operator of Qatar.

For commercial launch services to GTO, the duopoly of Ariane 5 and Proton has changed into a duopoly of Ariane 5 and Falcon 9, as Proton

Pacôme Révillon is CEO of Euroconsult, which is based in Paris, France.

Pacôme leads Euroconsult's strategy and operations and consults with high-level clients, particularly in satellite broadcasting, communications and finance. Under his management, the company has experienced a continuous global expansion and has strengthened its position as an international reference on the strategic, economic and financial aspects of space activities.

“The Best Of Times” For Satellite Actors

By Chris Forrester, Senior Contributor

Each year has its fair share of headaches for satellite operators, and 2014 was certainly no exception. The year was blisteringly good for SpaceX, and not so good for Russia’s Proton, while French-operated Arianespace faced continuous squeezing on its charges and political pressures on plans for the updated Ariane-6 heavy-lift rocket, now seemingly as far away as ever.

Michel de Rosen, President and CEO at Eutelsat, summed up the position regarding SpaceX, saying, “There were some considerable anxieties in the early days about SpaceX. We all remember the ads saying ‘Some launch, others talk,’ which appeared a year or two ago. I was surprised at how skeptical some people were about SpaceX, but the reality is that Mr Musk had the courage to go ahead and with his concept of frugality, and succeeded. Look at the car industry where the manufacturers always want their latest models to have a more sophisticated this or advanced that. The genius in Musk’s case is that a competitive launcher did not have to be more sophisticated or offer more luxury—the launcher just had to work and be cost-effective. Our industry needs this frugality. We all experience very real pressures from our customers to keep their transponder prices low, and so need to transfer these downward pressures on our own suppliers.”

Mr. De Rosen is far from alone in his comments. Martin Halliwell, SES’ CTO, has also grumbled about Arianespace’s lack of progress. Halliwell,

speaking at an SES investors’ day on June 25th, said that over the past 12 years, the European Space Agency had required a budget of \$1.6 billion in order to complete design work on a new upper stage rocket engine (the Vince engine). Halliwell said in that same 12 years, SpaceX of California had come from nothing and created a complete rocket launch system. “Europe has to change gears, and get going,” Halliwell said. “I think they are now, finally, getting the message. They have to step back and make this thing happen. They are saying, ‘Look, we’re not going to survive if we stay like this.’”

Indeed, SES CEO, Karim Michel Sabbagh, bluntly told readers of the French daily Le Monde in September that “launch prices could halve” due to SpaceX’s innovation. He explained that the typical cost of a rocket launch, of \$100 million, had come down to about \$60 million because of SpaceX and it could tumble to \$30 million if SpaceX’s re-usable first stage comes into play. “SpaceX’s new feature is its industrial model, not its launcher,” said Mr. Sabbagh. “The Europeans are not lacking on any front. They have the technology and the ability to reinvent the industrial model. What is needed now is the will.”

Time will tell whether Arianespace achieves this new goal. However, 2014 was also a year of further consolidation in the business. Top of the list was



SpaceX Dragon launch at Space Launch Complex 40 at Cape Canaveral Air Force Station in Florida.

the Eutelsat purchase of Satmex which started in July 2013 and wrapped up on January 1st of this year. The \$831m (plus \$311m in debt) purchase was considered 'brave' at the time (Eutelsat's share price immediately fell 6 percent) and many wondered how Eutelsat would transform this—mostly—telco-serving satellite into a profitable concern. After all, it was not that long ago that Satmex was facing bankruptcy. This past year has shown what can be done with re-invigorated local management and solid backing from a powerful parent. Eutelsat Americas is healthy and helping boost profitability, as well as expand Eutelsat's coverage over the Americas.

2014 also saw peace break out in terms of a long-running dispute between Eutelsat and SES over transmission rights from a key 28.5 degrees East spot over Europe. The dispute centered over access to 500MHz of frequencies at the 28.5 degrees East orbital position. A Eutelsat craft was occupying the position and had been responsible for dozens of channels being beamed into the U.K. and Ireland.

On Sept 16 2013, following a decision by a French Chamber of Commerce arbitration tribunal, SES announced that they had won the dispute and would start transmission on October 4, 2014, on its own satellite, which the company duly did. Eutelsat's clients switched to the SES craft. Eutelsat contested the decision, saying they would also appeal an earlier August 30th verdict achieved by the actual rights holder (Media Broadcast) at a Bonn, Germany, court where Eutelsat were ordered to not interfere with SES' transmissions. These somewhat ancient rights extend back to transmissions "owned" by Deutsch Telekom's T-Systems Business Services, and subsequently acquired by Media Broadcast. Readers with extremely good memories will remember they were originally part of the Kopernikus German geo-satellite system. Media Broadcast holds the license for the frequencies issued by Germany's licensing authority (Bundesnetzagentur).

A January 30th announcement from both parties clears away those complaints and reinstates a working relationship between the two giant satellite operators. In essence, the dispute is completely settled, and fresh "long term" commercial terms agreed.

4K, more than just a talking point

2014 also saw a greater number of tests of 4K transmissions, helped by the largest soccer event in the world, the World Cup from Brazil. There were additional experimental trials at NAB, IBC and other special events.



"By 2025 we expect 1000 Ultra-HD channels to be on air, and around 500 million Ultra-HD displays in use."—SES

As the year has progressed, it is now clear that the 'Age of 4K' is almost upon us. SES COO Ferdinand Kayser, speaking at IBC in September, said that SES is convinced that Ultra-HDTV will make a major impact, and that satellite will play a significant part in winning audiences for 4K viewing. "Satellite will be very relevant for delivery in the future," he said. Kayser based his argument on the challenges faced by IPTV and (to a certain extent) cable delivery of 4K signals.

Kayser firmly expects some key European broadcasters to have 4K channels on air during 2016. "The catalyst will undoubtedly be the UEFA soccer and that year's Olympics from Brazil." He said he expected some important payTV broadcasters, such as Canal+, to start closing their Standard Definition (SD) services soon. Kayser admitted that, even with the arrival of 4G and perhaps even 5G, as well as digital compression, Ultra-HDTV on these networks would be less than perfect. "No single technological answer ticks all the boxes," he said. "But satellite is very strong and also represents value for money and maximum choice. By 2025, we expect 1,000 Ultra-HD channels to be on air, and around 500 million Ultra-HD displays in use."

October also witnessed the giant MIPCOM programming market devote four days to the discussion and showcase of 4K material. The event was kicked off by 21st Century Fox's Co-COO James Murdoch, who spoke about how excited he was by the prospects for more "immersive" television. His colleague at Sky Germany, Gary Davey (EVP/Programming), told delegates that he had no doubt that 4K broadcasting would be the new TV standard. "We are going to be very active in 4K. We have not picked a launch date yet, but we will definitely be in the 4K business because we see it as a natural evolution of delivery very high quality content. We now know enough about it, and understand the scale of the problems so that we see it as a manageable transition."

"We are absolutely committed to 4K," added Davey. "My view is that people love the idea of big screens today. And as they buy these screens they are going to want content! One of my favorite stories, being an old-school linear TV guy, is with today's kids going to university and having their only connection with what we would call television is through a tablet or laptop computer. This is scary, I know. But the good news is that as soon as they leave college and get a job the first thing they do is to buy a huge TV set. There's a genuine desire for bigger screens and higher resolution. If [producers] have the choice to future-proof their output into 4K, they will."

2015 promises to be just as interesting. No doubt there will be challenges a-plenty—and more than a few opportunities!

Senior Contributor 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. He founded Rapid TV News and has edited Interspace and its successor Inside Satellite TV since 1996. He also files for Advanced-Television.com.

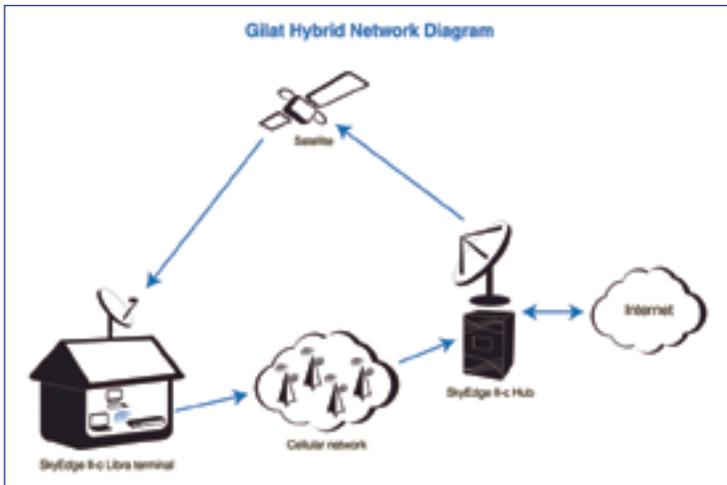
Gilat Satellite Networks

By Erez Antebi, Chief Executive Officer

For more than 25 years, products powered by Gilat technology have shipped to over 90 countries. We design and manufacture ground segment equipment and solutions, including VSAT systems for High Throughput Satellites (HTS), mobile terminals and components.

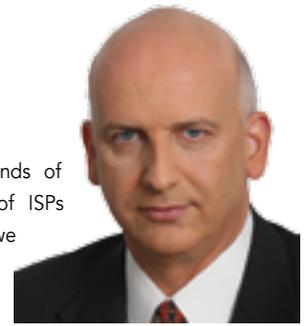
The satellite industry sits at a turning point: The frequent launches of high-throughput satellites have resulted in a situation in which HTS supply is expected to more than double within the next two years (Comsys, 2014). The initial consumer broadband market in North America is an example of what is occurring due to the abundance of satellite capacity—costs are down and the applications market is quickly broadening. We are seeing worldwide demand for HTS applications in a wide range of markets: Cellular Backhaul, Mobility, Government, Education, Emergency Response, SMEs, and Enterprise applications.

In response to such growing demand for Ka-band and HTS worldwide, Gilat has developed SkyEdge II-c, a comprehensive VSAT platform that supports multiple applications, a one-stop-shop for applications spanning from consumer to enterprise markets, and includes cellular backhaul and mobility. Gilat's multi-platform hub has been designed and optimized to operate with new multi-spot-beam satellites in addition to traditional wide beam satellites. SkyEdge II-c delivers high-throughput service speeds and very fast browsing capabilities using advanced web acceleration techniques.



The SkyEdge II-c platform has the flexibility of scaling up to serve a full satellite with one million VSATs, as well as the competitive option to support a network consisting of only twenty VSATs. Gilat's scalable hub is managed by TotalNMS, a comprehensive network management system. TotalNMS supports fast service introduction and effortless maintenance while maximizing network potential and assuring end-user satisfaction. It brings a complete set of network management functions into one simplified interface, streamlining service fulfillment and assurance operations, thus saving time and reducing costs.

Gilat has established strategic partnerships with HTS operators such as ThaiCom, Inmarsat, HISPASAT and SES Broadband Services, to deliver HTS solutions



worldwide. This year, multiple hubs and thousands of terminals were deployed for a diverse range of ISPs throughout Europe and Asia. As an example, we received a hub expansion order this year from SES Broadband Services for its "Astra Connect" network and we also signed on new ISPs and received orders for VSATs from new and existing ISPs who subscribe to the SES service.

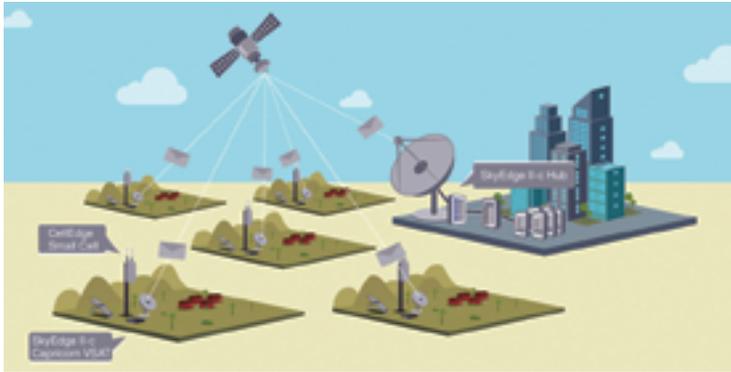
Everyone can agree that providing a region with broadband access brightens its economic outlook. Indeed, the satellite industry has led the way in delivering broadband to the most remote areas of the world. However, the Customer Premise Equipment (CPE) price point is often far out of reach in the developing world. This year, Gilat addressed this need with SkyEdge II-c Libra, an innovative, hybrid satellite-cellular terminal, priced at under \$200 per terminal, less than half the CPE price of a regular VSAT. The terminal was designed to deliver broadband Internet to lower-income households unable to afford a regular VSAT terminal. Gilat expects this product to significantly extend the reach of broadband to underserved areas in developing countries. The Libra solution leverages existing networks and provides growth paths for Mobile Network Operators (MNOs), Direct-To-Home (DTH) providers, and satellite ISPs.

- *MNOs can leverage their existing infrastructure to offer high speed broadband*
- *DTH service providers can enrich their offerings by adding broadband services*
- *ISPs can increase ARPU and customer loyalty by offering affordable, high-speed, fixed broadband Internet services*

Libra takes advantage of the asymmetrical nature of residential broadband traffic by transmitting the heavier download traffic (like video) via satellite, providing vastly improved download speeds of up to 20Mbps. The lighter upload path from the end-user is routed via the existing cellular network. As the latest addition to our SkyEdge II-c family of products, Libra exemplifies the multi-purpose, multi-application nature of the platform. Additional information is available at: <http://www.satmagazine.com/story.php?number=511281538>

During the 1990s, Gilat brought voice communication to the most remote locations around the globe; today, the challenge is to deliver to these areas high throughput data over LTE networks, and at a speed that matches handset device potential. The requirement is performance as well as providing cost-effective solutions and fast deployment. Gilat has met this challenge by introducing this year two unique solutions that enable MNOs to engage in quick network expansion. We have identified two distinct needs which we have addressed:

- *CellEdge—A full turnkey solution targeted at developing countries to extend 2G/3G networks to unserved rural areas*
- *Capricorn—Satellite backhaul for quick 3G/LTE deployment in the developed world, where time to market means success*



Gilat is unique in the satellite communication industry by offering the small cell base-station in addition to the satellite backhaul. Small cells enable operators to increase coverage and capacity where needed at a fraction of the cost of deploying additional macro-base stations. In hard-to-reach, sparsely populated areas, small cells with satellite backhaul are not just the only economically feasible solution, but are also the fastest to deploy.

CellEdge, introduced this year, is a full turnkey integrated solution optimized for efficient bandwidth usage and an enhanced user experience. Gilat offers an integrated solution with full turnkey services to support the needs of developing countries to extend 2G and 3G cellular coverage to unserved rural areas. This need often comes from Universal Service Obligations (USO) mandating coverage to the most remote regions to assist in closing the gap of the digital divide. Additional information is available at: <http://www.satmagazine.com/story.php?number=1806247148>

CellEdge offers a complete turnkey installation, combining the small cell, the VSAT, the energy solution, the infrastructure and logistics was deployed in record time in the Amazon rain forests of Brazil. TIM Brasil, the second largest operator in Brazil, was under an Anatel obligation to quickly provide 3G coverage to the remote regions of Santa Catarina and Paraná. Twenty rural sites were deployed under a two month tight deadline, followed by a repeat order an additional 30 sites. For more information, please see: <http://www.gilat.com/Gilat-Deploys-3G-Small-Cell-Network-for-TIM-Brazil-in-Only-Two-Months>

Gilat has brought to market this year an outstanding 200Mbps TDMA VSAT that quickly provides a high-performance, cost-effective, backhaul solution. SkyEdge II-c Capricorn was designed with the backhauling requirements of 3G/LTE networks in mind. This solution is especially effective as an alternative to the challenges faced by MNOs who are required to deploy multiple microwave links.

Gilat's SkyEdge II-c Capricorn offers mobile operators a method to provide LTE deployment ahead of their competitors. In developed areas, mobile operators are expanding their LTE networks to keep up with the ever-growing demand for more data, delivered at higher speeds. Handsets on LTE networks can reach extremely fast download speeds and must be supported by a reliable, high-speed backhaul infrastructure. With our patent-pending acceleration technology, built into our SkyEdge II-c hubs and terminals, we have succeeded in overcoming satellite latency issues to support the high-speed requirements of LTE networks. Gilat's SkyEdge II-c Capricorn successfully completed tests for LTE/4G cellular backhaul at a tier-one operator in East Asia. The 200Mbps Capricorn demonstrated an

outstanding sustainable speed in a single-session FTP download, reaching the handheld device's maximum performance. The demonstration took place over an LTE network based on the technologies of different, leading, equipment providers. The end-to-end test proved the capability of Gilat's acceleration technology to overcome both satellite delay and device limitations. Accelerated and encrypted data was delivered via satellite at speeds previously associated only with terrestrial networks.

The bursty nature of data traffic on LTE networks requires TDMA channel access instead of SCPC. The combination of 200 Mbps data rates and TDMA translates into much better economics for mobile operators deploying satellite for LTE networks. Additional information is available at: <http://www.satmagazine.com/story.php?number=1523386243>

The number of mobile units worldwide is projected to double within eight years (NSR, 2014). Leading the way in terms of revenue will be units enabling commercial airborne communications, as the expectation of constant connectivity expands from the U.S. to the rest of the world. Gilat sees growth potential in several mobility market verticals in which it is involved. Gilat possesses a strong differentiation in Mobility by meeting market demand for terminals with smaller sizes, lighter weights and lower power consumption.

Gilat sees great opportunities in Airborne and is working on further increasing its presence in that segment by adapting our antenna technology to this market. As our antennas are primarily made of plastic instead of aluminum, we believe the benefits of reduced weight and cost will be particularly attractive to potential customers. This year we have already supplied Wavestream BUC solutions to Tecom and Aerosat for inflight connectivity served by Global Eagle and Gogo. Outside of the U.S., we are noting a strong demand for our SatTrooper manpack terminals, which are available in Ku- and Ka-bands. SatTrooper is one of the smallest and lightest auto-point terminals in the market. A primary reason for this is the unit's low power consumption, which reduces the weight of the energy pack. At the same time, SatTrooper enables very high-speed transmissions, such as is required for video transmissions. Also, Gilat's Wavestream BUCs have been delivered this year for various OTP applications to our longtime customers L3 and General Dynamics, among others. Our BlackRay solutions for unmanned platforms are based on either our low-profile panel antennas or our new small, lightweight parabolic antennas. They are available in Ka- and Ku-bands, providing operators flexibility when choosing satellite capacity. The BlackRay terminals relatively small size and weight extends the operational range of UAVs, all the while increasing mission payload capacity.

2014 has been an exciting year for Gilat with many innovative products and solutions. We look forward to presenting additional pioneering solutions during 2015, with many additional and successful deployments of our groundbreaking offerings.

Erez Antebi serves as Gilat's Chief Executive Officer. He has been with Gilat for over 17 years. In his latest role as executive advisor to the CEO, Erez has been leading Gilat entry to the new market of spot-beam satellites and Ka Band VSAT technology. Previously Mr. Antebi served as Gilat's Chief Executive Officer for Gilat Network Systems (GNS) and Spacenet Rural Communications business units. Mr. Antebi previously served as the CEO of Clariton Ltd, Gilat's Chief Operating Officer (COO) and other executive positions in Gilat Satellite Networks LTD.

Global Teleports

By Rodger Boddy, Chief Executive Officer

2014 has been a significant year for Global Teleports. High Throughput Satellite (HTS) has reached the point where the technology is reliable, efficient, and cost-effective enough to provide a broadband service to become a true competitor to existing offerings.

At Global Teleports, we have been supplying reliable commercial satellite services to the industry for nearly 20 years. However, we didn't rush to enter the domestic satellite broadband market until we were satisfied that we could provide a truly viable service.

HTS has been much talked about over recent years and, during the past couple of years, we have seen some significant developments in the technology. During 2014, HTS technology developed to provide greater accommodation of adverse atmospheric conditions, thereby underwriting the use of higher frequencies that were previously impractical for implementation.

The advent of HTS meant that we now have many times more capacity than traditional satellites, meaning the technology has an important role to play across a wide range of applications. During 2014, we started to see many more of these satellites emerging, with more and more users getting on board with HTS services to extend their reach.

In the world of broadband, HTS fills a gap not currently well-served by traditional satellite or by other broadband services. There are still an alarming number of communities and areas who cannot obtain decent broadband coverage through other means. Thanks to recent developments in HTS, and the fact that more and more satellite operators have launched HTS capacity, we can now move broadband to almost every corner of the world. Also, prior to HTS, satellite broadband has been extremely costly—

now we can present a cost-effective and reliable offering across the globe.

At Global Teleports, having engaged in an HTS trial with a major client in Q4 2013, we officially launched our new broadband service for commercial and domestic users, Vip3Play, in March 2014. The service uses HTS technology with capacity now able to reach even the most rural of areas, and all at a competitive price. We are now delivering services into all sectors across U.K. and Europe—in Afghanistan, we are delivering services for the Fire, Crash and Rescue Services at Kandahar Airport.

As HTS has become increasingly available and deployed, we are also seeing the launch of additional, rapidly deployable, consumer class terminals, which are able to provide much greater throughput than their predecessors.

During 2014, there have been some significant developments in antenna design, allowing manufacturers to drastically reduce the cost of user terminals. Our service uses Newtec terminals with the firm's Point&Play® device, which is simple enough that anyone can set it up. In an industry where satellite interference is widely discussed, having a system that automatically directs to the correct satellite is a huge advantage, helping to drastically reduce the potential for errors.

At IBC 2014, Newtec launched its next-generation modem, MDM3100, which includes a number of technology enhancements. Their new modem is ideal for Enterprise, larger businesses and community service delivery, offering:





Global Teleport's Brooman's Park site, which is licensed for Permanent Earth station (PES) and VSAT network (VSAT) with OFCOM and offers satellite coverage over the Atlantic and Indian oceans.

- *Superfast broadband at speeds of up to 45Mbit/s*
- *Greater than 1000 simultaneous windows open*
- *Integrated 4 port, 1Gbit/s LAN*

Global Teleports is the first service provider in the world to offer the MDM3100 modem to our commercial customers.

There has been a great deal of dismay from rural communities who are drastically lagging behind in the provisioning of broadband. In the U.K., the government has supposedly teamed up with BT to roll out superfast broadband across the country—unfortunately, during 2014, there has been much discontent throughout the country with this plan. Many rural areas



Global Teleport's USA hub facilities are co-located in the SES Mediaport in Washington and delivers Ku- and C-band access.



The Global Teleports Adelaide hub is collocated in the Adelaide Mediaport, which owned by NewSat Networks.

have suddenly discovered they are either left out completely when the roll-outs are completed in their areas and they find they are still not connected, or they have to wait an additional two years before they will see the new services arrive for their access.

This year, we have been focusing much of our efforts on bringing our service to those disenfranchised areas, initially in the U.K. Thanks to HTS, we can cover the entire country. We were accepted for the U.K. government-led Urban Broadband Fund's Connection Vouchers Scheme. This program enables customers in the covered cities to fund the cost of broadband installation.

We have also been working with local councils and chambers of commerce to explain how we can assist in offering reliable broadband to rural communities. We are shortly due to start a trial in Wales with a local business, which is currently struggling with poor service. Once up and running, we hope the connectivity becomes the hub of the community.

The story is similar across the globe, with many businesses and consumers struggling with meager connections that can be solved by HTS.

Demand for our services has been extremely positive throughout 2014. To better accommodate our new services, we have expanded our U.K. operation into new, more secure premises, where we will be installing additional antennas, as well as hub and network monitoring facilities, all to enhance our global service delivery capability.

Our intention is to finish the year with this new facility fully operational—we will be well prepared and ready for what promises to be an exciting year in 2015.

Globalstar

By Jay Monroe, Chairman and Chief Executive Officer

This has been a great year for Globalstar—2014 was all about continuing the upward trend that was started with the completion of our second generation global network in 2013. That was no mean feat and we have since been working hard at building upon this foundation.

Our team has been energetic and creative in leveraging our resources to help our customers—individuals and businesses—communicate better, in more places and at less cost. We are excited by the momentum we're witnessing. Our credo at Globalstar is to make satellite services relevant to everyone, and it's gratifying when folks say that we're putting our money where our mouth is with this commitment. The process of bringing new and different satellite-based products to the market continues apace at Globalstar. Our ever-present goal is for these products to be economical for our customers to use every day.

In 2014, we saw the launch of SPOT Trace, an economical consumer market tracker that helps monitor any asset. Whether it is keeping tabs on a remote construction excavator, or ensuring your motorcycle is safe in a parking lot, Trace can keep users informed 24/7.

SPOT chalked up its 3,000th rescue in 2014. This is a milestone we're all proud of—there are people alive and walking the planet today, thanks to SPOT messengers, including our latest model, the SPOT Gen3. This is a huge accomplishment for a product which costs just a little more than one hundred dollars a year.

Also launched in 2014 was Sat-Fi, which enables anyone's smartphone, tablet or laptop to become a satellite phone. Seventy-five percent of the Earth's landmass does not have cellular or other terrestrial coverage. That's three quarters of every square mile of land. Now, with Sat-Fi, that huge area is within reach.

On the B2B side of the house, the debut of the STX3 chipset was also a landmark. This little module, with its communications capabilities and long life, is delivering huge commercial opportunities to device manufacturers who embed it into their solutions. By embedding the STX3 into a range of devices, value-added resellers stand to create new business opportunities. Fleet management, intermodal cargo, supply chain, aircraft, ocean-going vessels, and other transportation companies will benefit.



In 2015, we will be making major investments in our backbone infrastructure. We've received delivery of the first two new radio access networks from an order placed with Hughes Network Systems. The North American footprint will be the first to take advantage of this purchase. Our new ground technology assets will make a whole new range of products possible and I can promise they will be as avant-garde and interesting as those we've recently introduced to the market.

For instance, our next-generation ground infrastructure will enable better, smaller and cheaper satphones. We anticipate these appearing in the latter part of 2015. This infrastructure will extend Sat-Fi's reach to an even greater number of people.

We've done a good job of bringing our space operations and engineering teams in Silicon Valley closer together with product and software development. These groups are working in tighter collaboration, the results being improved internal efficiency, but moreover, accelerated rollout of new and better products.



When looking forward to 2015, one area of the business I want to highlight is the terrestrial use of Globalstar's spectrum for Terrestrial Low Power Service or TLPS. This is a private carrier grade broadband communications channel that supports the widespread use of 802.11-compliant devices. Instead of having to build special customer devices, anyone's Wi-Fi compliant device will work on our TLPS communications network. There are already billions

Globalstar Be Heard.

Sat-Fi™

THE WORLD'S MOST POWERFUL SATELLITE HOTSPOT

Sat-Fi turns any smartphone or other Wi-Fi device into a satellite phone





Globalstar's crystal clear, latency-free, voice quality priced GSP-1700 for the mass market.

We are also excited about our burgeoning international growth, particularly in Europe, the Middle East and Africa. Our new gateway in Botswana is a big step forward in bringing affordable satellite communications to countless businesses and people who never imagined such could be within reach. Soon we will have almost blanket coverage of some of the fastest growing economies. On the back of the Botswana gateway, we are already seeing an upsurge in activity across Africa.

In Latin America, we are embarking on a new commercial partnership with our gateway partners for the fast-developing Peruvian market. I anticipate this will fuel further momentum in neighboring countries.

We continue to dedicate ourselves to driving equipment and airtime prices down for consumers. As testament to our commitment, we launched the industry's lowest priced, pre-pay service at the start of 2014.

In the B2B space, in ever more competitive sectors, making such low cost communications tools available helps every customer's bottom line. As for the bigger picture of the satellite industry, 2015 will be a big year with High Throughput Satellites (HTS) delivering many new services.

If you want true mobility, if you're providing emergency relief in the African savannah, for instance, or repairing a damaged pipeline, you likely won't want to set up a dedicated VSAT installation. You want to reach into your pocket, pull up the antenna on a compact, low cost device and rapidly make a call, delivering a message that's clear and reliable. That's where we make a difference.

Jay Monroe is Chairman and CEO of Globalstar LLC, one of the world's leading Mobile Satellite Services providers. He has held the Chairman position since the purchase of the assets of Globalstar by Thermo Capital Partners in April 2004, and was appointed CEO in January 2005. Mr. Monroe directs the daily operations and manages the company's long-term strategic growth. Since becoming CEO, Mr. Monroe has launched several major initiatives to extend the quality and reach of Globalstar's service and expand its portfolio of voice and data solutions.

Mr. Monroe has been the majority owner of the Thermo Companies since the group's founding in 1984. Under his direction the Thermo Companies founded or acquired companies in diverse industries including power generation, natural resource development, industrial equipment distribution, real estate, telecommunications and leasing services. Mr. Monroe is on the Board of Directors of Thermo Capital Partners and several of its portfolio companies. Mr. Monroe is a graduate of Tulane University in New Orleans.

of Wi-Fi based wireless devices on the planet and we are adding a billion more each year, so there is an obvious need for more bandwidth. This has the potential to be a huge revenue driver for Globalstar.

Furthermore, we will integrate TLPS with Sat-Fi—people will be able to buy a device which acts like a Wi-Fi router over TLPS but in case of an emergency can operate over the satellite network. This will be a radical change in the way people think about satellite-terrestrial integration.

One of the big buzzwords recently has been BYOD—bring your own device. When you look at how we have brought innovations to the marketplace, especially with Sat-Fi, maximizing convenience for consumers, enabling remote consumers and workers to access satellites from their smartphone, and doing so at the lowest prices. While lots of people are talking about delivering consumer choice and freedom, we're actually doing it.



The latest generation of SPOT: SPOT products have helped in over 3,000 rescues worldwide

GS Group

By Andrew Bezrukov, Director for Strategic Marketing, Sergey Dolgopolskiy, GR, PR + IR Director, Foreign Projects + Ekaterina Tyukel, International PR Mgr.



For the GS Group investment and industry holding company, the year of 2014 was marked with several breakthroughs in the field of communications, one of the company's key global business areas.

The One TV broadcasting project from GS Group for the Kingdom of Cambodia recently celebrated its two-year anniversary on September 15, 2014. During 2014, One TV reached 80 percent of the country and became the first digital terrestrial TV operator in Cambodia to provide nationwide coverage. This occurred several years ahead of the planned transition from analog to digital broadcasting by the government.

In 2014, broadcasting services were delivered to the province of Candal and six, new, in-house TV channels for production appeared within the top 10 of the most popular channels among One TV subscribers. The total number of carried channels increased from 60 to 80. In May 2014, GS Group and Beximco Group, a leading Bangladeshi industrial conglomerate, announced a joint venture to launch Bangladesh's first DTH company for TV viewers in the country. The newly formed joint venture, Beximco Communications Limited, comes with integrated technological support from the GS Group.

In the spring of 2014, GS Group was the first company in Russia to offer a breakthrough solution for viewers who actively use two TV sets. The holding company released a new product under the General Satellite brand that was commissioned by the second largest DTH operator in the world, Tricolor TV. A set of two digital HD set-top boxes (STBs), GS E501 and GS C591, allows viewers to have access to differing content on two TVs simultaneously, using a single smart card.

The set is powered by the SiP (System-in-Package) solution, developed by GS Nanotech plant, a subsidiary of GS Group. The plant's core expertise is providing microelectronics solutions for satellite, cable and hybrid STB's. During 2014, GS Nanotech successfully implemented the SiP solutions in a range of receivers. SiP Amber S2 was the first microcircuit fully developed at GS Nanotech under SiP technology. Also this year, GS Nanotech produced more than 850,000 chips of this type; production growth of up to two million chips is expected by the close of 2015.



The entire hardware and software of the STB's are developed and produced by GS Group in Russia, based on the holding's own technology and manufacturing facilities which are located in Technopolis GS innovation cluster, also a part of GS Group.



Annual output of Digital Television Systems, the biggest digital STB's manufacturer in Eastern Europe, reaches more than 2.5 million STB's, which contribute 2 percent of digital STBs annual manufacturing across the globe.

A new line of STBs—the GS B210, GS E501 and the GS C591—were developed thanks to the synergy of the best international practices in the fields of industrial design and upgraded manufacturing facilities. London-based design consulting company, BID Studios, re-designed the unit for a more appealing presentation.

In September 2014, GS Group released a multiple-unit STB called the GS E212. This is the first unit design of receivers under the General Satellite brand that is able to receive both satellite and terrestrial signals. This innovative solution is specifically developed for Tricolor TV and is now setting a new standard for digital TV equipment in the local market. GS E212 is designed to simplify a users' transition from familiar analog broadcasting to digital television.

In November, GS Group launched the GS700 tablet under the GS brand, commissioned by Tricolor TV. The tablet was developed with three key fundamentals: smart remote control, multiscreen and interactive entertaining services. A brand new model of tablet features pre-installed applications such as Tricolor EPG, Tricolor Streaming and Kino and empowers subscribers to view TV at any time, anywhere. All of the apps on the table have the option to be uninstalled. The 1024x600 tablet with 7-inch IPS Screen is powered by the Android KitKat OS 4.4.2 operating system and boasts cameras 2M + 0.3M, a 2800 mAh battery, GPS, Bluetooth, HDMI output, B/G/N Wi-Fi Internet speeds, 1GB RAM, 4GB flash, Google Services, plus a microSD slot.

In 2014, GS Group became the first Russian manufacturer to offer an electronic warranty and leading-edge maintenance service for its customers. After registering the STB via the Internet, if a failure is detected or arises with the unit, the customer needs only to contact an authorized General Satellite service center. The new STB GS E212 also features the General Satellite unique electronic warranty.

One TV's management intends to expand territorial coverage and amplify the signal in Cambodia's capital of more than two million residents, Phnom Penh, and provide high quality TV viewing through the Internet. In the short-term, One TV is planning to offer value-added services, as well as extending content to provide subscribers with even more interesting channels.

The commercial launch of the DTH platform in Bangladesh—expected to cover the entire country—is scheduled for the first half of 2015 and aims to attract thousands of subscribers by the end of that year.

GS Group intends to implement a satellite broadcasting project in the Republic of the Union of Myanmar, a highly promising region for payTV platforms, due to the presence of a significant number of households with a TV and the current low availability of payTV in the country. The digitization of television in Indonesia, Bangladesh, Pakistan, Myanmar and other countries is also in GS Groups upcoming plans for the CIS countries, the Middle East and in Latin America.

In 2015, GS Group will continue evolving international broadcasting projects and will develop technological solutions for telecommunications projects, including launching new services and releasing state-of-the-art STB's. We would like to highlight a few global trends we believe are in store for the SATCOM industry...

- *Operators' revenue growth deceleration in developed countries (Europe, USA), resulting in stronger attention to the new markets*
- *Powerful process of market players consolidation in the U.S. and Europe*
- *Brisk growth in the emerging markets such as Asia, Latin America, and Africa, accompanied by the M&A integration processes*
- *Developing countries will see the growth of TV and online video viewing time*
- *Local market players will strengthen their positions*
- *4K technology will continue to evolve, but mass 4K solution deployment is still not expected until after 2015. Research from Parks Associates finds that more than 46 million households worldwide will subscribe to a 4K UHD payTV service by 2018*
- *HDTV expansion due to a decrease in technology costs*
- *Global markets will experience a lower interest in linear television. All markets are shifting towards a television that adjusts to a user who increasingly prefers watching time-shifted TV. This will result in development of all associated services, such as VAS and OTT. The number of catch-up TV fans will grow across the globe and we will observe new services emerging*
- *Undoubtedly, such giants as Netflix will pursue their incredible growth; however, local players will also emerge, such as A-MEDIATEKA in Russia*
- *The trend of video stream data compression is gaining at a rapid pace—the H.264/MPEG-4 AVC shift towards H.265/HEVC is inevitable for 4K/Ultra HD development*
- *Major market players will proceed with UHD TV test broadcasting of popular shows*
- *Content will remain the key driver of sales—top service providers will actively invest in local content production*
- *The rate of the Internet penetration is expected to grow in South Asian markets in 2015—this will affect the positions of the payTV operators having businesses in these countries.*

GS Group is an international investment and industry holding company, operating on the basis of its very own high technologies in telecommunications and its innovations. The international office of the holdings is located in Zug, Switzerland. Key activities include: implementation of international broadcasting projects, Nano-materials, microelectronics R&D and mass-production; deep wood processing; investment in venture projects; media content production and management; software products design and integration; full-service advertisement; and logistics and trade.

GS Group is a strong promoter, investor, integrator and leader in international broadcasting projects sphere worldwide.

Thoughts + Analysis For 2015

By Jos Heyman, Senior Contributor and Publisher, *Tiros Space Information*



The prediction is we will witness 238 spacecraft launched via 83 launches. As to their purpose, the following table provides a breakdown of this activity.

Objective	Launched	To be launched	Total
Scientific and technology	64	5	69
Crewed (incl. support)	12	3	15
Interplanetary	1	1	2
Earth observation	71	2	73
Communications	38	19	57
Navigational	14	2	16
Misc. military	5	1	6
Total	205	33	238

Table 1: Satellites launched in 2014 (as at Nov 1, 2014)

Year	Launches	Satellites
2004	53	73
2005	52	73
2006	63	94
2007	65	115
2008	67	105
2009	75	124
2010	70	122
2011	80	130
2012	75	134
2013	78	208

Table 2: Annual launches and satellites 2004-2013

Three launch vehicles, including an Iranian satellite, failed to place their payloads in orbit.

The significant increase is due to the 85 CubeSats that were launched or deployed from ISS during the year. One launch placed a massive total of 29 CubeSats into orbit. The above table does not include the 19 CubeSats that have been flown to ISS but, as of this writing, have not yet been deployed.

CubeSats

The full utilization of CubeSats is, at this point in time, somewhat limited — most of them are launched piggy-back or are part of a large batch (such as the Dnepr 1 launches) and their orbit is more or less determined by the orbit of the principal payload on the launch, irrespective of what that might be.

While this somewhat random orbit is acceptable for most technology related CubeSats, it stifles the use of these satellites for tasks which require a specific orbit. Dedicated CubeSat launchers, with a capability of, say, four to six CubeSats, would enable them to be placed in more specific orbits. However, such dedicated launchers would undoubtedly increase the launch cost of an individual CubeSat to an unacceptable level for some developers.

Placing CubeSats in these random orbits also makes them potential space debris, as they will stay in these orbits for as much as 25 years, well in excess of their operational use. Since 2005, reports indicate that CubeSats have been involved in more than 360,000 close approaches of less than 5km with other orbiting objects. Clearly, efforts will have to be made to limit their lifetimes and, indeed, some CubeSat developers are already addressing this challenge.

CubeSats and the relatively low cost associated with the, have allowed four countries to join the 'space race. The word 'race' relates to the Oxford Dictionary's definition as 'A group of people sharing the same culture, history, language, etc.'

Space Race

The word 'race' has also an additional definition in the dictionary, that being 'A situation in which individuals or groups compete to be first to achieve a particular objective'— that definition, in combination with the word 'space'—may become in vogue once again. Readers may remember that the term 'space race' was used during the 1960s to refer to the competition between the then-USSR and the USA to place a man on the Moon. The USSR lost this race, although by what is considered a small margin. This author believes we are now seeing the start of another 'space race' between Russia and the USA and that the target is now the 'first man on Mars.'

This start of this new 'race' was the Russian announcement that they intend to develop a new super-heavy carrier rocket that will be able to lift payloads of up to 120 tons using a two stage configuration. The rocket will become one of the standard launch vehicles for the next 20 to 30 years and would probably also be used for crewed flights to the Moon and Mars. Russia has set 2030 as the target for their colonization of the Moon with the aim, among others, to establish a spaceport for further exploration of the solar system—that's only 15 years away.

In comparison, the USA is developing the Space Launch System (SLS) rocket with a maximum payload of 155 tons. This launch vehicle is scheduled to fly in 2017, with a lunar mission set for the early 2020s and a mission to Mars projected for 2033. True, the details as described in this article fail immediate comparison. However, I would suggest that the Russian 2030 target will be preceded by lunar missions of an exploratory nature.

Add to this that, in spite of a stalling economy, Russia is determined to complete the Vostochny cosmodrome in the Amur region of Russia and that they intend to develop a new spacecraft that will be able to remove space debris from the geostationary orbit belt. This is a project other nations have discussed but at the same time steer away from—it seems clear that Russia is striving toward becoming the pre-eminent, global, spacefaring power.

Based on this author's perception on the level of determination and cunningness, or lack thereof as may be the case, displayed by the respective political leaders and their supporting legislative institutions, it is not difficult to figure out who is going to win this 21st century space race. Hopefully,

other leading space nations will get their act together to prevent them from becoming sub-class players in the global space effort.

Of course, it would be a lot better if the cooperation that the space nations have displayed on the ISS effort would be extended to the entire space effort so that we can do away with this paralyzing idea of one-upsmanship that seems to be developing.

Competition

Without doubt, 2014 was the year of the Falcon 9 launch vehicle. With eight launches of that launch vehicle in 2014, this vehicle has become a real threat to United Launch Alliance (ULA), a cooperation of Boeing and Lockheed Martin that has dominated the U.S. launch market for some time. In particular, Space X, the manufacturer of the Falcon 9, has taken aim at ULA's renewed December 2013 contract with the US Air Force to supply Atlas 5 and Delta 4 launch vehicles for another five years,

Space X has claimed that, although the Falcon 9 was not licensed at the time the ULA contract was issued, the continuing exclusion of the Falcon 9 does not hold water. SpaceX suggests that the license issue is separate from the contracting issue. Of course, SpaceX is claiming that the company can save the U.S. government even more money by re-opening the EELV contract and allowing SpaceX take part.

As part of this 'EELV war,' SpaceX has done everything possible to reverse the EELV contract situation. For instance, SpaceX stipulated that the ULA's use of Russian RD-180 engines for the first stage of the Atlas 5 should be blocked, due to sanctions imposed on Russia in the recent stand-off between the USA and Russia. The U.S. Court of Federal Appeals did place a temporary injunction on the supply of these engines, while ULA accused SpaceX of 'dirty tricks' and stated that there were enough RD-180 engines to meet launch needs for the next two years. The result of all these activities is that SpaceX could be cleared for military launches by the end of this year.

Somewhat similar competition arguments arose with the announcement that, in the next stage of its Commercial Crew Transportation Capability (CCtCap) program, NASA had selected the Boeing CST-100 and the SpaceX Dragon V2 crewed spacecraft for further development. These spacecraft will be used for flights to and from the International Space Station, ending the reliance on Russian spacecraft from 2017.

Sierra Nevada Corp.'s proposed the winged Dream Chaser would not be further funded—the company reacted to the decision by filing a protest with the Government Accountability Office citing "serious questions and inconsistencies in the source selection process." In particular, the company argued that their bid was \$900 million less than Boeing's proposal while, at the same time, scoring "near equivalent" on technical and past performance merits in NASA's source selection process. The immediate result of this protest was that NASA ordered Boeing and SpaceX to stop work on the CCtCap developments, although this work has re-commenced since then.

Unusual trends

With the recent launches of Ofeq-10, EgyptSat-2 and the two Kazakhstan KazEOSat satellites, the increase in Earth observation (EO) satellites is worth noting, in particular among nations that are not 'leaders' in the space world. Other EO satellites planned for launch include the Argentinian SOACOM system of two satellites, while the United Arab Emirates and Peru are also venturing into EO missions.

The objectives of these satellites read something like 'monitoring the Earth resources and/or climate', along with 'emergency and disaster management,' all good civilian objectives that produce a warm, fuzzy feeling. However, let's not forget that the same technology that is being used for EO can be switched to military application within a second and, while KazEOSat actually lists 'homeland surveillance' as an objective, it makes you wonder to what extent the other governments intend to play 'Big Brother' with these satellites, let alone use them for pure military applications.

In this context of 'crossovers,' it is perhaps worthwhile to note that our trusty GPS system uses a U.S. military satellite system as its prime source of information. Can you imagine the mayhem that could occur if the U.S. military decide to turn off the civilian use of the GPS satellites?

Another unusual trend seems to be taking place in the communications satellite market, where countries are attempting to use their geostationary orbit spot. Countries such as Bulgaria have proposed to place the BulgariaSat into orbit to service payTV in the region. This seems to be in direct competition with the established television broadcasting networks and one must wonder if ventures such as BulgariaSat are commercially viable, or if it is just a matter of occupying that geostationary spot and then sell that slot's use to another company, along with the satellite.

In fact Kypros, the Cypriot company that has access to some 18 orbital slots through its government, has decided that, rather than just selling the orbital slots, they will sell all of those along with a satellite and a launch vehicle. To manage this, Kypros has entered into an arrangement with Surrey Satellite Technology Ltd. (SSTL), who will provide its Geostationary Minisatellite Platform (GMP) for these package deals. Earlier, Kypros sold eight slots of a total of 26 that had been allocated to Cyprus to Australia's NewSat.

The political stand-offs that occurred during 2014 have created some difficulties in regard to the International Space Station. Fortunately, these adverse political maneuvers did not affect the operations of the ISS, where friendly cooperation between space nations continues as a matter of course. All hope that 2015 will see an extension of such cooperation into other space missions, as well.

Jos Heyman is the Managing Director of Tiros Space Information, a Western Australian consultancy specializing in the dissemination of information on the scientific exploration and commercial application of space for use by educational as well as commercial organizations. An accountant by profession, Jos is the editor of the TSI News Bulletin.

Hughes

By Pradman Kaul, President

I am pleased to report that Hughes had a strong 2014, with growing revenues and healthy margins in our businesses and markets all over the world. A landmark event that we're very proud of is crossing the one million mark of active users for our HughesNet® high-speed satellite Internet service in North America.

In the enterprise arena, our portfolio of HughesON™ Managed Network Solutions has been well received by the market, as evidenced by major wins and expansions, such as Delhaize (Food Lion), Springleaf Financial, and GTECH, the U.S.'s largest lottery provider, which extended its service agreement with us through September 2022, including space segment, hub operations, and maintenance for over 100,000 sites. We also expanded the scope of numerous contracts within our franchise-oriented markets, one of the largest being with Yum! brands (KFC, Taco Bell, Pizza Hut). On the technology front, we introduced the award winning HR4400 Branch Gateway, a single cost-effective device that combines strong security, routing, and Hughes' unique Active Technologies for multi-branch organizations.

On the international front, our service companies in Brazil, India, and Europe had a great year.

Our Brazilian subsidiary signed a contract extension with Telemar for the provision of broadband services for approximately 3,200 sites, while our Indian subsidiary continued to expand its rural bank and ATM network, where we now have over 10,000 sites in service. This is a major project that connects rural locations to the national banking network, whereas in

the past, residents had to travel to the nearest city with a branch bank to conduct banking transactions. In addition, Hughes India has more than 100,000 VSAT sites in operation.



Hughes Europe was selected by Smiggle for a comprehensive HughesON Managed Network Solution that includes wireless backup to support the Australian retailer's U.K. Launch. In the Middle East, we won a \$69 million contract for a global foreign ministry satellite network spanning six continents and 100 countries. In Colombia, we were selected by Hispasat and Anditel to provide high-speed Internet services to rural schools and communities under the Vive Digital program.

In the aeronautical world, Hughes partnered with Global Eagle Entertainment to provide a complete satellite broadband communications solution that underpins their inflight systems, including hub service and leased space segment. Beyond services in the U.S., Europe, and Russia, this year the business was expanded into the Asia Pacific region with Thaicom Public Company Limited (Thaicom), a leading satellite communications provider, now supporting in-flight services to airlines in Thailand and Southeast Asia.

One of our strategic objectives over the past few years has been to offer our customers the same technology platform all over the world, whether the operation is over Ka-, Ku- or C-band satellites. This means that the ground system control and management infrastructure and customer terminals are based on the same core technology building blocks, offering significant





Hughes' Germantown Network Operations Center (NOC).

R&D advantages and efficiencies and the ability to converge legacy platforms and new applications. Witness our JUPITER™ high-throughput technology. Employing a novel System on a Chip (SoC) and numerous other advancements—including an enhanced air interface and wideband carriers that can transmit over 1Gbps—JUPITER's modular design is the ideal, future-proof platform for operators to gain technology and cost advantages on today's conventional satellites and be well positioned for migration to next-generation High Throughput Satellites (HTS).

In addition to powering our HughesNet service in North America, the JUPITER platform has now been selected by operators in Latin America, Russia, Canada, Mexico, Malaysia, and the Middle East. This year, we captured some exciting new projects. For example, in Russia, we signed contracts to supply the gateway infrastructure for the RSCC AM5 Ka-band satellite. This is a first-of-its-kind network, delivering affordable satellite broadband services for the eastern part of Russia, and puts us in good position for future planned expansions across the entire country.

In Turkey, we recently were awarded a contract by Turksat for a JUPITER ground system to operate over that country's new Ka-band satellite. We also won a contract in Mexico to deploy a JUPITER system in Ku-band to provide broadband connectivity for more than 5,000 schools and community centers.

Clearly, the industry is recognizing the value in our strategy—I'm delighted to report that we were awarded the 2014 Technology Innovation of the Year at VSAT 2014 for the JUPITER System.

Looking ahead, we are on track for the launch in the first half of 2016 of our next-generation HTS, JUPITER 2/EchoStar XIX. With more than 150Gbps throughput, this new Ka-band satellite will have 50 percent greater capacity than JUPITER 1/EchoStar XVII. Building on the success of EchoStar XVII, the new satellite is being designed with an advanced architecture possessing more than 120 spot beams, powering expansion of high-quality HughesNet Gen4 Internet services across the U.S. and major parts of Canada and Central America.

Xplornet Communications, Canada's largest rural broadband provider, has committed to a lifetime lease for all of the Canadian satellite broadband capacity on JUPITER 2/EchoStar XIX, including the gateways necessary to support the service.

All in all, 2014 validated why I am extremely bullish about the continued growth of all our business segments, as our continuing investments in new technology and services yield ever higher speeds, lower cost per bit and more applications and benefits for our customers.

Leadership in both technology and service delivery sets Hughes apart and is the key to our success—this is how I see the future.

By Mary Cotton, Chief Executive Officer

This year was an important and transitional year for the satellite communications industry. The growth of High Throughput Satellite (HTS) continued to dominate the headlines, especially with the growing number of HTS satellites being launched, and the pace set to quicken in 2015 and 2016.

While HTS signals a new era for the industry, preparing enterprise markets for the impact of this technology is a longer-term venture that comes with a unique set of challenges. HTS changes how we design networks, how we offer services and how we manage operations. In addition, HTS impacts the value chain. New service delivery models are emerging today, from managed services to new forms of infrastructure sharing. While this leads to more complex operations, HTS also represents new choices regarding how to go to market with greater ease, speed, and lower risk.

Adapting to HTS is a process of transformation that will take years of hard work and collaboration. Although there's widespread buzz about our industry's future, we must understand the breadth of opportunity before us right now.

This year we saw continued growth within key emerging satellite markets, as well as increased demand for high bandwidth networks in many of our traditional markets.

One of the highlights was the growth of cellular backhaul. We're seeing several positive developments occur at the same time. The price of mobile devices has been dropping, even to the point where there are affordable options available in developing nations. Small cell devices are emerging as a cost-effective alternative to macro cells, which will enable mobile operators to dramatically lower the cost of infrastructure expansion. And HTS promises to lower satellite capacity costs.

These are promising developments as an explosion of mobile growth is expected worldwide. Ericsson is projecting another 2.4 billion mobile subscribers by 2019. Many of these will come from emerging markets,

and satellite backhaul is the linchpin. According to Euroconsult, the number of sites leveraging satellite backhaul between 2007 and 2012 reached 16,000 and satellite bandwidth for cellular backhaul in developing economies could grow at a compound annual growth rate of 7 percent by 2023.

Amidst these trends, TDMA is overtaking SCPC as the satellite technology of choice and is proving to be the most cost-effective model to support widespread populations that vary considerably in bandwidth usage. According to COMSYS, TDMA now serves twice as many sites than SCPC, and the use of iDirect technology has grown twice as fast as the overall industry. This means our partners are well-positioned to capitalize on this market growth.

Another major growth area is mobility. Today, the airline industry is embracing VSAT en-masse to support in-flight connectivity. Passengers want the same levels of connectivity in the sky that they enjoy on the ground. Airlines are leveraging onboard connectivity for live television, video streaming and other premium content to improve the passenger experience and strengthen customer loyalty.

Airlines are also discovering the value of VSAT to improve operational productivity. With greater access to real-time data, airline crews can make better decisions regarding the safety and operations of the airplane. They can resolve mechanical issues faster to increase turnaround times and can raise the overall level of customer service.

Euroconsult projects that the number of connected commercial aircraft will rise from 3,000 to more than 13,000 over the next 10 years. NSR projects that satellite service revenues will reach \$3.4 billion in the same time period. A similar story is playing out on cruise ships, as passengers want to connect across multiple devices, and crew discover the value in onboard connectivity to run more productive operations. We have seen several major cruise lines



Advancing a Connected World



upgrade their fleets with higher performance VSAT systems, responding to these surging bandwidth demands.

Growth is accelerating in the shipping industry, as well. HTS enables vessel operators to support higher bandwidth applications. As a result, operators and service providers are targeting the maritime market with new solutions. In fact, NSR projects that of the nearly 50,000 VSAT-connected vessels in the waters by 2023, 33 percent will be on an HTS network.

One of our oldest and most critical markets is government and defense, and while 2014 was a challenging year for the U.S. market with budget set backs and troop withdrawals, we still saw overall demand increasing, especially on a global basis. Foreign militaries are adopting VSAT to increase real-time intelligence gathering, provide situational awareness to warfighters in the field, and strengthen overall mission coordination. They are investing in VSAT to expand recreation and welfare services for troops deployed far from home. According to NSR, military VSAT services worldwide will reach \$10 billion by 2021.

As we look a bit further out, perhaps the biggest VSAT opportunity is tied to the emergence of the converged, end-to-end telecom network. Looking ahead to the year 2020, demands on the network look to be enormous, with Cisco projecting that there will be nearly 4 billion people and 50 billion machines connected to the Internet. Connectivity is rapidly transitioning from a network that is fixed to one that is highly mobile. Cisco projects that overall mobile data traffic will increase 11-fold at a rate of 61 percent over the next six years!

We're rapidly moving toward a day when telecom operators must deliver seamless IP connectivity to every person, place and organization on the planet. That simply can't happen without VSAT being integrated into the end-to-end network as a core access technology.

At iDirect, we believe that this presents a crucial growth opportunity for our industry. The market for satellite IP connectivity will expand across the telecommunications landscape and create new growth opportunities for satellite operators and service providers.

HTS is a crucial part of this equation as it creates an opportunity to improve satellite economics and ease of use. However, this will simply be conjecture if we don't first understand the extent of the transition we need to go through and work as hard as ever on solving the kinds of technical and business challenges we've always embraced.

At iDirect, we are committed to developing the capabilities required to tackle the most significant HTS challenges by working with satellite operators and service providers. We are looking at the diverse technical architectures, as well as working to understand and support the various new business models that are arising. We're focused on higher speeds, lower costs and specialized capabilities for the most promising vertical markets.

As everyone in the satellite industry works through the incredibly important and long-term transition related to HTS and the bigger opportunity ahead, 2014 highlighted an important lesson for today. As an industry, we need to increase our individual commitment to innovation, while collaborating in new ways to build a brighter future. That will take creativity, ingenuity and most importantly, it will take time. Our promise is to support our partners through this transition, while keeping them in the best position to deliver the high value services that the market demands today.

Mary Cotton joined iDirect in September 2007, bringing more than 18 years of technology leadership creating and driving successful growth strategies in CEO, COO and CFO roles.

Prior to iDirect, Ms. Cotton served as Senior Vice President with SAP Industry Solutions, the world's largest business application software company. She joined SAP in 2005 after managing the acquisition and sale of Frictionless Commerce, a provider of supplier relationship management software, where she served as Chief Executive Officer. Prior to SAP, Ms. Cotton held several top management positions including Chief Operating Office and Chief Financial Officer at Aspen Technology Inc., a provider of software and services that help companies improve their manufacturing processes. There she executed an aggressive growth strategy that took AspenTech from a \$6M private company to a \$330M publicly traded international solutions provider. Ms. Cotton holds a Bachelor of Science degree from Boston College.

Advancing a Connected World



Integrasys

By Juan C. Sanchez, Founder and Chief Executive Officer



For Integrasys, 2014 has been an impressive year. New products have been released and new industry application customizations were achieved.

In North America, Satmotion Pocket has had a major impact on Internet service via satellite following an agreement we signed with one of the largest TDMA network manufacturer. Integrasys has also opened a new office near Washington DC to serve U.S. customers, where demand for our services is growing rapidly.

During this year Integrasys, as a technology leader on carrier monitoring and VSAT commissioning system, pushed the application of state-of-the-art innovation, allowing Integrasys customers to benefit from the most advance technologies. One example is Satmotion Pocket, which was developed for Google Glass and allows broadband consumers to install and commission a VSAT autonomously at a remote site—all hands free—all that is needed are the Google Glass and Satmotion Pocket.

In 2014, Integrasys worked with one purpose in mind—to solve interference issue on the satellite industry. The company has worked closely with Global VSAT Forum (GVF) and IRG Interference Reduction Group (IRG). Our Satmotion Pocket allows service providers to deploy their networks

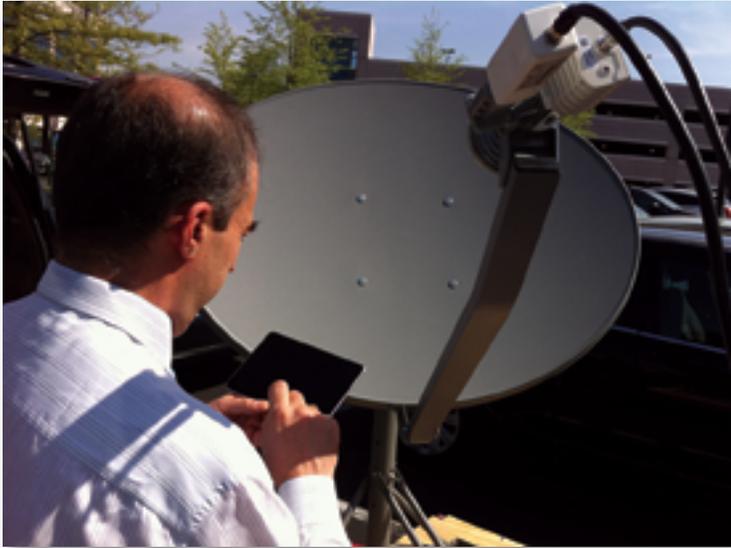
in a short time frame and to remain interference free, while minimizing OPEX. This system allows autonomous deployment without the need to call the Network Operation Center (NOC) or Hub.

The second initiative is focused on SATCOM operations and the broadcast industry. Integrasys have upgraded the Carrier Monitoring product line to support and detect Carrier ID as a standard inclusion, with maximum accuracy and minimum time required for implementation. Also for the TV distribution industry, we have launched Satmotion SNG to enable broadcasters to access satellites far faster, while also minimizing CAPEX and OPEX.

Integrasys has also developed a cost effective solution for High Throughput Satellite (HTS) monitoring. Euroconsult has forecast that over the next decade, HTS will generate a 35\$ billion dollars in aggregate revenue from usage of HTS capacity. HTS reduces the complexities involved in monitoring beams from one NOC. To address HTS market growth, Integrasys has upgraded our Carrier Monitoring product line to support HTS as well as uplink beam and downlink beam monitoring.



Google Glass displaying data from Satmotion during VSAT adjustments.

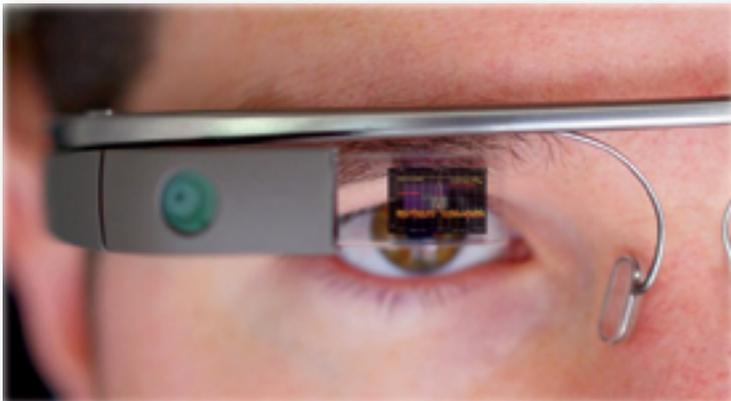


A Satmotion demo underway.

This support is for any topology and business model—our ControlSat and Vectorsat are capable of monitoring any remote beam from the NOC and only require a minimum CAPEX investment. In this manner, Integrasys has become the correct partner to ensure satellite communication quality of service for HTS payloads.

As Integrasys's market is now global, we have had numerous, challenging projects which turned out to be big successes. Integrasys signed an agreement with iDirect (the world's largest TDMA network manufacturer) to commercialize the Satmotion Pocket with the iDirect platform. This agreement has driven increasing demand and our first sales in the U.S., the Middle East and Asia.

Integrasys also is very active in the Latin American (LATAM) markets, experiencing a growing demand for Carrier Monitoring systems, especially in Brazil, as that country is the most rapidly growing, emerging economy in this region. In Brazil and Latin America in general, satellite communications are severely affected by tropical rain. Minimizing these weather-related challenges requires that SATCOM services be monitored, especially when



Satmotion display on Google Glass.

critical, real time applications are in use, such as in the oil and gas industry. These networks require an automated, real time monitoring service to maximize network availability and to detect any service degradation before any system loses service.

Regarding government applications, Satmotion Pocket was successfully trained for use by GVF at SATCOM Endeavor to 21 military personnel from U.S. and Asian forces for deploying rapid, accurate and reliable communications for disaster preparedness. Satmotion Pocket is extremely easy to use and the technology can either replace, or co-exists, with traditional man-pack products.

Additionally in 2014, we launched a completely new product—GeoBeam. This is low cost software that allows our customers to minimize the time invested on link budget calculations and network design, enabling the satellite operator and service provider to select the correct technology, capacity, coverage for the specified requirements.

GeoBeam allows the user to make wise purchases, investing only in the correct capacity and systems to maximize bandwidth and service availability in the required service area. This year, we have added the interference calculation functionality, inter-satellite (with adjacent satellites) and intra-satellite. Furthermore, GeoBeam is able to design, load and export service contours and coverage areas using the ITU standard GXT files when requesting satellite orbital position and satellite frequency license data.

As a result of these innovations, Integrasys has become one of the most inventive companies in the satellite industry in 2014. At SATCON 2014, we were awarded a Vision Award for the Most Innovative Technology Award for 2014 and were also shortlisted in several awards, such as the Global VSAT Industry Awards, in London.

2015 is Integrasys' 25th anniversary and we are forecasting significant growth, with new partners and customers. Integrasys is targeting the key markets of the Americas and Asia Pacific (APAC). The company will continue launching new products and updating the current releases to state-of-the-art technologies. In Q1 of 2015, we will be releasing the new interface for ControlSat and VectorSat, a key project as of this writing.

We believe 2015 holds a great deal of promise for Integrasys as well as for the SATCOM industry.

Juan C. Sanchez is the Integrasys CEO and founder since 1990, leading the company for providing the fastest and more accurate Carrier Monitoring Systems on the market. Today Juan C. Sanchez is responsible of the offices worldwide. Before founding Integrasys, Juan C. Sanchez was Telecom Test and Measurement Department Manager at Hewlett Packard where he was specialized on Satellite RF measurement.

By Steve Spengler, President and Chief Commercial Officer

2014 saw tremendous change and a plethora of innovation occurring across the satellite sector. The same was true at Intelsat, where we made tremendous strides against our operational strategy, prepared our business for the first Intelsat Epic^{NG} launch scheduled for the end of 2015 and executed initiatives that will shape our business for many years to come.

With Intelsat 29e currently on track for its launch at the end of 2015, we continued development efforts around our Intelsat Epic^{NG} high throughput satellite (HTS) platform, including designing and implementing teleport infrastructure to support the traffic this new generation of satellites will drive in the broadband infrastructure, mobility and government sectors.

Customer interest in Intelsat Epic^{NG} across our customer base gained momentum throughout the year. For example, in the broadband sector, we expanded our relationship with South African telecommunications leader, Vodacom. Together, we are building a satellite broadband solution focused on the small office/home office (SOHO) and small and medium enterprise market (SME) in Africa. By using existing Ku-band satellite capacity and IntelsatOne® managed services to enhance its Satellite Connect product line, Vodacom is demonstrating that Intelsat-enabled services can serve the professional broadband market today.

The service is operating on the Intelsat 28 satellite, and once Intelsat 33e is operational, Vodacom will seamlessly access Intelsat Epic^{NG} capacity due to its backward-compatibility and open architecture design. By adding a high-performance overlay to its network, Vodacom will have easy access to additional throughput for its busiest regions. This will result in the

delivery of more reliable, secure and cost efficient broadband connectivity to the SOHO/SME market in South Africa.

In the maritime sector, Intelsat signed an agreement with Airbus Defense and Space, the world's second largest space company, for a fully managed service. This agreement includes secure access to Intelsat's global hybrid satellite network, which is comprised of Ku-band satellite capacity and terrestrially managed network, IntelsatOne. In addition, Airbus will be able to bridge its maritime VSAT services to Intelsat's Epic^{NG} platform.

The open architecture design will provide Airbus Defense and Space the flexibility to incorporate HTS capacity into differentiated offerings designed to customer needs. For Airbus Defense and Space end users, the benefits of Intelsat Epic^{NG} capacity will be realized without any need to change equipment, minimizing capex expenditures and lowering the total cost of ownership, delivering better performance and operating cost. Epic^{NG} will reduce the cost-per-bit delivered, enabling network operators to offer the robust, high speed wireless data services needed to support tomorrow's network, wherever their customers require communications.

The pace of change in the media sector brings numerous opportunities and challenges, with new formats and distribution methods changing viewership and business models. The shift from Standard Definition (SD) to High Definition (HD) is progressing rapidly across our service regions. Our Intelsat 30 satellite, which was launched and entered service





in Q4 of 2014, supports growth in HD programming for the DIRECTV PanAmericana network.

Other customers are gearing up to introduce 4K Ultra High Definition (UHDTV) to the marketplace. In more developed markets, full on convergence of the media and broadband infrastructure is driving media customers to change their technology and business models to adapt to the new age of multiscreen. Regardless of the trend or the region in 2014, Intelsat worked with its customers to maximize potential viewership and optimize distribution.

MultiChoice, Africa's leading payTV provider, committed to use Intelsat capacity to expand their digital terrestrial television (DTT) and Direct-To-Home (DTH) offerings for the continent. MultiChoice expanded its C-band capacity on Intelsat 904 to distribute content to its terrestrial towers, further extending the reach of its DTT GOtv product offering to countries in sub-Saharan Africa, where it is already present, as well as to target new countries. MultiChoice also signed a 15-year service agreement for Ku-band capacity on the Intelsat 36 satellite to expand its DTH services. The spacecraft, which is expected to launch in late 2016, will be co-located with Intelsat 20 at 68.5 degrees East, Intelsat's premier DTH neighborhood in Africa, where MultiChoice has been the anchor customer since 1995.

In Latin America, HBO Latin America Group (HBO LAG) signed an agreement for capacity on three Intelsat satellite video neighborhoods, Intelsat 21 located at 302°E, Intelsat 11 at 317°E, and following its launch scheduled for 2015, Intelsat 34 at 304.5°E. HBO LAG will use the capacity to increase its HD channel line-up for cable, direct to home and IPTV providers throughout Latin America. Intelsat will also provide a teleport restoration program using the company's teleport facilities in Ellenwood, Georgia, and Riverside, California, along with the IntelsatOne terrestrial network.

Intelsat continues to be a leader in defining satellite's role in the 4K UHDTV market. Our efforts date back to 2013, when we delivered the first live true 4K broadcast to the floor of IBC. In 2014, we built on this accomplishment. First, we demonstrated that a multiplex 4K feed and a down-converted HD feed could be transmitted over a 36MHz transponder using DVB-S2X technology. This provides programmers with a Commercial Off-The-Shelf (COTS) solution for offering 4K content in an efficient manner, while at the same time maintaining the quality of the content.

After establishing that satellite technology will be playing a major role in the developing 4K UHDTV sector, Intelsat conducted a media survey that laid out the timeframe for adoption by broadcasters, establishing 4K's path to commercial viability. The results of this survey of media executives from our global customer base, released in September, found that 4K UHDTV will be mainstream within 10 years, with 42 percent of Intelsat's respondents stating they have made a firm decision to launch a 4K UHDTV service and have a specific timeframe for its roll out (23 percent within the next four years).

The results of this survey provide a clear insight that ties the technological achievements behind 4K broadcasting to a business roadmap for capitalizing on these opportunities. This insight was missing from previous broadcast technology pushes.

Despite a difficult environment, our government business made important progress. Intelsat General was one of four companies awarded a contract by the United States Air Force (U.S.A.F.) to study the viability of using commercial facilities and operations expertise for the Tracking, Telemetry and Command (TT&C) of government satellites. The goal of the contract, known as the Air Force Satellite Control Network (AFSCN) Commercial Provisioning (CP) study, is to provide USAF Space Command with a detailed plan for leveraging commercial TT&C facilities and capabilities to substantially reduce operations and maintenance costs while enabling the government to meet national security space objectives and warfighter operational needs. The USAF has stated that a future space concept of operations could include a mix of government and commercial command and control networks.

Our efforts to support our customers current and future requirements, made possible by the strength of our diverse global network, means that we are constantly developing new solutions and thinking about alternatives that will support customer growth. Our solutions help our customers address the continual changes in the media sector, as new delivery methods, such as Over-The-Top (OTT), grow in popularity.

Lastly, to better support our customers, we completed a number of initiatives designed to enhance teleport operations, including the centralization of terrestrial network operations and integration of managed services operations teams into a single operations center, the Managed Services Operations Center (MSOC). This created a single "super" operations center with IP, broadband and media networking expertise, where customers can call in for any requirement related to their managed service, be it service activations, deactivations and troubleshooting, regardless of service of application.

In addition to the centralization of operations, improvements were made in automation as well as fiber bandwidth connecting teleports as part of a multi-year teleport upgrade program. Our goal is to allow our customers to leverage assets that may be spread across multiple teleports but provided as a single integrated solution, with a single call to the new MSOC to address all needs.

Our Chief Technology Officer, Thierry Guillemin, has said he believes the satellite industry is poised to innovate and change more in the next few years than it has in the past 50 years—I couldn't agree more. Intelsat Epic^{NG} comes at the perfect time, given the intense broadband connectivity and content distribution demands of our customers. This has created a greater need for more bandwidth delivered to more places in the most cost-efficient manner. Epic^{NG}'s higher throughput at a much lower cost per bit makes it an ideal platform to meet end-user needs, while at the same time, improves the business model in a way that unlocks new growth opportunities for our customers and new applications for the satellite sector.

With new, cost-effective solutions at hand, 2015 will be a good year for the satellite industry, and an especially "epic" one for Intelsat.

Satellite Interference Reduction Group (IRG)

By Martin Coleman, Executive Director

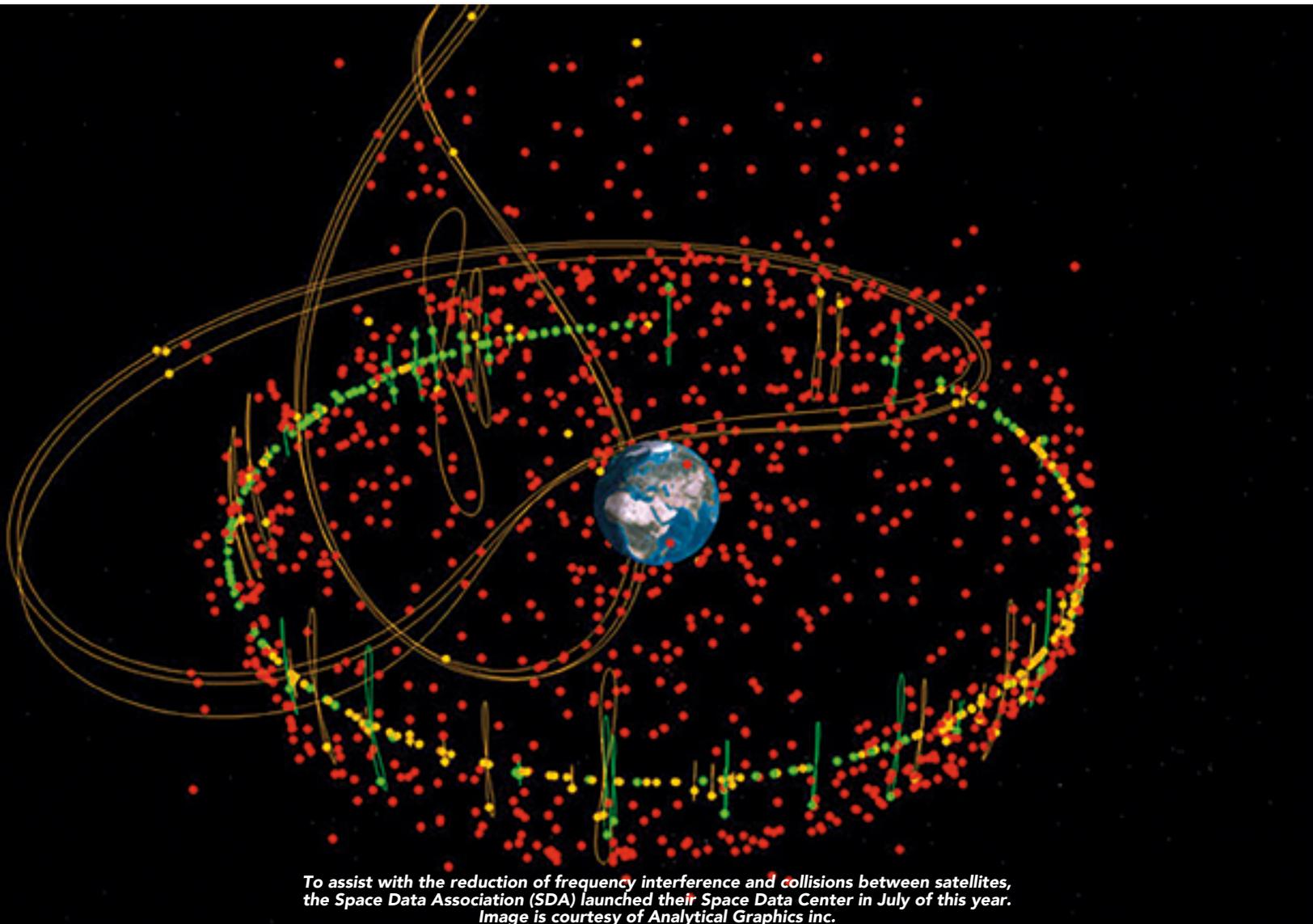
Over the past couple of years, our organization has focused much effort on the development, standardization, and now, the implementation, of Carrier ID. While there is more to be done to ensure widespread adoption of this technology, we need to build on success and look ahead and add to our toolbox to continue to help us solve satellite interference. As the cause of around 40 percent of all interference is VSAT networks, improving the world of VSAT seems a natural step to take, especially as this type of interference can be the most difficult to solve.

Demand for satellite capacity to serve VSATs has seen rapid growth in our industry over the past ten years. There are a number of unique challenges specific to VSAT systems. For example, they are often operated in remote, unmanageable locations and increasingly used in mobility applications. Equipment quality and accuracy of the installation is paramount, yet difficult to achieve, with system design lacking and simple procedures, such as

misalignment, easily leading to cross polarization or adjacent satellite interference. Additionally, remote terminals used in TDMA and DAMA configured networks, by nature, must be inexpensive and mass produced which, to date, has led to a growing interference problem!

Satellite operators are smart people—they have a number of tools in place to reduce VSAT interference. As Chris Grogan from SES said at our recent IRG Workshop, “It’s not like the Wild West out there—we do have a pretty good idea of who is transmitting where and on what equipment.”

Additionally, there are a number of tools in the bag from some suppliers of VSAT networks as well as satellite operators, such as automated cross-pol measurement systems.



To assist with the reduction of frequency interference and collisions between satellites, the Space Data Association (SDA) launched their Space Data Center in July of this year. Image is courtesy of Analytical Graphics Inc.

The installer and operator certification training programs in place through the Global VSAT Forum (GVF) makes it possible to ensure equipment is installed properly and certified operators are employed on VSAT networks.

When interference occurs, satellite operators possess sophisticated geolocation tools, and that toolbox is always improving. In example, just recently new, single satellite geolocation technology was launched by Siemens Convergence Creators. Indeed, geolocation is an area of IRG expertise and the group is looking to improve this further, in terms of standards and processes. Remember, the current, older generation, installed VSAT remotes are ticking time bombs. We are stuck with what is out there as we cannot retrofit those existing terminals. Simple rules could be implemented here; no subscription equals terminal that must be powered down.

IRG has already passed over to GVF the first definitive conclusion on the root cause of VSAT Interference and, guess what, the need for VSAT Training and System Type Approvals are up there at the top. IRG believes that VSAT Systems can be designed to prevent 99 percent of interference events!

Through GVF we have training systems in place as mentioned previously; however, we are short on obtaining type approvals for future networks. Inmarsat has probably taken the lead with its GX Terminal program in this respect and have shown that type approval must apply to the complete terminal, not just the antenna, to include the BUC, cables and modem. By the way, if we integrated the Modem and BUC in more cases, we would eliminate the RF interconnect cable and probably resolve most retransmission issues with a single stroke.

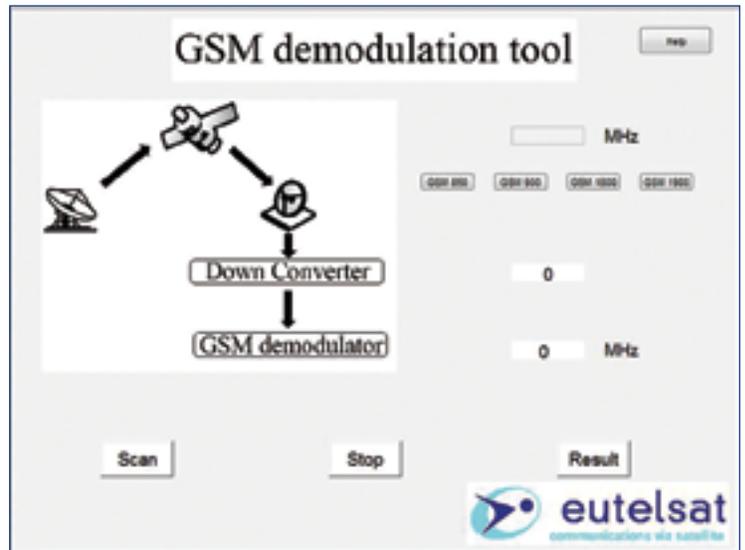
As well as those top two initiatives, what other features need to be added to any VSAT System? They should have Carrier Locking to make certain transmission is cut when not allowed. Terminal Power Verification, which allows a remote terminal that is not within nominal conditions to cease transmission and automatically trigger an alarm to the Hub.

A well designed system should always be able to stop any remote terminal transmitting faster than an operator is able to do. If not, debug tools should be in place to remotely shut down terminals using burst time planning with MAC addresses, round robin, terminal groups or individual log off to determine and stop interference. Again, all of these elements can be part of the type approval process.

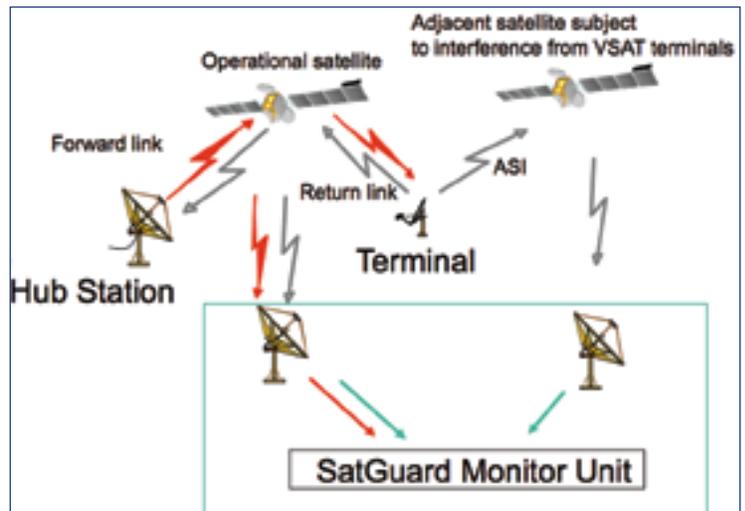
We have tools being developed by manufacturers to help with the installation of VSAT. Integrasys is one such company using an "App" on a mobile phone to help the installer. In addition, IRG has recently been presented with two unique tools being developed by industry. Taking each in turn...

A common issue caused by badly installed or maintained RF cable from modem to the BUC is that of GSM retransmission. In the past, operators have used modified Nokia handsets to detect this problem, but this is not an integrated solution.

Eutelsat has tidied this up by developing a GSM Demodulation Tool using a simple detector unit to locate GSM beacons, a PC and a mapping software. In most cases, this detects the mobile cell being received and thus pinpoints one or a few VSAT terminals in the area that they are likely to be the cause; a simple, elegant solution. Eutelsat is already starting to integrate this tool into their main operation suite of interference mitigation tools.



Verisat, a provider of test equipment and solutions for DVB-RCS, in partnership with SES, has developed a VSAT MF-TDMA interference analysis system called SatGuard. This unique development uses a modified Software Defined Radio (SDR) unit to capture the signals. The clever part is the ability of the system to receive the Terminal Burst Time Plan (TBTP) off air from a network and then tag interfering bursts being transmitted in real time. This resolves which terminal, whether via its MAC address or timing, is causing the problem. This information can then be sent to the VSAT network operator for corrective action—this takes the guesswork out of locating those remotes.



Through practical and intelligent engineering, the toolbox we have at our use is growing in number and capabilities.

Developing new tools and processes can ensure we truly minimize VSAT interference—and we can do this today. IRG and GVF are working hard to make this happen, to also promote and help to develop tools. This is not wishful thinking. This is reality and available now. We just need to step up and make all happen in a timely manner.

Keysight Technologies

By Mark Wallace, Americas Field Operation Vice President and General Manager

Keynsight Technologies works with customers who are involved in every form of communication technology: satellite, cellular, cable, fiber, landline, microwave backhaul, wireless connectivity. All have a need to enhance system performance, increase data throughput, lower the cost of service and reduce customer churn.

From our conversations with those in the satellite business, we believe ongoing market and business forces will continue to affect technical requirements. These are creating new challenges in the design, simulation and test of new-generation systems—traditional or NewSpace.

The engineering problem is easy to summarize: pack more bits into the available spectrum, achieve faster data throughput and do so in a power-efficient manner. Solving the problem is more complicated and is driving technological shifts such as wider bandwidths, spectrum reuse and complex modulation.

Wider bandwidths enable higher peak data rates for a single user and also increase overall system capacity by expanding the number of available channels. Multiple channels are multiplexed together, creating one wider-bandwidth signal that is sent as one transmission through a single transponder.

Spectrum reuse is enabled by narrow spot beams. The ability to create spot beams also allows more power to be focused onto high-demand urban areas. Through the use of phased-array antennas, these beams can be steered to focus on a specific region and then be reconfigured as needed. A single satellite can produce dozens to hundreds of spot beams and, as long as the respective beams don't overlap, the same frequency can be used for transmissions to and from physically isolated areas.

The third trend is toward the use of increasingly complex modulation formats. Higher-order modulation enables higher data rates through greater spectral efficiency and a better signal-to-noise ratio; however, this

requires tradeoffs between increased capacity, power efficiency and link performance.

Industry innovations such as High-Throughput Satellites (HTS) and digitally regenerative payloads are the embodiment of these shifts. These innovations use architectures that are quite different from conventional analog "bent-pipe" designs. Instead, these are mixed-signal systems that carry analog and digital representations of modulated signals. Digital modulation formats may be wideband, higher-order or custom, but all provide greater spectral efficiency.

The good news: increased spectral efficiency pushes more information through the available spectrum. The bad news: as modulation becomes more complex, the difficulty increases when attempting to identify and troubleshoot issues in signal quality.

With a regenerative payload, the process of understanding what's happening along the signal chain becomes easier with an approach that creates continuity across design, simulation and testing. As an added benefit, achieving a high level of continuity across an integrated design-to-test flow helps reduce the inherent risks in system integration. This flow enables the verification of system operation within the designed link budget all the way to In-Orbit Testing (IOT).

One way to achieve greater continuity is to use a common metric. In the macro view, the digital-signal bit error ratio (BER) is the end-to-end measurement that defines the end-user's experience. System operators demand predictable and consistent BER across all user terminals. This is challenging in part because it depends on what happens when switching from one ground station to another and this makes it difficult to guarantee acceptably low levels of BER in all situations.

Testing BER is especially challenging because it varies with signal level and a variety of component characteristics. This makes it difficult to determine which parameters to test and where to measure them.

As BER can be optimized, it is necessary to optimize the modulated waveform across a variety of signal representations, from digital to microwave. This must be done consistently, independent of the signal's physical form. Fortunately, a suitable metric is readily available for digitally modulated signals: error vector magnitude (EVM).

At its simplest, EVM is the difference between a reference vector and the vector of the actual received or measured signal. It provides an aggregate summary of many types of signal impairments, and this makes it an ideal way to detect issues in modulated signals.

EVM is also a convenient way to quickly observe signal degradation between points within the block diagram of a system that contains analog and digital representations of modulated signals. Through careful examination of EVM measurements at specific points in the system, this type of "comparative



signal analysis” makes it possible to identify modulation imperfections, trace them back to their origin and determine the fundamental mechanism that caused the problem.

The best way to measure EVM is with vector signal analysis (VSA), and the gold standard for EVM measurements is Keysight’s 89600 VSA software. To address the need to probe and measure digital and analog signals, the 89600 VSA is compatible with a variety of instruments: logic analyzers, digital oscilloscopes, signal analyzers and digitizers. This enables cross-domain probing—and high quality measurements—throughout the design.

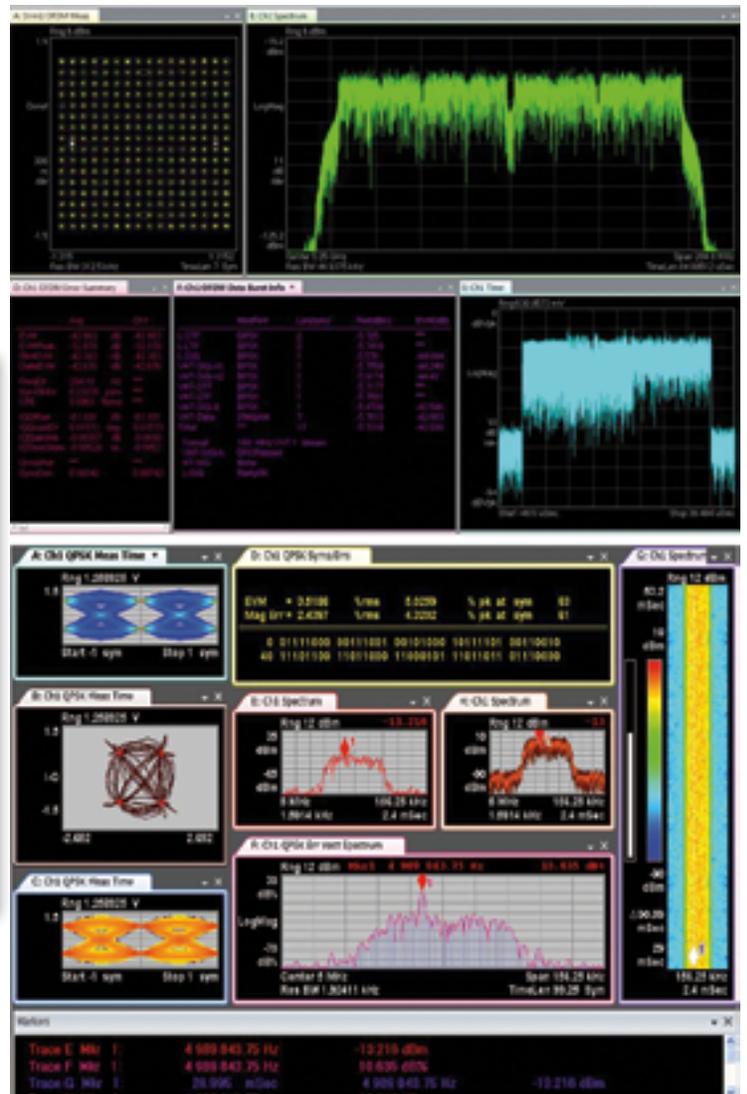


EVM measurements from the 89600 VSA also enable comparisons with models created using design and simulation tools such as Keysight Advanced Design System (ADS) and SystemVue electronic system-level (ESL) software. This helps ensure continuity in measurements performed throughout the block diagram and across the design process.

This type of approach can assist satellite developers in addressing a variety of test challenges: reducing the time and cost of thermal/vacuum testing, emulating real-world conditions for power-amplifier characterization, and troubleshooting digital modulation. They can gain confidence from fully specified test equipment in multiple form factors—instrument, modular, handheld—united by common software and applications. They can gain efficiency with simulation and measurement results that correlate across the product lifecycle.

The net effect is greater assurance that satellites and subsystems will work first time, every time for the duration of the mission.

Whether the focus is on traditional or NewSpace satellites, consistent results put developers in a strong position to drive the changes they seek—a must for 2015. The bedrock is measurement integrity that lets them focus on what’s needed and optimize how to get there: packing more bits into the available spectrum, achieving faster data throughput and doing so in a power-efficient manner.



Top screenshot: Verify the latest WLAN signals with 802.11ac demodulation and analysis.
Bottom screenshot: Verify modulation types ranging from AM/FM/PM to QPSK (shown), 1024Q AM and 18APSK.

Mark Wallace is currently the Americas Field Operation Vice President and General Manager and has held that position since November 2011. Mark joined Hewlett-Packard (HP) in 1985 after graduating from the Illinois Institute of Technology with a bachelor’s degree in electrical engineering in 1985. He joined the company as a field engineer selling test and measurement products into the wireless industry. In 1995, he was named global business development manager responsible for sales and business development in Asia and Europe for a major wireless NEM (network equipment manufacturing) account. Two years later, he was promoted to wireless sales manager for major NEM accounts in the U.S.

Following the Agilent split from HP in 1999, Mark joined Agilent’s Electronic Measurement group, Wireless Business Unit as channel manager responsible for global account management and business development into the wireless industry worldwide. In August 2004, he was named National Sales Manager within North America and through several assignments has managed all portions of the US and Canadian Test and Measurement Sales Organizations, until his promotion to Americas Field Operation Vice President in November 2011.

KVH Industries

By James Dodez, Senior Vice President, Marketing and Strategic Planning

KVH has always approached the maritime satellite communications market with an innovator's desire to find a better solution. With maritime satellite communications, the biggest challenge historically has been how to address a complicated need—providing reliable and affordable satellite Internet connectivity to vessels at sea anywhere in the world—with a simple solution.

Adding to this challenge is the fact that demand for broadband connectivity onboard vessels is skyrocketing. There are a number of reasons: Ships today need Internet connectivity to operate more efficiently in their voyage planning, compliance with regulations, and crew morale, to name a few. In 2014, we also saw the start of the next big trend in maritime SATCOM: the need to provide entertainment and operations content onboard vessels.

With both these demands—for connectivity and content—KVH met the challenge with a unique within the industry solution—the mini-VSAT BroadbandSM network combined with our TracPhone[®] V-IP satellite communications systems and the new IP-MobileCast[™] content delivery service. Our mini-VSAT Broadband network and TracPhone V-IP satellite communications systems provide broadband connectivity to more than 4,000 vessels worldwide. According to an industry report by Euroconsult earlier this year, that makes KVH the market share leader in maritime VSAT. In addition, our IP-MobileCast content delivery service, which we launched in May, is a maritime first: This service employs multicasting technology to deliver commercially licensed news, movies, TV programs, sports, music, chart updates, weather data, and training programs to ships at sea. No other company has such a complete solution, and KVH surpassed many challenges to create this one-provider convenience.

IP-MobileCast overcomes the prohibitively high satellite communications costs typically charged to deliver files for individual use. The new service is notable for numerous technological advancements: Content is delivered over the top of the network, so there is no charge for the delivery, only for the content itself; the multicasting transmission does not affect the vessel's mini-VSAT Broadband onboard data speed; the service ensures digital rights management (DRM) of copyrighted material, such as Hollywood

movies and television programs; and the content is delivered using forward error correction to minimize burden on the mini-VSAT Broadband network.



Thousands of hours of beta testing were completed to ensure the IP-MobileCast service can deliver large multimedia files and regularly updated content to a vessel's onboard server, which can then make the content available to nearly all types of platforms on the ship, whether it is a flat screen TV, a computer, or a Wi-Fi enabled personal device, such as a smartphone, tablet, or laptop.

Creating IP-MobileCast involved overcoming tremendous technology hurdles as well as making certain we had rights to the content that mariners most want to enjoy while onboard ship. For news and entertainment content, we rely on our own KVH Media Group, which produces NEWSlink[™] publications in 60 different editions for mariners worldwide, and also secures rights to new-release movies from Hollywood (MOVIElink[™]), TV programs (TVlink[™]), and sports events (SPORTSlink[™]; see the graphic below). One of our first SPORTSlink events delivered via the IP-MobileCast service was the 2014 FIFA World Cup[®] in June and July of 2014, enabling mariners at sea to enjoy this international event.

For IP-MobileCast, we are also forming partnerships with leading maritime companies to provide operations data to vessels via the IP-MobileCast service. For example, we announced arrangements with Transas for its electronic chart updates and AWT for its high-resolution weather data. We also acquired Videotel, the leader in maritime e-Learning and will make their training courses available via IP-MobileCast multicasting delivery.



The key to our satellite communications solution meeting the needs of mariners worldwide lies in the robustness of our mini-VSAT Broadband network, which covers 100 percent of the global maritime market through a combination of 19 Ku-band transponders and three C-band beams. KVH has built this global infrastructure by leasing available commercial satellite capacity, rather than investing in our own satellites, leading to lower costs and better prices for customers.

In 2014, we completed a six-month rollout of new Adaptive Coding, Spreading, and Modulation (ACSM) technology to enhance the mini-VSAT Broadband network. The ACSM upgrade followed a yearlong Variable Coding, Spreading, and Modulation (VCSM) technology upgrade. Together, the ACSM and VCSM upgrades enabled us to deliver more data at faster speeds. On an ongoing basis, we continually monitor and enhance the mini-VSAT Broadband network.

The most important challenge for the maritime satellite communications industry in the near future is to continue to improve on ways to provide affordable transmission of data and content to and from vessels. This challenge is compounded by the fact that shipping companies have spent years focusing on IT strategies to circumvent the use of satellite communications, due to the ridiculously high costs of the legacy satellite services.

The economies and efficiency of access to the Internet and cloud-based applications are too well documented on land to deny. Shipping companies will be compelled to adopt better satellite communications solutions to meet many needs: access to current data to meet new regulatory requirements; ways to improve crew living conditions; reducing greenhouse gas emissions and saving bunker through improved voyage planning; delivering charts electronically; and meeting new training requirements.

New satellite services using HTS technology will offer the next major enhancement to maritime satellite services. We're looking forward to enhancing our mini-VSAT network using this technology in areas where we have concentrations of customers in one region. KVH works with leading satellite providers such as Viasat, Intelsat, Eutelsat, SES, and Skyperfect JSAT, so we feel we're in a great position to leverage new technology and enhance the value of the airtime packages we offer our customers.

Going forward in the manner that has always guided us, we want to be in the solutions business. We are always interested in our customer's problems, and are having great discussions with our application service partners about the future services that will be enabled by enhanced, affordable connectivity. Short term you will see enhanced versions of our application partners' services and our own eLearning and distance learning courses, plus new ideas for providing the critical data our customers need in the most cost-effective ways possible.

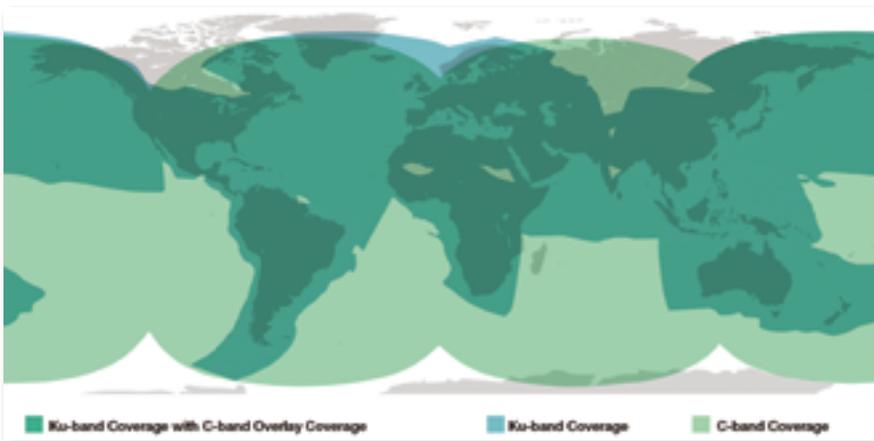
Real-time data about weather forecasts and sea conditions, for example, plays a key role in optimizing voyage planning for a vessel, and the only affordable way to get the quality and frequency of weather data that ships need is with our multicasting technology. With the new greenhouse gas emission regulations and more expensive fuels that are involved, route planning and vessel compliance with instructions relating to course and speed will become more of a vessel management priority. Captains' decisions to ignore voyage planning recommendations will be reduced, ultimately resulting in safer voyages, and greater profitability for all maritime operations.

New maritime regulations are going to create significant new requirements for training courses and automated systems that monitor individual seafarer's training and test their capabilities. A new generation of seafarers, raised with Internet access, game systems, and abundant multimedia, need to be trained with high quality, entertaining, multimedia content.

Training is required to operate equipment is becoming more complex. Our vision is a consistent, high quality, distance-learning service that enables seafarers onboard vessels to take courses and demonstrate their competency with centralized, shore-based instructors and collaborate with other students working on the same class work. Satellite connectivity is a key to this vision. With a strong position in terms of being able to access readily available commercial satellite capacity, we are committed to maintaining KVH's mini-VSAT Broadband network as one of the highest quality, most reliable maritime VSAT services on the planet. Adding new capacity is a fast, dynamic process and fielded terminals on vessels worldwide are automatically updated over the air to take advantage of the new satellite capacity so all customers benefit from future expansion.

You'll see us continue to monitor and improve the network, thereby providing more consistent data speeds for bridge and crew, and all at affordable airtime costs. With our acquisition of maritime e-Learning leader Videotel in July of this year, we made a significant step forward in our ability to provide seafarers with the type of training most needed today, and deliver it on a variety of platforms. You'll also see us continue to pursue ways to provide the most engaging content and essential data to ships at sea, using the most advanced satellite communications technologies available to improve maritime operations worldwide.

An expert in maritime industry trends, James Dodez joined KVH in 1986, and has held a variety of positions where he has helped to guide the company's strategy as a disruptive entity in the maritime satellite communications market.



Mishaal Aerospace

By Mishaal Ashemimry, Aerospace Engineer, President and Chief Executive Officer



This year has been a quite unique for Mishaal Aerospace, a U.S. based Smallsat Launch Vehicle Provider. We moved from the design and manufacturing of our vehicle concept to testing and demonstration.

To list some of our accomplishments this year:

- *Successfully passing Hydro-proof testing of the M-SV combustion chamber*
- *Successfully completing our first static test of the M-SV hybrid rocket propulsion system*
- *Receiving Letters of Intent to launch future Smallsats for several clients*
- *Meeting with several key potential investors*

Naturally, accomplishments are replete with difficulties and 2014 had a fair share of obstacles. For example, we had several failed hydro-proof tests of our combustion chamber before finally succeeding—this was especially stressful, as one of our biggest technological milestones depended on the success of the static test. The failed hydro-proof test forced us to think on our feet in order to meet the static test date. Luckily, we have a great team who were up for the challenge and finally, on July 22, 2014, we passed our hydro-proof test. This placed us back on track for the August 10th static test.

The next challenge was our most important test of the year, the first static test of the hybrid rocket motor. The hybrid rocket motor is formulated and built in-house using our own proprietary technology. This motor powers our M-SV, Suborbital Vehicle, and also serves as the booster in the M-OV, Orbital Vehicle. Therefore, demonstrating this rocket motor at the static test is extremely crucial to the development path of our vehicles, as it will prove the design and power of our hybrid fuel formulation.

August 10th was the big day. By 11:30 a.m. Pacific Time, the test configuration was nearly complete. We still had several functional tests to finish before starting the LOX loading.

Later in the afternoon, we experienced some issues loading the oxygen—we needed more spare parts. Given the excessive heat at the FAR (Friends of Amateur Rocketry) test site near Mojave, California, and the need to obtain those spare parts, we scrubbed the test to August 11th.

After several nail-biting problems the that morning, we managed to solve all of the issues and were ready for count down—our hearts were pumping with excitement. At last, the moment we had all been working and waiting for had arrived, and the test was a complete success—this validated and demonstrated our hybrid rocket propulsion system and made our years of hard work with an amazing team all the more worthwhile.

From a business perspective, some of our highlights are meeting several serious potential investors who, like us, want to disrupt the aerospace market by providing smallsats to provide a cost-effective and the ability to frequently access space on their terms. We look forward to working together with these investor as we pave the way for a “New Space” where sending satellites to orbit is more common place and accessible to all interested parties. In addition, we are also fortunate to have received, after intensive hard-work, several signed Letters of Intent with visionary clients that are able to apply game-changing technologies to missions.

While 2014 has been a difficult year that tested our resolve and drive, Mishaal Aerospace has accomplished many milestones, all with flying colors. As we approach 2015, we have a highly positive and plentiful list of additional milestones to achieve.



"THE ROCKET WILL
FREE MAN FROM
HIS REMAINING
CHAINS..."

~ Wernher von Braun

Forward Firing

Oxidizer Tank

Fuel Tank

Grounded Engines

From a technical perspective, we plan to continue our testing efforts on the M-SV to complete four more static tests which will finally lead to a flight test and qualification. In addition, we will also perform several M-OV upper-stage motor testings and verifications, as well as finalize the M-OV main engine design and manufacturing. Moreover, we plan to initiate launch site Phase I efforts to ready our facility for ongoing flight tests as well as commercial flights.

From a business perspective, we plan to close our series A round with strategic investors and continue efforts to advance the development of our vehicles. Consequently, Mishaal Aerospace will be hiring several more positions to fulfill these milestones with key personnel.

Just recently, MISHAAL Aerospace Corporation announced that Outernet Inc., a New York-based global broadcast data startup, signed a Letter of Intent for launch of their satellites, once MISHAAL Aerospace's M-OV, Orbital Vehicle, is ready.

The Letter of Intent highlights Outernet's satellites launch requirements and the minimum payload intended for launch. This letter of Intent also paves the way to enter into negotiations once the M-OV is ready for commercialization and launch.

In addition to its existing Fixed Satellite Service over conventional geostationary satellites, Outernet is interested in offering a mobile service from a constellation of CubeSats sent to Low Earth Orbit (LEO). Their aim is to provide basic information such as news, education and emergency alerts to the 60 percent of humanity who do not have access to it.

"We are eager to have MISHAAL Aerospace succeed in the development of their M-OV, which will enable us to access space on our terms and increase the utility of our service" said Syed Karim, Outernet's CEO.

We look forward to 2015 and welcome the challenges that the new year will bring—without the challenges, our creativity and ingenuity will not be tested to its fullest, and the latter is needed for ultimate success.

Founded in 2010, Mishaal Aerospace specializes in launch vehicle development to send small satellites (<=500 kg) to Low Earth Orbit. We design, develop and launch our own line of rockets, the M-Rocket, which is the first generation of cost-effective dedicated small satellite launch vehicles. The M-Rocket serves the broad applications of small satellites for clients from government, research, commercial aerospace and telecommunication industries. Mishaal Aerospace's objective is to provide a turn-key and cost-effective approach to space access, making it more common place and accessible.

Mishaal Ashemimry is an aerospace engineer by profession and an entrepreneur at heart. Based in Miami, Florida, Mishaal founded Mishaal Aerospace in 2010. After working for Raytheon Missile Systems, Mishaal decided to roll up her sleeves and pursue her life-long dream of building rockets for space access.

Her professional experience and areas of expertise include: aerodynamics, wind tunnel testing, vehicle design, predictive simulation and analysis and rocket stage-separation analysis, with a strong focus on computational tool development. Her academic focus included: experimental and analytical aerodynamics, rocket design and nuclear thermal propulsion.



MITEQ, Inc.

By Howard Hausman, President and Chief Executive Officer

For MITEQ 2014 is a good year; bookings are up over 20 percent. The Microwave industry seems to have released many projects that were on the drawing boards but held up for a multitude of reasons. The increase in procurement has spanned all of MITEQ's major product areas including satellite communication, space systems, and commercial and military microwave components and systems.

To better understand MITEQ's view of the industry in 2014, a short background about the company is in order. MITEQ is an engineering company with 15 different departments that designs and manufactures microwave components, microwave subsystems and microwave systems. Approximately 50 percent of our products are used for military applications and the other fifty percent 50 percent are used for non-military applications. Approximately 10 to 15 percent of these products are for military and non-military use in space craft for commercial, scientific and military applications.

In addition to being ISO certified, we are also certified to AS9100, the high reliability aerospace standard. MITEQ is known in all sectors of the industry for our technology, quality and reliability. Three of our 15 departments focus on the Earth station SATCOM business, which is 40 percent of our total sales.

The 12 other departments design microwave amplifiers, oscillators, synthesizers, microwave switches, mixers, phase shifters, integrated microwave assemblies and microwave fiber optic links for military, space, and commercial customers. In addition, our microwave component departments supply high technology microwave components and subsystems used in our satellite Earth Station equipment. MITEQ designs and manufactures virtually all of the RF and microwave components as well as the subsystems used in satellite Earth Stations, save for the high power amplifiers and waveguide assemblies. Some of the major subassemblies supplied to our satellite Earth Station customers are dual conversion frequency up and down converters, block converters (single and multi-channel) in outdoor environmentally seal boxes, indoor block converters in our patented 1/3 rack 1RU assemblies, low noise amplifiers, low noise amplifier redundant systems, Up Link Power (UPC) controllers, beacon receivers, RF/Microwave Fiber Optic links, test translators, amplitude and group delay equalizers, in rack mount or environmentally sealed outdoor packages.



By product segment, our RF/Microwave business designing and manufacturing Low Noise Amplifiers (LNA), Oscillators, microwave synthesizers, Microwave switches, attenuators and phase shifters, RADAR and Electronic Warfare (EW) receiving systems, and Microwave Fiber Optic links has been extremely active, with a significant increase in orders over the past year.

The space segment equipment orders have been particularly good this year with many multi-million dollars projects for military and non-military satellite applications such as spaceborne radar, Earth Observation (EO) platforms, and communications.

In the airborne SATCOM sector, MITEQ won multiyear contracts for Low Noise Amplifiers and antenna switches used to connect passengers to the Internet on commercial aircraft.

In the satellite Earth Station sector of MITEQ's business, Ka-band programs are our primary growth area. New programs are being rolled out by every major communications supplier, and MITEQ has captured a significant amount of those projects. We have started many new programs, captured follow on work from programs we were involved with in the past and have been awarded additional work on programs that are continuing. Many of these programs are custom products designed to the customer's unique specifications with large manufacturing quantities and multi-year production cycles. MITEQ anticipates continued and robust growth in this area, as satellite owners and manufacturers are designing for higher capacity in each satellite, which makes the industry more competitive with ground based Internet connectivity solutions.

MITEQ's success is, in part, due to its unique capability, diversity and capacity to design specialized microwave equipment. We have in-depth experience in most of the primary microwave components used in our microwave systems and use this technology advantage to successfully design and manufacture custom systems to support our customer's exacting requirements. In addition to our microwave engineering capability, resident at MITEQ is an embedded systems capability that enhances the performance of our microwave equipment. We provided instrument



Ka Band Products

Airborne and Ground Based • Low Noise Amplifiers • Converters • Mixers

accuracy in our control and monitoring functions over temperature ranges greater than the capability of most instruments.

Even with the large amount of new Ka-band systems rolling out, MITEQ continues to support a highly robust Ku-, C- and DBS-band (Direct To Home) TV market. Ku-band remains the primary satellite service around the world, C-band is still the service of choice in areas of high atmospheric participation and DTH services are a thriving and expanding market across the globe. Q-band (45GHz) and V-band (50GHz) are future growth markets. MITEQ has been designing and manufacturing equipment in those bands for customers who are researching the anomalies and possible uses for future bandwidth expansions.

MITEQ's Earth station primary products are frequency converters for indoor and outdoor operation; however, the company also builds a significant number of diversified microwave-based support equipment for Earth stations. Our Uplink Power Controller (UPC) has been used successfully for many years to stabilize the level of the transmitted signal received at the satellite.

With a surge of Ka-band systems going into operation and the issues with atmospheric attenuation under adverse environmental conditions at Ka-band the transmitter power controller sales in 2014 have significantly increased. In 2014, MITEQ introduced a new multi-channel up link power controller that has enhanced capabilities to function in L-band and VHF/UHF IF frequencies with upgraded local and remote controls.

Other new products introduced in the current year are third rack slope correction modules to mitigate the problems encountered when the Earth stations must use long coaxial cable runs from and to L-band Block converters and fiber optic transmitters and receivers embedded in our block converters for those users who want to mitigate the issue of long coaxial cables.

MITEQ has numerous satellite Earth station equipment usage around the world that have been operating successfully for decades. This equipment, although still functional, is nearing end of life in that maintenance is difficult due to parts obsolescence. MITEQ is working with our customers to plan upgrades to the older Earth station equipment to support future long term operations with no disruptions.

MITEQ has been highly active developing and manufacturing equipment for our customer as they roll out new Ka-band satellites and Earth stations to support the satellite infrastructure. We are supplying up converters, down converters, pilot generators, test translators, and uplink power controllers to major satellite programs around the world. This year alone we have been awarded many contracts over \$1,000,000 for Ka-band equipment. We have also been doing well supporting current equipment in the C-and Ku-band. MITEQ is investing with our customers in Q- and V-band equipment to satisfy future bandwidth demands.

The industry is active and expanding and MITEQ expects to be a significant part of the continued industry growth.

Howard Hausman received his BSEE and MSEE degrees from Polytechnic University now part of New York University and is President/CEO of MITEQ, Inc., Hauppauge, New York. MITEQ, Inc., is a microwave engineering company with approximately 350 employees. The company designs products for ground based satellite communications systems, space borne microwave systems, Radar systems, Reconnaissance systems, commercial aircraft WiFi systems, and various microwave products for defense electronics . Howard Hausman directs the four engineering divisions of the corporation, Microwave Electronic Components and Systems, Microwave Amplifiers, Satellite Communication Systems, and Special Projects. Reporting to Mr. Hausman are corporate finances, corporate services, quality assurance, operations and marketing.

During his career, Howard Hausman served as Chief Technology Officer, Vice President of Engineering, and other related titles, before being appointed President/CEO of MITEQ, Inc. As an engineer he has designed microwave systems and components for satellite communications, Radar and reconnaissance systems that include receivers, transmitters, and synthesizers. Mr. Hausman was also an Adjunct Professor at Polytechnic University, now part of New York University and Hofstra University where he taught graduate and under graduate courses in Electronic Engineering. Howard Hausman is also a recipient of the 2010 New York University / Polytech Distinguished Alumni Award and the 2013 IEEE LI Section Alex Gruenwald Award "For outstanding contributions to enhance the knowledge of the IEEE LI Section members in Satellite Communications and Microwave Theory". He has lectured around the world and authored many papers relating to microwave systems, satellite communications, Radar, and reconnaissance systems. Mr. Hausman also holds a patent titled; "Measuring Satellite Linearity From Earth Using A Low Duty Cycle Pulsed Microwave Signal".



NewSat

The last 12 months for NewSat have been busy and productive, with excellent progress made during the year on the Company's strategic growth project, the Jabiru Satellite Program.

NewSat, Australia's largest pure-play satellite company, is a unique player within the industry. Our current journey from a "solutions provider", to a "teleport operator" and development into a "satellite operator" is an industry first.

The Jabiru-1 satellite achieved significant milestones in 2014. Led by NewSat's CTO, David Ball, the comprehensive technical review of Jabiru-1 was completed with Lockheed Martin, achieving Critical Design Review (CDR) of the satellite and each subsystem. With component manufacturing progressing, many of the key satellite components from numerous external suppliers across the USA, Canada, France, Germany, Italy and Spain have been delivered to Lockheed Martin in advance of spacecraft integration scheduled to take place at Lockheed Martin's facilities in Denver, Colorado, early next year.

NewSat also conducted mission analysis kick-off with Arianespace and Lockheed Martin, awarded General Dynamics C4 Systems SATCOM Technologies contract for four large antennas and associated electronics for Jabiru-1, signed a contract with GMV for the flight dynamics system, and signed on Kratos Integral Systems International (Kratos ISI) for the contract to provide the satellite command and control system for Jabiru-1.

As SVP, Kratos ISI James Kramer said, "The EPOCH IPS system will provide NewSat a full complement of satellite command and control capabilities to ensure safe and efficient operations for Jabiru-1, and the system will scale to meet the needs of the Jabiru fleet in the future."

To also support Jabiru-1, NewSat continued expansion on the Adelaide teleport which will house the Jabiru Satellite Control Centre and Jabiru Customer Support Centre.

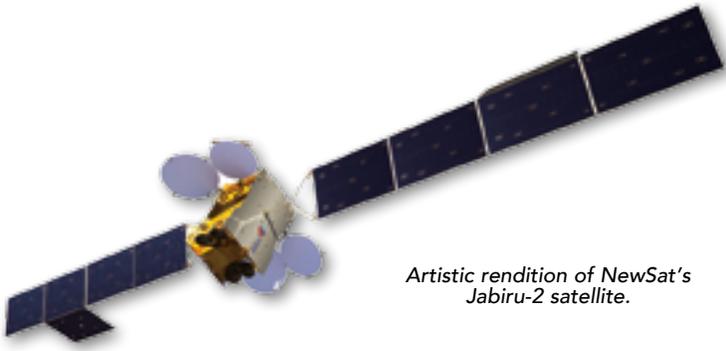
The MEASAT-3b satellite, which hosts the Jabiru-2 payload, has officially commenced commercial service. One month after the successful September 12th AEST launch, satellite manufacturer Airbus Defence and Space has concluded the on orbit testing of MEASAT-3b and the satellite is now operational.

MEASAT-3b successfully launched as Flight VA218 via an Ariane 5 ECA launch vehicle from the European Spaceport in French Guiana. This is the same launch vehicle procured for Jabiru-1 and was the 61st successful consecutive launch for the Ariane 5 launch vehicle.

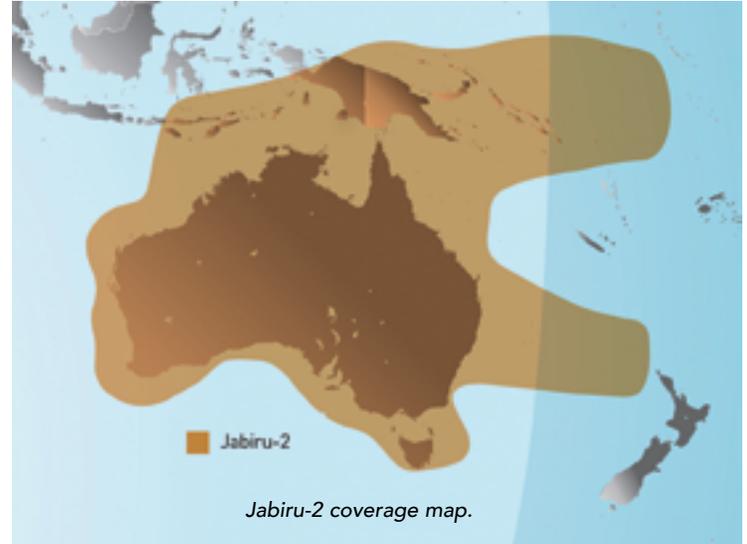
This Ku-band payload provides fresh capacity to satisfy the growing communication requirements in and around Australia, as well as Papua New Guinea, Timor Leste and the Solomon Islands. With highly concentrated bandwidth, enabling high-quality communications ideal for government and enterprise requirements, Jabiru-2 will meet the demand of today, tomorrow and for years to come.



NewSat's Adelaide, Australia, teleport.



Artistic rendition of NewSat's Jabiru-2 satellite.



Jabiru-2 coverage map.

Commenting on this significant moment for NewSat, CTO David Ball said, "The big benefit of the Jabiru-2 program for us, compared to leasing capacity off an existing operator, is that we were able to work with MEASAT to design the beam exactly the way we wanted it to look, the coverage area, the power focus and the peak performance areas...it's a great opportunity for us to have design influence in the early days and our operations team is now scaling up their activity and their involvement to a greater degree than we have in the past. It's a good exercise for us to go through as we approach launch of Jabiru-1."

NewSat continued a number of key strategic partnerships throughout 2014, including MTN and ITC Global, confirming NewSat as a key partner in the Asia Pacific, supporting broad and unique network requirements.

With the objective of exceeding customer needs in terms of access and connectivity, MTN has selected NewSat to support their growing requirements today and into the future.

"We are excited about implementing this strategic partnership with NewSat as we think ahead of our customers' needs in these already growing regions," said Zafar Khan, vice president, systems and space engineering, MTN. "The markets where we lead—cruise, megayachts, ferries, oil and gas, commercial shipping and government—are growing in vessel count and in demand on our already robust network....MTN seeks to exceed their needs in terms of access and connectivity to more applications. So, this is a key move to continue to lead our sectors in network capabilities and in value-added services. In addition, it will add efficiencies to our network in the way we grow our future services."

The strategic partnership with NewSat and MTN considerably enhances the satellite coverage and throughput for MTN customers in Southeast Asia and Oceania. The agreement extends C- and Ku-band satellite coverage in these regions now, and puts MTN in a strategic position for future service launches, including Ka-band.

NewSat's partnership with ITC Global strengthened in 2014, with continued focus on opportunities in the global energy sector. The ability to connect multiple sites and offshore platforms inherent to the oil and gas industry on one network within the same bandwidth pool is a key factor in the design of the Jabiru Satellite Program.

"What we like about the Jabiru platform is that the EIRP and on the uplink the G/T ratio is being optimized not just for where there are population centers but rather where there are resource projects and energy or oil and gas projects," said Chris Hill, CTO, ITC Global. He also highlighted that NewSat's Perth teleport is a strategic benefit in serving Asia Pacific.

NewSat was reconfirmed as top teleport operator in Asia Pacific. Ranking 13th in the WTA Independent Top Twenty 2013, NewSat was also shortlisted as a finalist in the VSAT Service Provider of the Year at the 2013 VSAT Industry Awards and as a finalist for Satellite Provider of the Year in the ACOMMS 2014. New teleport business contracts was up 44 percent when compared to the last financial year, while the quality of NewSat's teleports was also recognized with a major US\$13.6 million contract signed in June with a telecommunications company based in Asia to support growing connectivity requirements across the Asia Pacific. The contract will use steerable capacity on Russian Satellite Communications Company (RSCC) Express AM3 satellite, enabling the customer to provide cellular and Wi-Fi backhaul services across parts of Asia.

Looking ahead, 2015 will be another eventful year for NewSat as the launch of Jabiru-1 approaches, with more Jabiru-1 construction milestones with Lockheed Martin, such as spacecraft integration and assembly, and advancing construction of the Adelaide teleport. Jabiru-2 will be essential in supplying the required capacity across various industries as partners evolve and seek to successfully compete and create value in the Asia Pacific region which continues to dominate global economic growth.

Newtec

By Serge Van Herck, Chief Executive Officer

Next year marks Newtec's 30th birthday and we couldn't have asked for a more buoyant year as we reach that milestone. This is especially true as we launched Newtec Dialog, our innovative multiservice platform that is equipped with a brand new patented technology, the realization of a new DVB transmission standard and strong financial growth, among the year's highlights.

As we move toward 2015, we are also entering the era of multiservice, with broadcasters facing numerous challenges. These include more complex workflows, the introduction of new services, increased user expectations for always-on connectivity and pressure on efficiency in both the space and ground segments. The importance of embracing the multiservice trend was emphasized by our recent comprehensive industry survey, aimed at addressing the key challenges for broadcasters.

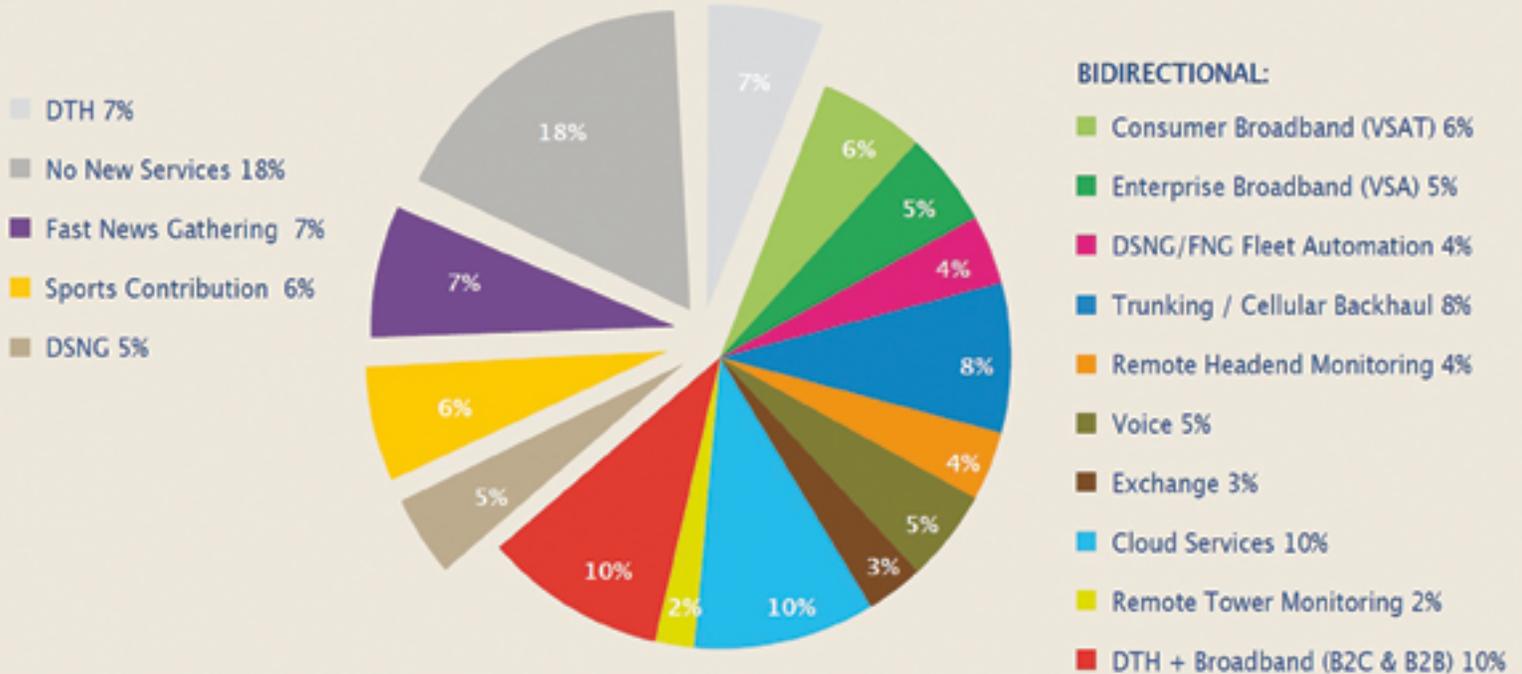
In total, there were 270 respondents to the survey, with the findings revealing that 82 percent of broadcasters and broadcast service providers plan to launch additional services in the near future. If these services are launched on dedicated and inflexible networks, then CAPEX and OPEX will grow in tandem with the addition of new services.



A single platform that is shared between multiple services, a "multiservice network," will help to address rising costs while increasing network flexibility.

Responding to this trend, and with the culmination of years of research and development, we believe Newtec Dialog® contains all of the traits broadcasters and service providers need in order to thrive in today's market—flexibility, scalability and efficiency. With Newtec Dialog, our customers can increase their operational efficiency and easily adapt their

What new services will you add in the near future?



82% of the participants will add new services to their network in the near future. The majority of the to-be-added services require bidirectional satellite connectivity (e.g. VSAT).

Results of this survey are Newtec ©

infrastructure to business or market changes. Meanwhile, our new, patented return technology, Mx-DMA™, incorporates the best features of MF-TDMA and SCPC technologies, solving the difficult choice of selecting one or the other. First seen at the SATELLITE show in Washington DC and CABSAT in Dubai, Newtec Dialog held its European launch more recently at the IBC 2014 tradeshow in Amsterdam.

Even before the European launch, the multiservice platform had been selected by Airbus Defence and Space for their Terralink satellite connectivity service portfolio, which delivers reliable satellite connectivity to a large range of enterprise customers, including those operating in the humanitarian, mining and energy sectors. We are confident that Newtec Dialog provides the future proof solution to address increasing OPEX and CAPEX challenges, while remaining agile to allow for new satellite services in an ever changing world.

I am also proud to add that the Newtec Dialog® multiservice broadcast solution has also been provided to the European Broadcasting Union (EBU) to complement the full workflow automation in the newsroom environment, with a dedicated and flexible network infrastructure. The aim is to maintain the EUROVISION News Exchange as the world's leading platform for the exchange of quality news content by providing an efficient transport of video and really efficient end-to-end workflow support.

Another trend during 2014—UHDTV demos. This year has seen a new landmark established for the entire industry in terms of efficiency, with the introduction of a new transmission scheme, DVB-S2X. Newtec has been one of the greatest proponents of DVB-S2X and integral to rallying the industry to work together to create the new standard.

This year, we were the first to launch commercial products supporting the new standard across Newtec's entire portfolio (full solution including modulators, demodulators and modems). There have been a series of live tests using the new technology over satellite from companies that include Intelsat, Eutelsat, SES, MEASAT, Ericsson, Sony and others—remarkable how quickly the industry has come together to support DVB-S2X. This standard will make the satellite communications industry stronger and we are proud to be a part of that technology impetus.

Bridging the digital divide also remains a key focus for Newtec. During the year, we have partnered with several new players to connect regions around the globe. Our latest project saw us carry out an installation in Asia, teaming up with First United Broadcasting Corporation (FUBC) to launch the new iGsat broadband service, which will deliver high-speed satellite broadband across the Philippines, which is comprised of over 7,100 islands.

The introduction of High Throughput Satellite (HTS) has also had a major impact on the business model and value chain in our industry. At Newtec, we have experienced two new important projects on HTS this year. The first was with SES, with our terminals being used to deliver the Astra Connect for Communities satellite broadband service to several German villages. Meanwhile, Bentley Walker, one of the world's leading service providers for broadband satellite VSAT services, extended its coverage using Newtec's Ka-band VSAT broadband platform and HTS Ka-band capacity on Avanti's HYLAS 2 satellite, which was launched in August 2012.

Our position at the forefront of the industry also saw some of Newtec's senior representatives invited to speak at the world's biggest and most important conferences. I personally was delighted to accept a request to speak at Satellite 2014, VSAT 2014 and the VSAT Latin America conference.

Finally, thanks to market evolution and our strong performance in Direct-To-Home (DTH), broadcast systems, consumer and enterprise network markets, Newtec experienced significant growth of 20 percent during 2014, for the financial year ending in September. We are thrilled with the strong figures, which absolutely underline that our strategic direction is on course to provide an extremely strong base for the future. As we enter 2015, we look forward to continuing to focus on our core markets, as well as placing a stronger emphasis on fast growing markets in the future, such as, oil and gas, HTS and cellular backhaul.

Serge Van Herck holds an electrical engineering degree from the University of Ghent and a MBA degree from the Vlerick Leuven Gent Management School in Belgium. With more than 20 years of experience in the satellite telecommunications industry, Serge worked for seven years as Head of Satellite Services at Belgacom and was a member of the Eutelsat Board of Signatories until 2001.

Before joining Newtec in 2003 he served for two years as Senior Manager in the Communications and High Tech practice of Accenture in Brussels. In 2003, he became Newtec's Director Business Development for Asia and General Manager of Skyware, a former subsidiary of Newtec in Germany. He was appointed CEO and Chairman of the Board of Newtec on March 1st 2006.

In 2008, he joined the WTA (World Teleport Association) and ESOA (European Satellite Operator Association) as a board member. He also serves as a board member at VOKA (Flanders' Chamber of Commerce and Industry) and Agoria (Belgium's largest employers' organization and trade association).



Norsat International

By Dr. Aimee Chan, President and Chief Executive Officer



In early 2014 we completed the final steps in incorporating our acquisitions, bringing together our divisions and building and growing the business across all three business units: Sinclair Technologies, Satellite Solutions and Microwave Products.

In April of this year, Norsat expanded its product offering and launched the ATOM series Ku-band Block Upconverters (BUCs) and Solid State Power Amplifiers (SSPAs). These BUCs and SSPAs are among the industry's smallest, lightest, and most power efficient available in the market, making them ideal for portable applications such as COTM, airborne, and broadcast. We completed deliveries of the new line of ATOM products to Harris Corporation and other customers

In the second quarter, Norsat demonstrated our redesigned TXC Series Combiners at the International Wireless Communications (IWCE) Expo in Las Vegas. The TXC combiners feature improved performance and are designed to allow a number of transmitters to share a single antenna. The design allows for easy expandability, enabling customers to purchase in single-channel increments and bolster their networks as demand arises.

Customers can expand their current systems without increasing their tower loads by simply adding more radio room equipment due to the TXC Combiner's efficient use of rack space.

Norsat signed several significant deals throughout the year including:

- *A 3-year National Individual Standing Offer (NISO) with Public Works and Government Services Canada ("PWGSC") for the supply of UHF/VHF antennas. Our products enable the critical communications within Canada's extreme weather conditions and terrain and met their stringent design criteria.*
- *A deal to provide marine VSAT (very small aperture terminal) units for use in naval ships. The units are built to withstand high impact shocks and vibrations that occur on military ships.*





Looking to the future, Norsat will continue to work closely with our customer base to ensure that new products we launch can be tailored to meet their specific needs. Norsat continues to diversify its business by broadening its product portfolio through research and development and the pursuit of strategic acquisitions, as well as expanding its customer base on a geographic and market sector basis. Specifically, Norsat is focusing on markets beyond the U.S., as well as on the commercial, resource, transportation and public safety segments that we believe will lead to growth for the company in the coming years.

Norsat continues to execute a balanced growth strategy that incorporates investment in staffing levels, new product introductions, continued enhancement of existing product lines, greater diversification by geographic region as well as by industry verticals, and a broadening of the solutions we provide to customers. These strategies have resulted in improved revenue growth with less dependency on certain market segments, and improvements in operating profitability.

Our recently announced third quarter financials are showing solid revenue growth with a 20+ percent increase in sales of our microwave components which is driven by deliveries of our new ATOM series of products. We continue to receive strong interest in the ATOM product line and believe it will continue to provide long-term growth for years to come. We are very pleased that Norsat ended the third quarter with a net positive cash position; it's first in nearly four years. We anticipate that we will finish strong in the fourth quarter and our revenue is on track with our expectations.

Although revenue growth is positive, in 2014 we experienced some challenges due largely to a decrease in military demand and budget constraints among other non-military customers. Other service revenues were also lower year-over-year due to the non-renewal of significant airtime contracts. We are seeing continued softness within land mobile radio, which is affecting our satellite business, but anticipate the market will rebound during the coming year.

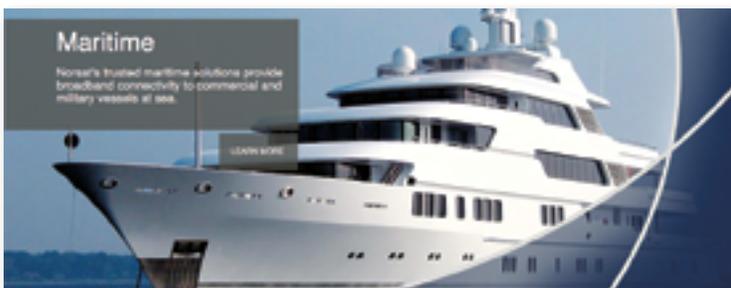
Operationally, we continue to maintain a strict cost discipline across our operations while ensuring we invest in R&D for future growth. To drive ongoing efficiencies, we balance cost reductions with strategic investment throughout our operations. We have also ramped up our LEAN manufacturing initiatives in order to streamline our material process and to continually improve our operational efforts.

Norsat International Inc., founded in 1977, offers products and services that include microwave components, portable satellite systems, maritime solutions, remote network solutions, and equipment financing. Through its Sinclair Division (www.sinctech.com), Norsat is a leading provider of antenna and RF conditioning products, systems and coverage solutions for public safety, defense and private wireless networks. Norsat also provides engineering consulting to meet customers' specific needs.

The company's products and services are used extensively by telecommunications services providers, emergency services and homeland security agencies, military organizations, health care providers, news organizations and Fortune 1000 companies. Customers include NATO, the United States Department of Defense, Marine Corps, Army, Navy and Air Force; FOX News, CBS News; Boeing, Reuters, Motorola, TESCO, General Dynamics and others. The company's corporate office is located in Richmond, British Columbia, Canada and has offices in Aurora, Ontario, Canada, Hamburg, New York and Lincoln and Somersham, England.

Dr. Amiee Chan has more than 15 years of experience in executive management and research & development in the telecommunications industry. Offering a rare blend of technical and corporate strength, Dr. Chan's strategic vision has driven Norsat's innovative product development program and resulted in consistent revenue growth since her appointment as CEO in 2006. Prior to joining Norsat, Dr. Chan worked at Creo Inc. where she guided the company through multiple product developments, beta programs, rollout strategies and product launches. Her strategic approach to business was reflected in the growth of Creo's \$80 million consumables product division. Dr. Chan's work has been published over a dozen times. She currently holds three US patents in satellite technologies and has been involved in high level research teams such as the NASA ACTS Terminal Program.

Dr. Chan holds an Executive MBA from Simon Fraser University where she majored in Strategy & New Ventures, as well as an Electrical Engineering Ph. D. in Satellite Communications from the University of British Columbia. Dr. Chan currently serves on the Dean's External Advisory Board for the Beedie School of Business at SFU, the Science World Board of Directors and the UBC Engineering Advisory Council.



NSR (Northern Sky Research)

2014 was an interesting year in many ways for the satellite telecom industry. On a macro level, it was a year in which investment and preparations were made for significant advancements down the road—both on the supply side with development of new High Throughput Satellite (HTS) systems, and on the demand side with the rollout of things such as UltraHD set-top-boxes (STBs) and content, and new applications such as in-flight connectivity taking off.

Beyond that, Gov/Mil remains in a difficult slump, with demand slackened due to withdrawal of troops and budgetary constraints. Moving forward, this is expected to rebound around the 2016 timeframe. Finally, “wildcard” technologies—such as O3b and the Internet of Things via Satellite—continued to move forward and unlock potential new markets for the industry.

The Supply Side

2014 saw many announcements of HTS satellite systems, both global and regional. However, in terms of actual in-year launches, there were only five satellites with any notable HTS capacity in GEO and most payloads were quite small. More significantly, O3b added four satellites to MEO with HTS capacity and the system went fully operational this year.

However, 2014 has been an important year overall in terms of the build up of HTS capacity for the coming decade. Companies with systems such as Epic^{NG}, Global Xpress, O3b and others have revealed expansion plans. Many regional satellites over Latin America and Africa announced HTS capacity more tailored to these regional markets. On the whole, 2014 has set the stage for a huge influx of HTS capacity that is expected to be delivered in the 2016-17 timeframe and that has impacted the SATCOM data business at large.

The regions that saw the most FSS capacity launched in 2014 was Europe and the Middle East, largely dominated by Central and Eastern Europe. RSCC’s Express satellites, Turksat and Gazprom, contributed significantly to these launches, although there were concerns related to the reliability of launchers and the health of satellites put into orbit. Asia was not far behind with AsiaSat, Thaicom and Measat adding substantial capacity over Southeast Asia. Sub-Saharan Africa and Latin America remained important regions from HTS capacity perspective with missions like Eutelsat 3B selling off entire HTS payloads before launch.

From a launch perspective, the year started off with delays and that, combined with technical issues on Proton and business challenges on Sea Launch, pushed back many launches to 2015 and perhaps beyond. Nearly every mission after May 2014 was delayed, if not significantly (greater than six months), then at least by a month or two. Some smaller missions, mostly PrideSats that relied on government backing, were also delayed, but that is a recurring trend more than being specific to 2014. Overall, expectations from new entrants such as SpaceX remain high, as both Russian and American launchers went through a tough year.

Finally, from a capacity perspective, 2014 was still dominated by traditional FSS Ku-band capacity. Apart from Inmarsat 5F2 and Thaicom 7, every satellite carried some form of widebeam Ku-band capacity in 2014. C-band

was more sporadic, mostly prevalent in emerging markets such as Asia and Africa. Widebeam Ka-band was even more difficult to find, with ABS2 and Turksat 4A being the only notable launches with this form of capacity. On the whole, 2014 was a building year for HTS and business-as-usual for FSS capacity. The next two years are expected to see more focused and tailored HTS missions with 2016 being a key inflexion point.

The Demand Side

When reviewing 2014 from a demand perspective, we believe this will have been a pivot year for the satellite telecom industry. As noted in our supply analysis, 2014 was a big year for HTS in terms of laying a foundation for future launches. On the demand side, this has led, and will continue to lead, to new applications that will drive demand for bandwidth moving forward. Consumer broadband witnessed healthy increases across a number of markets during the year, including the development of niche markets in places such as Russia and Brazil that we believe will prove lucrative in the long-term. Commercial mobility, in particular in-flight connectivity, will certainly agree that 2014 was a monumental year, perhaps ushering in the start of widespread aero connectivity use as we know it.

Beyond applications that are being spurred by the advent of HTS capacity, longtime bread-and-butter applications such as video distribution and DTH also saw a big year in 2014. Unquestionably, the biggest development in the demand picture for these two applications has been the continued investment and introduction of UltraHD. Corresponding to the in-flight connectivity market segment, we believe that, when looking back on the industry many years from now, we will say that 2014 was the year that UltraHD (UHDTV) really took off. Today, UHDTV is being broadcast selectively in a number of countries, including South Korea and Japan, and—more importantly—developing countries are already seeing significant buzz. Indian DTH operators have started to announce UHDTV set-top box (STB) rollout plans, while China is already the largest market for UHDTV compatible TVs in the world, despite having little UHDTV content as of this writing.

2014 was also undoubtedly a big year for frontier regions in general. Sub-Saharan Africa saw several major announcements, most notably a shared satellite deal between MultiChoice South Africa and Intelsat for the Intelsat-36 satellite which will be launched in 2016 and co-financed by the two companies. However, demand in the region during 2014 and beyond may be skewed by first-time customers signing on to HTS payloads as their first foray into communications via satellite, given the HTS capacity we’ve seen coming over the region in the previous year or so. Demand in 2014 saw solid and healthy growth across a number of applications, but perhaps the most major takeaway from the year was the laying of groundwork for new applications that will boost demand in the long-term. The infrastructural development during the year, whether penetration of UHD set-top boxes or installation of Wi-Fi onto airplanes, will be the biggest legacy from a demand perspective in 2014, and will cause 2014 to have been a major pivot year in the industry.

MSS

The novelty in 2014 for mobility via satellite is the aeronautical sector’s use of HTS capacity, starting with JetBlue offering in-flight connectivity service on Viasat’s

HTS network. The install rate by Panasonic on long-haul aircrafts has also picked up this year and their intent to buy an HTS payload on Eutelsat 172B signals a continuing trend towards globally-available high-capacity IFEC services.

For maritime, O3b began testing services on Royal Caribbean and this year might be a record year in terms of contract announcements. However, even with signs of improving economic conditions, internal merchant maritime economics still remains tight—increasing pressures to reduce cost and improve efficiencies. Driving those improvements are larger, more efficient vessels in all maritime segments (from offshore support vessels to the latest containerized cargo vessels) as well as the steady migration from MSS to VSAT, C-band to other frequencies, and the integration of HTS services. Although the maritime market has fallen out of the limelight as the industry becomes aero-crazy, there is still plenty of life and ships to connect. On the land-mobile side, the almost simultaneous release of Sat-Fi, IsatHub and the GO Wi-Fi hotspot devices by Globalstar, Inmarsat and Iridium respectively was a timely reminder that MSS players are on a path to address the growing BYOD trend.

Government/Military

Ending 2013 on a low note after a series of highly successful years, the government and military SATCOM market hoped for a resurgence of demand and funding in 2014. This did not materialize and market struggles continued, with revenues continuing to decline. The U.S., by far the biggest market for COMSATCOM, lowered capacity procurement and paid less per transponder due to ongoing budget cuts. Compounded by the withdrawal of U.S. and NATO forces from Afghanistan, markets weakened across the board. We believe that 2014 might be more famously remembered as the mid-year in a multi-year slump in government and military markets, although the appearance of ISIS means that MEA demand may not fall off as much as previously thought post-Afghanistan.

Simultaneously, and bolstered by additions to existing MILSAT constellations, governments increased reliance on proprietary, 'paid-for' capacity in lieu of commercial procurements. Nonetheless, governments did engage in exploring the adoption of new services: MEO-HTS and Ka-band GEO-HTS systems are both undergoing trials and likely to see increased adoption in 2015. Airborne ISR missions, combat air support, and mobility continue to generate demand, opening the door to future growth. Finally, the mid-year award of US Pathfinder and French ASTEL S3 contracts signaled an interest in updating procurement practices, potentially leading to efficiencies that will benefit both operators and customers in the long-term.

Other Noteworthy Developments

On July 10th, 2014, O3b Networks successfully launched its second batch of satellites, commencing global operations to be further enhanced by a third launch on December 18th, 2014, expanding the MEO Ka-band constellation to a total of 12 satellites. O3b initially intended to provide broadband

Internet to the "Other 3 billion," those in developing countries without Internet access. Strictly speaking, the company continues to follow through on achieving that goal—2014 saw them continue into other, higher-value applications, such as mobility. Specific niche cases such as the Cook Islands have provided exceptional results, with many times faster Internet access allowing for economic development. Moving forward, it will be interesting to see how far O3b is able to go in providing Internet access to markets such as this. RCCL, which has subscribed to the service and is in the process of implementing it, is looking to transform the cruise-line experience by upgrading to a shared downlink of 500Mbps, more than 20 times faster than their previous 22Mbps connection. In addition to setting new expectations for some mobile and fixed applications, O3b has initially performed more promisingly than other non-geostationary systems, such as Teledesic and Skybridge, propelling investments in new systems, such as WorldVu.

M2M/Internet of Things (IoT)

In the M2M/IoT sector, growth remained consistently strong throughout 2014—with the exception of the military and civil government applications—despite the increasing potential competition from the terrestrial side of the business. Competition is increasing with Thuraya and Viasat announcing a dedicated M2M/IoT platform for launch in 2015, and the acquisition of VARs from previous years are now increasing the usage of 'deep analytics' tools to optimize business, especially in the transportation and cargo sectors. This is a trend which NSR views will drive higher bandwidth solutions into the future, increasing the adoption of next generation L-band services and HTS offers.

Google/Facebook Market Entry

The early part of 2014 saw much speculation and mystery surrounding the potential entry of Google into the satellite telecom space, and with other companies such as Facebook generating rumblings. Then, in November, Elon Musk was reported to be planning to launch a 700-satellite constellation for global Internet access. Relatively little conclusive news has come about relating to the entry of companies from this sector, but it nonetheless poses the following question—as many satellite applications are beginning to converge into just one "flavor" or another of Internet access, is the playing field now wide open for other entrants, such as Google, Facebook, Microsoft or Musk, to come in and offer their own competing services? And if so, what does this mean for the greater Satellite Telecom industry?

Bottom Line

Indeed, 2014 was a non-standard year for satellite telecom. While FSS supply and demand was relatively business-as-usual, with heightened growth from emerging and frontier markets taking center stage, HTS and MEO-HTS continue to shake things up by allowing for new applications and uses for payloads that would have been more or less inconceivable a decade or so ago. Moving forward, the market will continue to see changes in the way that supply, which is increasingly HTS, meets demand, increasingly defined as "Access to the Internet."



Orbit Logic

By Ella Herz, Chief Operating Officer



Contracts, customers, products, employees, revenue; by all of these measures 2014 was a good year for Orbit Logic. The company's multi-year, forward-looking vision and investments in situational awareness, constellation management, and planning software including related mobile, web, and onboard applications have paid off in 2014 as military, commercial and civil satellite programs have multiplied.

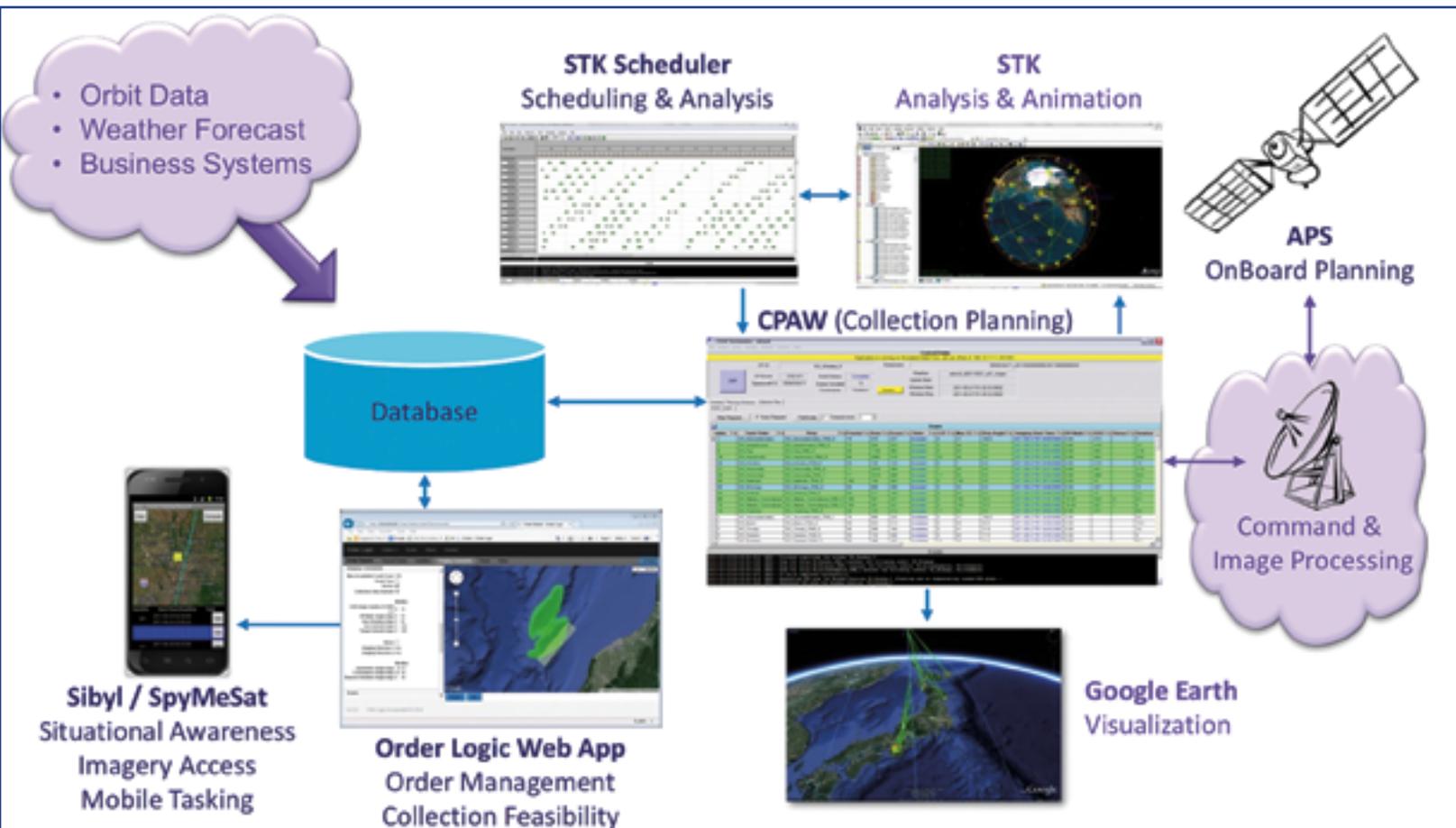
In 2014 we continued to enhance our collection planning tools for operations, analysis and constellation support. This year we were challenged to keep pace with the latest market direction, so we responded with implementation of new imaging collection modes for point, area, and video imagery collection using frame cameras.

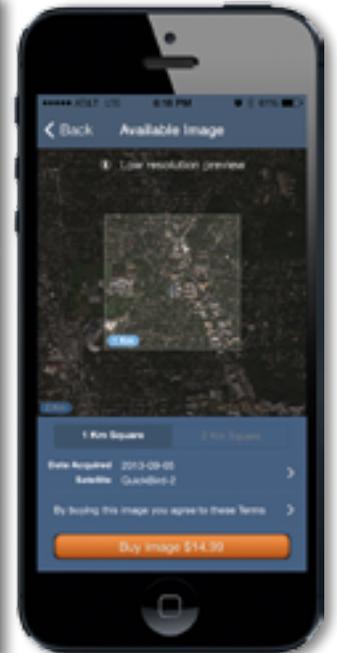
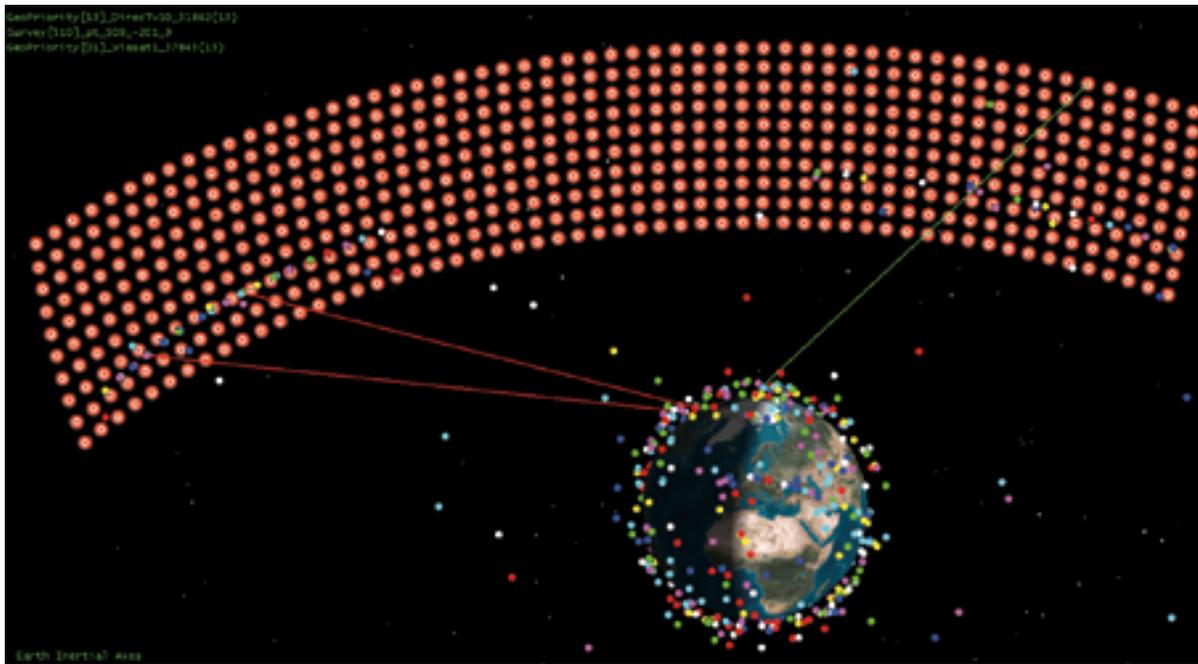
This year has seen tremendous growth in interest in imaging satellite constellations, especially from within the U.S. In past years, it seemed that much of the imaging collection planning projects came from Canadian, European, and Asian markets. However, this year, while international interest remains high, imaging projects are rapidly emerging from within the United States.

With these updates, CPAW is ready to support collection planning by the small satellite constellations that are becoming so popular, as well as continuing to support the more traditional agile line sensors used by larger spacecraft. As always, our CPAW architecture allows constellations to be defined and configured to support planning for collaborative, optimized constellation efficiency, even across a constellation of mixed satellite and sensor types. The upcoming year will be filled with augmenting the existing automation, configurability, and interfaces to adapt CPAW to support new systems, vehicles, and sensors.

Related interest in Orbit Logic satellite imaging planning software has never been higher. Orbit Logic's Collection Planning products have been recognized as the only true off-the-shelf software available that provides configurable, high-fidelity simulation and planning for these imaging satellites and imaging satellite constellations.

Throughout Orbit Logic's almost 15 year history, we have built products in areas where we have identified a need for configurable, scalable, easy-to-use COTS software products.





This year we created a new application called Order Logic to bring the most customer-facing features of imagery order management directly to the end user or customer service personnel through a secure web interface.

In Order Logic, authorized users can create, edit, and browse imagery collection orders, check on order collection or processing status, and get updated collection timeline estimates and feasibility reports. Configurable permissions and workflows provide the flexibility to deploy Order Logic in multiple operational environments for multiple user types. And because Order Logic interfaces with the same database used by CPAW for collection planning, both systems are always in sync and customers always have the latest status for their imagery orders.

Meanwhile, Orbit Logic's original planning software product, STK Scheduler, continues to provide planning support for new and ongoing programs in the civil, commercial, and military space sectors. For example, in 2014 Orbit Logic was awarded an SBIR to develop a configurable, automated system to improve sensor tasking efficiency and responsiveness for Space Situational Awareness (SSA) applications.

Recent and ongoing product enhancements for STK Scheduler include SSA-specific optimization features, anchor tasks, system mode tracking features, improved scheduling algorithms and more. STK Scheduler continues to be the industry-leading COTS software product for space system scheduling.

The SpyMeSat mobile app brought Orbit Logic directly to the public via iTunes and Google Play. In 2014, the SpyMeSat user base significantly expanded when we added the ability to download the latest satellite image of a user's current or specified location directly to a mobile device. SpyMeSat even broke into the top 10 Utility apps on iTunes shortly after this new public version was released in June.

Following on the heels of the success of the SpyMeSat consumer app, Orbit Logic also delivered a custom mobile app based on SpyMeSat. Big new features are on the way for SpyMeSat in 2015, so remain tuned-in for those developments as they occur.

As a small, innovative business, it is no surprise that Orbit Logic received multiple SBIR research contracts in the past year in topics related to mission planning and scheduling. Our customer base continues to expand with new commercial and government customers using Orbit Logic products for science mission planning, contact scheduling, SSA sensor tasking, imagery constellation management, collection planning, and more.

The SBIR contracts, along with strong support from existing software license and renewing maintenance customers, allowed Orbit Logic to continue to invest in and advance our software with the latest concepts and technologies.

This year, our staff has grown and we have continued to support and expand all of our COTS products: Collection Planning & Analysis Workstation (CPAW), STK Scheduler, Order Logic web app, SpyMeSat mobile app, Autonomous Planning System (APS) flight software, and UAV Planner.

Looking ahead, Orbit Logic foresees continued strong performance and growth. As the market for constellations of large and small satellites and UAVs continues to develop, more and more customers are turning to Orbit Logic for our experience and high quality off-the-shelf products that provide coordinated, configurable, validated, deconflicted plans. While maintaining and enhancing our current products and service contracts, we also expect to expand our onboard, web, and mobile presence.

What Next To Expect In The LATAM Market

By Carlos Placido, Senior Contributor



Latin America was marked by a number of events and trends in 2014, which hint at gradual shifts for the satellite services ecosystem; and offer more visibility as to what to expect in 2015 and beyond.

For starters, 2014 could be considered a pivotal year for satellite broadcasting as a result of the first transmission of a major, globally-relevant live sporting event in Ultra-HD format: The FIFA World Cup matches that took place in Brazil were encoded in multiple video formats but retransmitted live in 4K Ultra-HD to Europe, North America, Latin America and Asia via Eutelsat and SES satellites, among others. While the Ultra-HD 4K (UHDTV) market remains small and rather driven by “non-linear” content (TV series or movies viewed “on-demand” by consumers with high-speed broadband and 4K TV screens), the technology is undeniably important for the satellite industry to coordinately jump on the UHDTV bandwagon in order for linear (live) content to fully seize satellites’ distance-agnostic, one-to-many broadcast economics.

Another important event was the acquisition of Brazilian payTV player GVT by Telefonica. If this could signal a new wave of DTH consolidation in the region is unclear; however, this was certainly an important milestone that highlights that telcos absolutely need satellites to grow their payTV user base in Latin America. There is also an interesting announcement by GVT that hints at how satellite DTH can interwork with terrestrial access. GVT just announced the company would launch a set top box (STB) with integrated Wi-Fi for its payTV service. The project—still in beta—reveals how satellite TV could co-exist with IPTV (and OTT) via technology bundles that seek distribution efficiencies for different forms of content.

While the FIFA World Cup in Brazil commanded much industry attention in 2014, there were other important events that relate to two-way satellite connectivity that hint at changes starting to take shape. One could categorize these 2014 events into three groups: National “Pride” Satellite Programs, High Throughput Satellite (HTS) Commitments and Value Chain Shifts. Examples for each are listed below with a summary and conclusions as to what to expect next.

National “Pride” Satellite Programs

Several Latin American countries strengthened commitments in 2014 to nurture and develop domestic satellite communication programs. These government-driven, domestic satellite communication programs, often referred to as “pride satellites,” tend to have multiple goals, including fostering nationwide digital divide programs, technology independence, national security and domestic broadcasting/ communication. Some main examples for 2014 include:

- **ARSAT-1:** In October, 2014, an Ariane 5 rocket placed into orbit Argentina’s first GEO communication satellite. ARSAT-1 is the first of a series of satellites designed, developed and integrated in the country by state-owned INVAP. This marks an important milestone for Argentina’s ambitious program to develop spacecraft development capabilities.

- **TKSAT-1 (Tupac Katari):** After commencing operations in April, 2014, the Bolivian Space Agency reported that customers use over 30 percent of the Bolivian satellite capacity and expect that half of the satellite capacity will be in use by end of 2014, essentially achieving a 50% fill rate in just one year.
- **Defense and Strategic Communications Geostationary Satellite (SGDC) System:** Brazil’s SGDC program addresses communications needs of the Federal Government, including the National Broadband Program (PNBL) and strategic/defense communications. During the 2014 VSAT Latin America event in Sao Paulo, Visiona Tecnologia Espacial and Telebras shared details about Brazil’s government satellite program. The first satellite (SGDC-1) to be launched in 2016 includes a multi-purpose, extensive Ka-band payload with spot beams across Brazil and also X-band capacity.
- **MexSat:** Mexico is planning to launch the Centenario and Morelos 3 satellites, to provide additional satellite connectivity. These satellites will complete the three-satellite Mexsat system, which already counts with the Bicentenario satellite, launched in 2013 to provide Internet access to thousands of public locations via the Mexico Connected program.

HTS Commitments

During 2014, several satellite operators confirmed their HTS plans and better articulated strategies around HTS. Some examples are:

- **Hispasat:** In 2013, Hispasat became the first operator to provide Ka-band spot beam capacity in South America via a hosted payload arrangement with MNLA. It is anticipated that Hispasat will include additional Ka-band beams in future satellite launches.
- **O3b Networks:** With the (delayed) launch of a batch of MEO satellites, global satellite operator O3b completed its initial fleet and is now able to offer seamless global connectivity. During 2014 O3b started providing services in the Americas, by provisioning a high-speed, low latency link for a Royal Caribbean cruise ship.
- **StarOne:** StarOne-D1, ordered in 2013 and scheduled for launch in 2016 will be the first Star One satellite to be fitted with Ka-band transponders for broadband services.
- **Hughes and Viasat:** U.S.-based HTS leaders Hughes and Viasat are planning to launch two HTS satellites (Echostar-19 and Viasat-2) by 2016/17 that would provide each over 150Gbps. In addition to full coverage of the United States and much of Canada, these satellites will likely cover the Caribbean, Central America and Mexico. Development around these two HTS satellites, particularly over Mexico, is something to watch closely given the potential impact on bandwidth supply and the services food chain.
- **Yahsat:** Yahsat announced in 2014 plans to launch its third HTS satellite in 2016, which will include Ka band capacity over Brazil.

Value-Chain Shifts

The HTS paradigm is forcing all players, including service providers, to reassess their core competencies. Three iconic events occurred in 2014, which could shed light on the roads that traditional satellite service providers could take to transition to HTS service offerings.

- **Telefonica Media Networks:** Media Networks Latin America (MNLA) started offering residential ka-band services in 2014. With a fully integrated ground infrastructure (including Hughes' Jupiter broadband platform and RF Ka-band gateways) and a hosted payload on the Amazonas 3 with 8/9 beams over the major metropolitan areas, MNLA's Ka-band offering could be considered a vertically-integrated platform, but offered to end users via commercial distributors (wholesale model).
- **Hughes Brazil:** In 2014, Eutelsat do Brasil, the Brazilian affiliate of Eutelsat announced a contract with Hughes for the entire Ka-band capacity covering the Brazilian territory. The Eutelsat 65 West A satellite, scheduled for launch in 2016, will host a Ka-band payload with 24 spot-beams, of which many will cover a significant portion of the Brazilian population. Hughes Brazil has been a successful (traditional) service provider in Brazil focused on enterprise users. The shift to Ka-band using owned capacity could signal that Hughes in the future Hughes could transition from a traditional service provider model to a vertically-integrated one (as in the U.S.).
- **Axesat's Acquisition of Enlaces Integra:** In May, 2014, Colombian satellite service provider Axesat completed the acquisition of Mexican SP Enlaces Integra, previously a subsidiary of Mexican satellite operator SatMex. Axesat can be considered a good example of a traditional enterprise-focused satellite service provider seeking growth regionally via geographic expansion and diversification. Axesat will possibly transition to HTS "traditionally": This is, by continuing leasing satellite capacity from wholesale FSS/HTS operators.

Looking Forward

New HTS entrants, value-chain shifts and government plays define Latin America as a new ball game for two-way satellite services, presenting opportunities and threats.

As FSS dominance does not guarantee HTS success, satellite operators are driving differentiating strategies, ranging from open HTS architectures (Intelsat Epic), to vertically-integrated offerings (MNLA, Hughes and ViaSat). However, when looking at the 2015-2017 launch schedule of satellites with HTS payloads, it is evident that several operators are in a "land grabbing" mode, even weighting the risk of an oversupply scenario towards 2017. Oversupply is a sensitive term for the satellite industry. If such a scenario were to take occur, over the longer term such may not be bad news, as lowering barriers could signify supply-side economics which, as a result of less expensive bandwidth, could foster further growth for incipient applications such as residential broadband, 3G & 4G backhaul and mobile data offload.

A changing competitive scenario presents a fertile ground for agile satellite service providers that design and integrate win-win offerings with high efficiency enabled by HTS and sophisticated compression/ optimization



technology. Of particular interest in 2015 will be how Intelsat's 29e satellite, the first of its Epic series, will impact the business of B2B satellite connectivity including mobility, enterprise VSAT and cellular backhaul. Mobility will be a key focus for the Caribbean region, but South America could leverage Epic for enterprise VSAT and backhaul.

Increasingly, Mobile Network Operators (MNOs) are viewed as the ISP by default so the digital divide can be bridged via smart hybrid satellite-cellular interworking. Note that, despite the economic challenges for (data-dominated) 3G and 4G satellite backhaul, a small yet promising number of such services were provisioned during 2014 across Latin America using traditional FSS capacity—Ku-band Epic could catapult this particular market segment.

The satellite play of country governments will be stronger in several Latin American countries looking forward—satellite operators, telecom players and service providers need to adjust plans and seek ways that maximize the socio-economic impact of private-public initiatives around broadband access, 3G/4G backhaul and data offload in remote, suburban or underserved areas.

Carlos Placido is an independent consultant with 20 years of progressive experience in the areas of telecom consulting, business development, engineering and R&D. With focus on emerging satellite markets and technology, he has conducted numerous strategic consulting projects as well as research and management activities, including global market research studies for Northern Sky Research (NSR), business development support for technology vendors and project management at Telefonica. Until 2004, Carlos led a development team at INTELSAT, where he was responsible for identifying and validating future satcom uses of emerging video and IP data technologies. Carlos is also contributor and administrator for Satcom Post.

PocketQube

By Tom Walkinshaw, Chief Executive Officer

Most people in the space industry have never heard of PocketQubes. That's not really surprising, as PocketQubes are a relatively new concept and, for some, they many drawbacks when compared to the status quo (Cubesat/Microsats).

PocketQubes were developed from frustrations within the academic community at the continued, escalating cost of a CubeSat Launch. In the early days of the Cubesats, a 1U cost approximately \$40k to get launched; however, now this has escalated to \$125k, in some cases. The idea behind PocketQube is that if you go smaller, you can significantly reduce your launch expenses to the point that a 5cm cube launch can cost as little as \$20k.

Total satellite project could be around \$35k for the hardware and launch, with PocketQube Shop showing that commercial subsystems can be readily available for this niche community.

There is a fallacy which is quite persuasive in the small satellite community and that is that no satellite under 1kg (1U) can do anything useful. There seem to be a few drivers for this observation. Incumbents generally have products which depend on the CubeSat standard, so they are unlikely to take seriously (at least, publicly) that a smaller standard is able to replicate similar capability.

Another area is just a general awareness of satellites such as WREN, the German 1p (5cm cube) which squeezed in a three axis reaction wheel, camera with SSTV capability and four pulsed plasma thrusters. WREN's total mass was 170 grams and was built by a hardware engineer as a side project in his garage.

Last year, the community witnessed a big breakthrough as the first four PocketQubes were launched into Low Earth Orbit (LEO). These satellites—WREN, \$50Sat, QubeScout-S1 and T-LogoQube—proved that such

satellites could, in fact be flown, tracked and operated successfully.

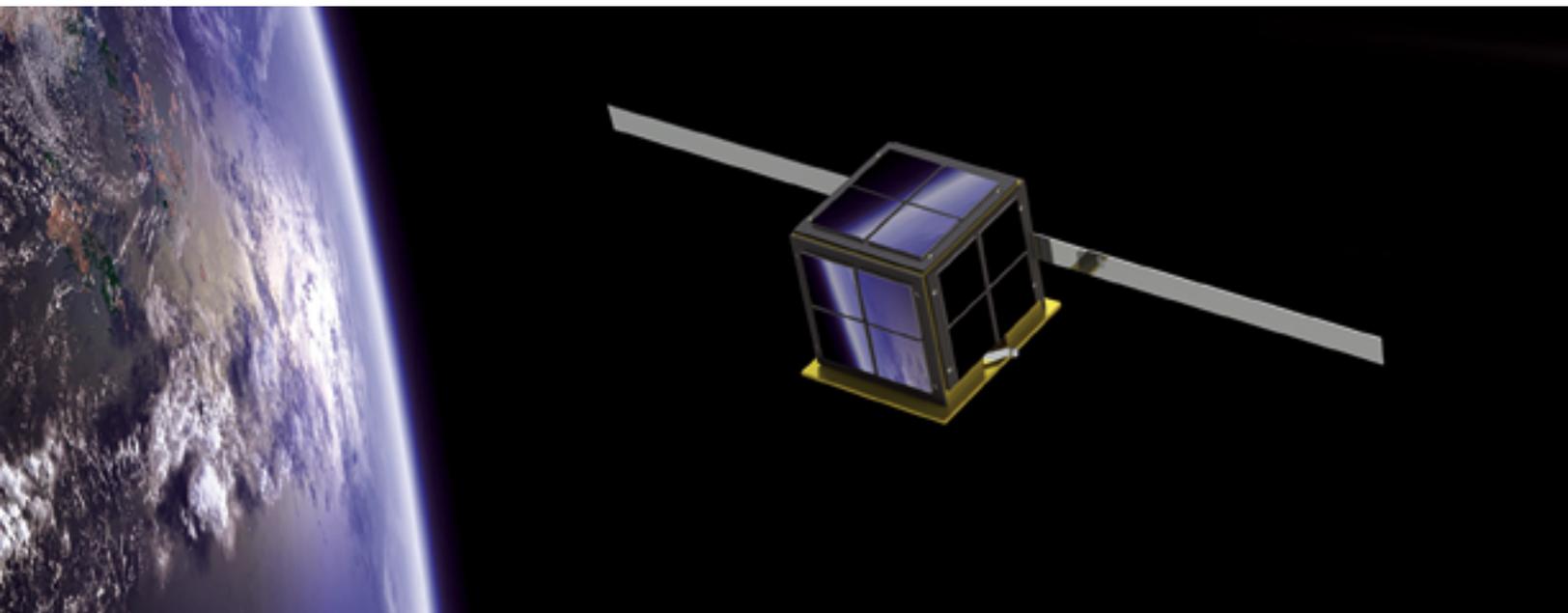
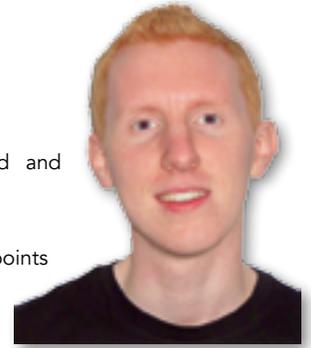
The big standout from the communities' points of view is the \$50sat spacecraft, whose price included the internal electronics and the open source code. At the time of this satellite's launch, this was the world's smallest operational satellite and remains the world's most inexpensive satellite to operate in LEO.

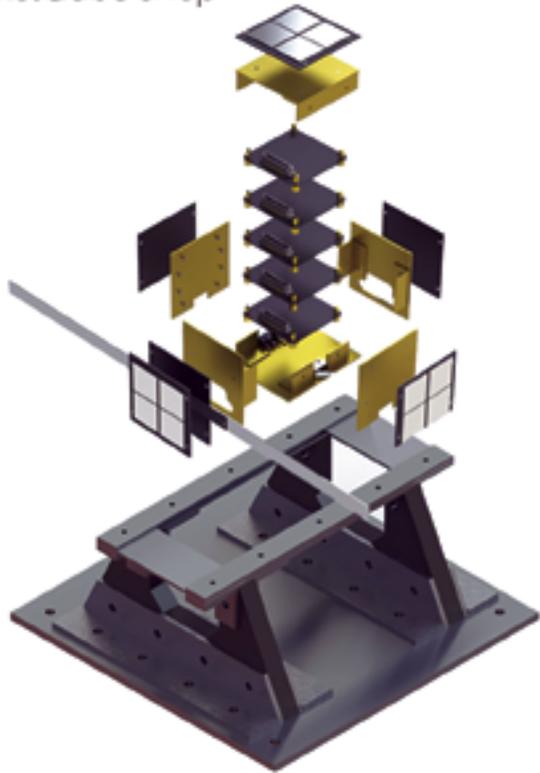
\$50sat's success is important for several reasons. The satellite proves that PocketQube satellites can last at least 12 months on orbit, the build can be managed inexpensively and the work can be completed by people who, in many cases, may have never previously built a satellite.

A key moment during 2014 was the first PocketQube Workshop, which was held at NASA Ames in Mountain View, California. More than 40 delegates attended the one day event, which covered the rapid growth of the PocketQube concept.

Speakers included Prof Bob Twiggs of Morehead State University, the creator of PocketQube; Dr Jerigan, a NASA veteran now helping with T-LogoQube, Sonoma State's PocketQube that is currently in LEO; Chantal Cappelletti from the GAUSS Team; Dennis Wingo from Skycorp; Kris Kimel and Tyman Clements from Kentucky Space. NASA Ames' Pete Worden also contributed to the proceedings. PocketQubes were first proposed by Professor Twiggs (the CubeSat co-inventor) in order to tackle the escalating cost of launches for University groups on tight budgets. The standard 5cm cube can be stacked to create larger spacecraft.

In October, PocketQube won a SMART Award from Scottish Enterprise. The award represents funding of more than \$100k (£63k) to develop the





In May, we partnered with Radiobro of Alabama to add the MiniSatCom Transceiver to our Shop. In September, we added another partnership, this time with DHV of Spain to sell the first PocketQube Solar Panel Sets.

The PocketQube Solar panels are available in a number of configuration including 1p, 2p and 3p. They leverage flight heritage gained from the Unisat-6 microsatellite, which launched earlier this year using DHV Solar panels. Panels can be tailored to different structures upon request. Both MGSE and EGSE have also been developed. In the coming months, we are hoping to add an OBC and a PQ60 Development board.

In addition to our own systems, we are quite keen to collaborate with the wider satellite community and have developed a standard called PQ60 v1.0. This is similar, in many ways, to PC/104, which is used in CubeSats and allows for the incorporation and interface of different parts from various vendors.

PocketQube Shop is the largest vendor of PocketQube hardware and currently sells structures, transceivers and mechanical/electrical ground support equipment. Their Founder/CEO Tom Walkinshaw said:

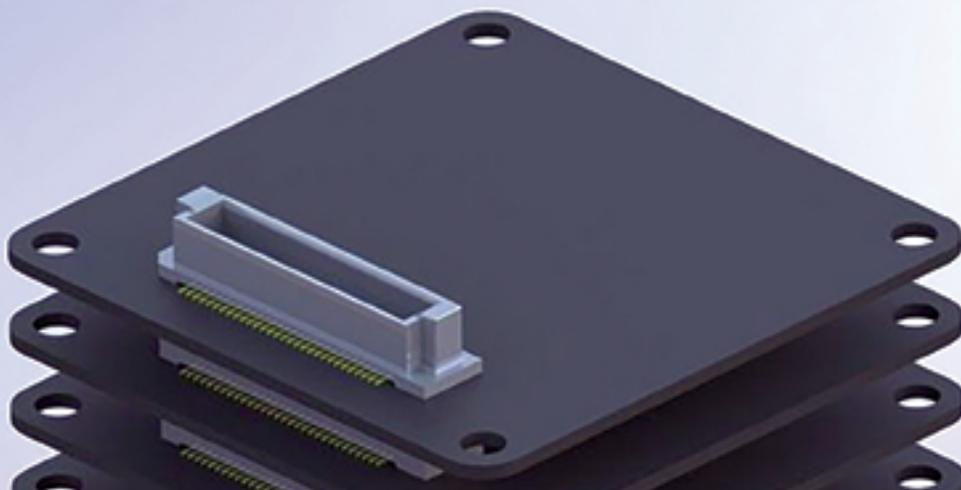
‘We are really excited to be working with DHV on such an exciting and innovative product for the PocketQube marketplace. PocketQubes can cost a fraction of the build and launch price of a Cubesat and therefore COTS hardware make the barriers a lower for first time satellite builders’

The next launch is expected in 2016 and appears likely to be completely sold out. For me this is immensely exciting—the more hardware we orbit, the more people with believe that PocketQube is the obvious way to proceed for smaller missions.

We are also aware of a number of different teams from all over the globe who working on their PocketQubes. These include OzQube-1 from Australia, which is building a 1p with a camera onboard. BME-1 from Hungary is set to build another 1p, this being a follow up to their 1U Cubesat MASAT-1. There are live project being developed in the USA, Argentina, India, Jordan, OMAN and Taiwan. We expect many more during the coming year and are extremely positive about the future of PocketQube.

first commercially available Electrical Power System (EPS) for PocketQube class satellites. For our company, this was a big milestone and gave us the resources to move into our new office/manufacturing space and hire additional team members.

Our company was the first in the world to sell COTS PocketQube components. Our structures were the first component available, funded after a successful Kickstarter campaign.



RR Media

By Elad Manishviz, Chief Marketing Officer

Formerly known as RRsat, RR Media is a leading provider of global digital media services. Our smart global network distributes more than 650 live broadcast channels, 100,000 hours of live events every year and massive quantities of streaming media and VOD content. In addition, we fully manage 150 channels, from "A" to "Z." We have witnessed many exciting changes in 2014.

This year has been a terrific one for RR Media, as the company was recognized by Forbes as one of the 10 Companies Changing the TV Industry. Plus, RR Media won the inaugural TVBAward for legacy content.

In early September, RRsat rebranded to RR Media to reflect the expansion of the company's global media service offerings, which are designed around the needs of the industry and our clients. The company's smart global network, covering 95 percent of the world's population, optimizes content delivery across satellite, fiber and the Internet, reaching more people, in more places on more devices. Our three global media centers, located in metropolitan New York, London and the Middle East, allow our customers to reach a worldwide audience through their local operations.

This year brought new partnerships and smarter technologies to promote our largest expansion in company history. Throughout the year, we delivered and managed live content for some of the biggest sporting events in the world, including the 2014 World Cup, the NFL and the NBA. Our company made superb progress during 2014, with acquisitions and state-of-the-art service enhancements, creating a truly global ecosystem of digital media services. By offering a full digital content solution in many different regions and vertical sectors, RR Media's customer portfolio has significantly increased.

Along with the company rebranding, RR Media introduced a new scalable, global media services platform that was demonstrated for the first time at the IBC2014 Conference, a global meeting place for all those engaged in creating, managing and delivering the future of electronic media, entertainment technology and content. The Global Media Services Platform is a fully integrated, media content management and distribution platform that addresses the entire media value chain for traditional broadcasting and new media. The platform converges the preparation, management and distribution of broadcast and online video into a single workflow, allowing for solutions that accommodate any customer—and is accessible globally.

Customers are free to focus on the creation of their content and viewer offerings, while our team manages and implements all operational and technical aspects of content preparation and distribution.



We recently introduced a number of new additions to the platform, including a U.S.-based channel origination and playout service, to make RR Media's services more accessible to local customers in the United States and the Americas. Additionally, we have introduced an innovative, automated, dubbing solution that enables broadcasters and content owners to quickly and effectively localize their content, creating new audiences and further opportunities to for revenue generation.

As mentioned earlier, October saw RR Media named in Forbes "10 Companies Changing the TV Industry," which recognized the company's innovative and long-term commitment to remain at the cutting edge of market developments. The list features the world's leading companies in the media industry and celebrates new innovators as well as traditional TV players. RR Media also won the award for legacy content at the inaugural TVBAwards. The award recognized RR Media's delivery and restoration of British Pathe's historic archive for YouTube, consisting of 85,000 pieces of video content from the 20th Century.

In August, we announced the expansion of our group to lead the growth of our U.S. sales team with industry veterans Rick Phelps and Dante Neyra. They have helped strengthen our presence and capabilities within the North American and Latin American markets. These two additions will add depth and strength in multicultural and digital media, enabling RR Media's global strategy to build and establish relationships within the regions.

Following the IBC Conference, our company announced a three-year deal as the delivery partner for Premier League football club Arsenal's International Programming Block. Arsenal matches, as well as two magazine shows weekly, will be optimized for delivery using fiber and satellite to reach millions of households in Europe and Asia. We are thrilled to have the privilege to distribute high-quality content for one of the world's most successful and recognized Premier League clubs.



Our ability to distribute high-profile sports content worldwide is aptly demonstrated, while also giving us the platform for future partnerships with sporting clubs and other organizations.

Signing a multi-year deal with Cisneros Media, RR Media provides a secure and reliable technical platform to deliver its content around the globe, launching new channels and expanding into new territories. RR Media will provide Cisneros Media with full playout and global distribution services for their portfolio of payTV channels, which includes Venevision Plus, VmasTV and VePlusTV, with reach into the Latin American market. This partnership is the first for RR Media in the Latin American market and signifies the company's commitment to broaden local capabilities throughout the Americas.

In April, iConcert, the cross-media entertainment channel, signed a three-year extension to the global media services deal as RR Media's role expands to become the single supplier for playout and global delivery. Under the agreement, RR Media provides the end-to-end solution allowing iConcert to focus on its core business and expand its audiences.

Shortly after the company's rebranding event, we collaborated with leading sports media services company Deltatre. Our companies are working together to deliver interactive and engaging sports content that will be viewed by billions of fans from any location in the world. We provide our smart global distribution network which uses satellite, fiber and Internet connections to optimize content while Deltatre provides its media asset management system. The live or on-demand interactive content is delivered to users across multiple devices. Additionally, it provides analytic information on user behavior and branding opportunities leading to monetization options for partners and advertisers. Our partnership with Deltatre offers broadcasters and digital content owners a full range of hassle-free media services from taking and managing to delivering and monetizing their content. Our customers are able to focus on new and creative ways of making their content engaging to their clients in real-time, all the while generating new business opportunities worldwide.

September was a busy month for us, as we announced a new partnership with Harmonic to offer next-generation, converged media management and delivery services for broadcast and online media applications. Working with Harmonic places us in the unique position to adopt next-generation

virtualization technologies, allowing us to rapidly move to more regions and to work on behalf of customers with more complex requirements.

At this year's IBC2014 conference, RR Media demonstrated, in cooperation with Kaltura, its converged broadcast, online video service offering for broadcasters and content owners. This service allows content owners and publishers to prepare, manage and deliver content to any network, in any format, on any device.

As viewer habits and experiences are changing rapidly, opportunities exist to monetize the same content over a variety of screens via many different models. A unified and efficient way of preparing, managing and distributing content is, therefore, required in order to effectively support viewer demand in a cost-effective manner. RR Media's converged service offering provides a fully managed, end-to-end solution, allowing broadcasters and content owners to focus on new and creative ways of producing engaging content, as well as generating additional revenue.

Our core business goal remains enabling customers to focus on their needs. To do that, we will need to continue to create flexible, software-based solutions that make it easier for our customers to enhance their business. With that, we will see more integration among our products and those of our partners, as well as a shift toward cloud-based solutions.

As 2014 comes to a close, we can say we've taken great strides toward providing a variety of broadcasting solutions, to engaging new partnerships as well as launching our new platform, which pioneers new, patent-pending, cloud-based technology.

Moving from a dedicated hardware infrastructure to more software and cloud-based solutions is the logical progression for RR Media as technology matures. We look forward to continuing to be a significant force in this vibrant industry in 2015—and beyond.

Elad Manishviz was appointed as CMO of RR Media in January 2014. Mr. Manishviz brings more than 15 years of business leadership and experience in the digital media, entertainment, video and the advertising market segments. Mr. Manishviz held a variety of executive positions in global media-related software, communications and Internet-focused companies. Prior to joining

RR Media, Mr. Manishviz was the CEO of Wallstream and he has also served as VP Products and Strategy at DG-MediaMind. Previously, he served as a VP of Products at NDS (now part of Cisco). Mr. Manishviz holds an Executive MBA from the Hebrew University and Bachelor degree in Media and Management from the College of Management in Tel-Aviv.



Satellogic

By Emiliano Kargieman, Founder and Chief Executive Officer

Similar to the promise of cyberspace in the late 80's, untapped by the massification and miniaturization of microelectronics, Space is today's new Wild West: a vast territory with boundless potential, whose time has come to be developed.

Satellite services have been available for more than 30 years; however, the high up-front investments needed to build traditional satellites, in addition to long development cycles that is frequently counted in decades, produced an industry with a distinctively low rate of innovation.

Space gives us a highly unique vantage point to tackle some of Earth's most pressing problems, and yet, until now, that unique potential has been systemically underutilized. That's the reason why Satellogic was created.

With a background in software and network engineering, it was clear to us that what was needed to harbor and embrace innovation in space was to build a new, accessible distributed platform in Low Earth Orbit (LEO). The platform had to be created using inexpensive components that could be produced in short, agile development cycles. We set out to accomplish this goal.

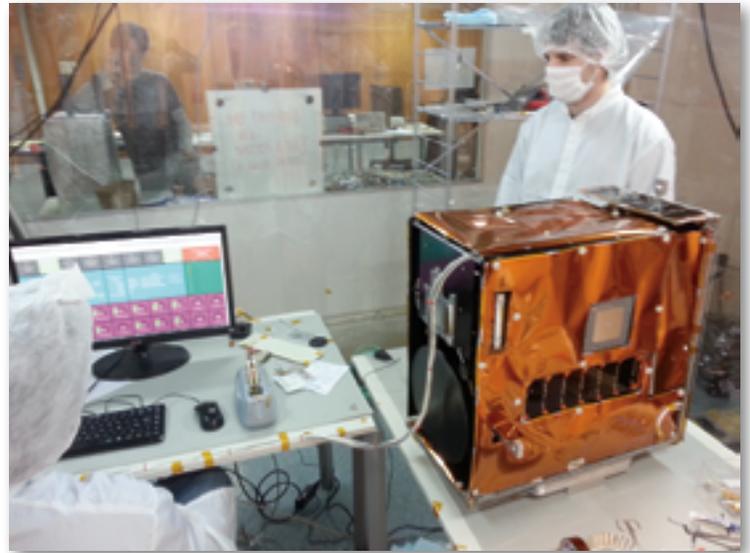
For those who may be unfamiliar with Satellogic, we are a global company building a constellation of satellites to provide affordable, commercial grade imaging and observation data for any part of the world, in high-resolution, in real-time.

By operating a coordinated mesh network of imaging sensors orbiting the Earth, we aim to reinvent and improve the way we make daily decisions on agriculture, oil and gas, and many other prominent industries, while democratizing access to space-based data and making the unique vantage point of space available to every individual.

This was a big year for Satellogic. After three years of working quietly on our technology, we officially introduced the company to the world in May and launched our 3rd satellite—BugSat-1, nicknamed Tita—from the Russian launch base of Yasny in June.



BugSat-1's predecessors—CubeBug-1 and CubeBug—had been launched earlier, in April and November of 2013. In 2015, we plan on building an additional 15 satellites and setting up our service constellation which, in the following years, will lead to hundreds of satellites on orbit, with the ability to monitor global processes and to image every area of the globe.



SATELLOGIC

BRINGING SPACE DOWN TO EARTH

Commercial-grade Affordable Earth Observation in Real-time





2014 will be remembered as a hinge year for Earth Observation (EO), with massive companies, including Google, starting to take a vested interest in the sector. A new cadre of startups have directed their innovative approaches to materialize the promise of space, appropriating technology that belonged, until now, only to the realm of governments and big space agencies.

Some of the biggest challenges we'll face as a society in the next 20 years will concern how we manage food production and distribution, energy generation and distribution, and our natural resources.

We will be able to evaluate and address these issues based on reliable data as we begin to quantify the Earth with our platform. It won't matter if the platform is monitoring hydric stress in your backyard, pirates off the coast of Somalia, visualizing weather patterns or monitoring social conflict, the focus is on serving customers' needs.

At Satellogic, we are focused on building the platform that can deliver crucial data from space, to allow us to engage more closely with our planet. We look forward to the coming year and beyond—truly "Bringing Space Down To Earth."

With a formal background in Mathematics and Philosophy, Emiliano has spent the last 20+ years building technology and technology companies. He founded his first company at age 15; later, he co-founded Core Security, developing pioneering work in the Information Security and Software industries. For his work in Satellogic, he was awarded the "Most likely to impact the lives of 1 Bn people" award by NASA Ames-based Singularity University.



Signalhorn

By Robert Kubbernus, President

When times are lean and everyone is concerned, thinking about budget cuts, listening becomes one of the most important skills to acquire and use in business.

At Signalhorn, we focused in 2014 on talking to our customers about how they were using the services they were purchasing from us and finding out what else they wanted us to be doing for them. As a result, we gained a deeper understanding of where they wanted to take their businesses, and how we could support them in that effort.

We noted three trends emerge from these listening sessions with our customers:

- *The one word that kept coming up was “austerity.” Every organization and every country we encounter—with the possible exception of the United States—is still talking about austerity, austerity, austerity...*
- *Despite this widespread lean-and-mean business mentality, our regional customers continue to have global strategies and global aspirations. They want to grow regionally and internationally.*
- *Countries operating in the hot spots of the world where we provide services, such as Africa and the Middle East, have raised their tolerance level for civil disorder. They are willing to take more risks than they were five years ago to maintain their remote operations.*

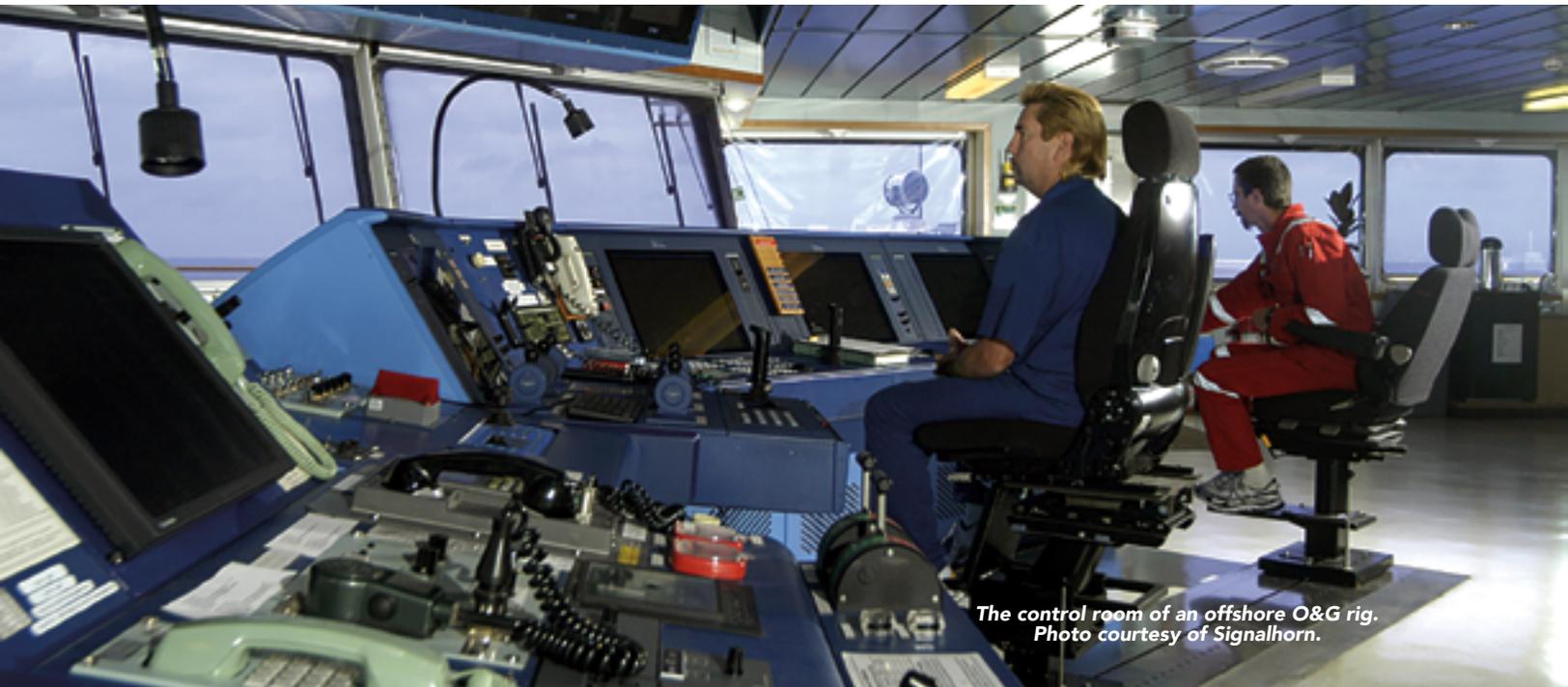
These trends in 2014 presented us with many opportunities to help our existing customers make better use of the network and satellite services we provide to them.

One example of this is the work we have been doing for Mayr Melnhof Karton, based in Vienna, Austria. The company is the world’s largest producer of cartonboard, a product familiar to anyone who ever opened a box of breakfast cereal. Mayr Melnhof operates seven cartonboard mills in Europe and 33 other plants around the world that print and fold the raw cartonboard to create packaging for food, cleaning products, beverages and a variety of other labeled goods.

Some of the company’s machines produce a 12,000-pound roll of thin cardboard in eight minutes, running so fast that they cannot easily be stopped and restarted. These machines are all controlled by automated systems running on a huge network based in Vienna, making continuous and reliable communication network links indispensable. To prevent this, we provide Mayr Melnhof with backup satellite connectivity as an “insurance policy,” available in case of a general network outage, or a local disaster such as a flood or fire, which could disrupt the company’s land-based connections.

With Mayr Melnhof and other customers, it is no longer good enough to just sit back and offer a few megahertz of satellite capacity or access to a fiber network. We focused in 2014 on really understanding our customers’ technical, security and other issues, always with a view toward how can we help them meet their financial goals. Often in 2014, we had to resell our austerity-minded customers on the benefits of Signalhorn services as part of a collaborative discussion of what they were trying to achieve in their business. In many cases, we found that, despite worrying about expenses in the short term, our customers are focused on long-term global





The control room of an offshore O&G rig. Photo courtesy of Signalhorn.

strategies. Many of them have established footholds in particular regions but are anxious to expand, particularly into Africa and the Middle East.

One such customer is KCA Deutag, one of the world's leading energy drilling and engineering contractors. The company, based in Aberdeen, Scotland, has extensive operations in West Africa, the North Sea, Russia and Southwest Asia. The company is expanding its operations in the Middle East, and signed a contract with us to provide hybrid network connectivity to seven land rigs in Oman as well as three new rigs and a warehouse in the Khazzan gas field there.

In spite of the turmoil in parts of the Middle East and Africa, we have seen few signs of customers wanting to pull back their operations, with the exception of those in Libya. Even in Iraq, we are much new commercial activity. Most companies have come to the realization that civil unrest is going to continue for a long time and is just another cost of doing business.

Also in 2014, we made investments in our network with "smart" routers and other technical improvements, partnering with outside support companies to help us manage the network. We worked the bugs out of the new equipment and now have a much more responsive and robust network than we did before the work began. Along with these endeavors, our push to much greater network security and compliance to meet PCI DSS standards and more are all underway. Network security is at the top of our mind as well as for all of our customers—Signalhorn must be at the forefront of these efforts.

As we move toward 2015, we feel that we are managing our own business better than ever—we worked through the same austerity exercises as many other companies—and are looking at our customers completely differently than we did a year ago. We plan to triple the size of our commercial department in 2015, adding seasoned people in the U.K., Africa, North

America and Asia.

In 2015, we expect that business conditions in the many nations and regions that make up the global economy will begin to improve. If that happens, we will likely see reduced focus on corporate belt tightening. However, we expect that our customers will continue to focus on obtaining the best value from their network provider—we intend to continue supporting them in that endeavor.

Robert J. Kubbernus is President & CEO of Signalhorn, a global provider of network services and communications solutions with global operations that are supported by the company from their operations centers in Germany and Switzerland. He assumed the position in February of 2012 when he acquired Signalhorn (then named Satlynx) from its previous owner, GE.

Canadian born, Mr. Kubbernus has more than 25 years of leadership experience in companies involved in telecommunications, IT and Network Security, e-commerce, plus other industries.

Prior to purchasing Signalhorn, Mr. Kubbernus was President & CEO of TrustComm, a Houston-based telecommunications company providing satellite and terrestrial services to corporations and government organizations. TrustComm, formerly known as Skyport Global Communications, operates from the Ellington Field Joint Reserve Base and is a major provider of telecommunications services to the U.S. National Guard, FEMA, U.S. Department of Defense, and others.

In 1990 Mr. Kubbernus established Bankton Financial Corp. in Toronto, Canada, and remains the company's President and CEO. Bankton has provided private investment and investment services over the past two decades with a focus on internal investments. In 2000 he was nominated as Ernst and Young's Entrepreneur of the Year and appointed on Venture Magazine's list of "Most Influential People." He has taught computer science at the university level and has served on a number of corporate boards in Canada and the United States.

Skyware Technologies

Dr. David Geen, Managing Director



For Skyware Technologies, 2014 represented an enormous build-up toward the proliferation of new Ka-band VSAT service offerings that are scheduled to come online over the next several years.

One has only to look at satellite launches that are planned between 2012 and 2016 to see evidence of this anticipation in the marketplace (please see Figure 1). Twenty-two Ka-band satellite launches are projected to be completed this year; that's more than four times than those launched in 2012.

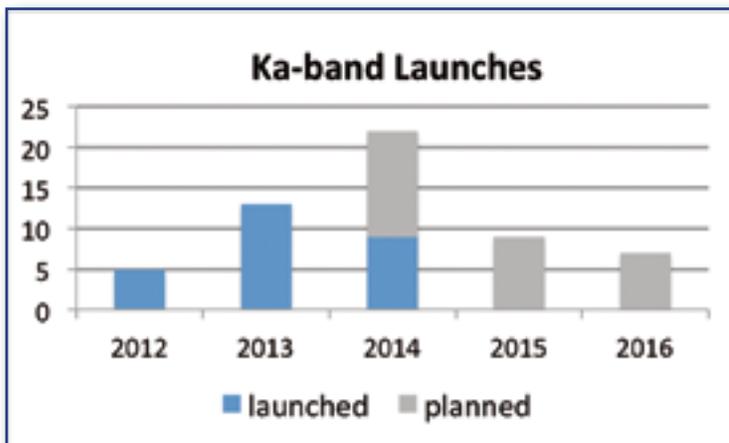


Figure 1.
Ka-band Satellite Launches 2012-2016.
Satellite data from satbeams.com and o3bnetworks.com—
Data realized on October 30, 2014.

There appears to be insatiable demand for bandwidth from consumers, governments and enterprises alike, all being driven by a dramatic rise in the use of IP for video media distribution, enterprise data collection, and audio and video communications. This new capacity will bring connectivity to an even greater base of end customers and to new applications as it drives down the cost per bit and extends coverage nearly everywhere through

a host of regional and global operators. Broadband access is on the path to ubiquity and VSAT will play an important role in this.

In anticipation of the burgeoning demand for high quality and affordable Ka-band ground segment equipment, Skyware Technologies has invested for more than three years in a suite of platforms that are designed to address a cross section of end user market segments. These platforms range from RF transceivers for consumer broadband and enterprise remote applications as well as transportable terminals that address the demanding needs of enterprise and government customers (please see Figure 2). In addition to these platforms, we have developed products that have been optimized for large VSAT OEMs, with deployments all over the world to support regional and global services. One example of this is our partnership with Inmarsat to develop a line of integrated terminals for their first-of-a-kind Global Xpress network, for which we are an approved manufacturer.

Just as the cost per bit of data service is an important metric to the adoption of satellite communications, so is the cost of purchasing and operating the necessary equipment. While a glut of new network capacity will undoubtedly tend to drive average data prices downward, we believe that the variety of technology implementations between networks will force customers to compromise flexibility or invest heavily in several terminal platforms, incurring additional capital, maintenance, transportation and training expenses. These “hidden” costs are considerable drivers of the total cost of managing an organization’s communications infrastructure. Enterprise and government customers with operations across regions or around the globe will find a great deal of value in solutions that minimize such costs. For example, media news gathering organizations that require reporters to travel to any place on the globe on a moment’s notice will benefit greatly through the use of an equipment platform that they are familiar with, able to operate easily under pressure, and are confident that the system will work anywhere needed. Without a flexible technology platform, a news bureau will be forced to purchase and manage a stable of different terminals in order to support their organization’s mission.



GX Over the Air Test a Success

The transportable ATOM 65, fixed SKY terminals, and 5 watt DRC transceiver have passed Inmarsat’s rigorous factory acceptance and over the air tests.



Image credit: Inmarsat



Figure 2.
The Skyware Technologies ATOM 65 Ka-band Transportable Terminal

We believe that Skyware Technologies has a role to play in driving down the total cost of VSAT connectivity through the development of versatile, modular, communications platforms – versatility that allows our customers to maximize the reuse of existing hardware investments from one application or location to another.

For example, the Skyware Technologies DRC RF transceiver family (please see Figure 3) supports a wide variety of modem and hub technologies and provides electronic frequency sub-band switching and unique electronic polarization switching capabilities. These features make the DRC the most versatile Ka-band transceiver on the market and help our customers reduce their total cost of ownership by avoiding unsafe working conditions to reach the transceiver wherever it is installed (e.g., on top of a news van), increasing system reliability because of reduced need to expose the feed chain to environmental hazards, and maximizing reuse of equipment when switching between different satellites and modems. Similarly, the ATOM line of transportable terminals is designed around a modular platform such that it can be adapted in the field between networks or even VSAT frequency bands—without the need for tools.



Figure 3.
The Skyware Technologies DRC Versatile Ka-band VSAT Transceiver

Without a doubt, we view the ongoing proliferation of new Ka-band capacity as beneficial to end users and for the competitiveness of the VSAT industry in general. However, bandwidth is only one variable in the total expense of communications and there are numerous other costs to consider when deploying new technology into a particular application.

The new capacity may all be called “Ka,” but each network implementation varies enough to introduce potential hurdles in realizing all the benefits offered by choice and global availability. At Skyware Technologies, we are committed to delivering on the promise of “Ka” and preventing our customers from being bitten by the hidden cost of variety.

Dr. Geen received his BEng (Hons) in Communications and Electronic Engineering in 1992, followed by his PhD in Antenna Design, both in Newcastle, UK. He began his career working in the USA designing bespoke feed chains for large Earth station antennas. Dr. Geen has nearly 20 years of experience in the design of communication systems for terrestrial and satellite applications. Following several years in Engineering management, David spent the last three years establishing and growing Skyware’s deployable terminals business for Enterprise, Media and Government applications. This was ultimately the catalyst that led to the recent spin-out of Skyware Technologies as a new and exciting company offering cutting-edge Ka-band RF electronics and terminals for the Satellite industry. Recently David was made Managing Director of the company and now strives to build on the foundations of the business he helped establish three years earlier.



Approaching 2015, Spacecom's AMOS brand is a well known name across the globe. As an emerging global satellite provider, we have moved from providing satellite services in Europe—primarily to Central and Eastern Europe (CEE) and the Middle East—to also bringing our services to all of Africa, areas of Asia and soon to Western Europe, as well.

We have also introduced new technologies to maintain and ensure Spacecom's world-wide reputation for excellence. We believe that these moves enhance our reputation for customer service and will continue to be powerful tools for our future.

Since the successful launch of AMOS-4 to the 65 degrees East prime orbital position, where it serves Asia and Africa with valuable Ku- and Ka-band capacity, Spacecom has expanded into new markets that are hungry for reliable service. Today, the AMOS fleet consists of the AMOS-2 and AMOS-3 satellites co-located at the 4 degrees West orbital location serving Central and Eastern Europe, the Middle East and the U.S. East Coast, AMOS-5 located at 17 degrees East serving Africa and the Middle East and AMOS-4.

Together, our satellites offer a wide range of communication and broadcast services for the telecom, broadband and broadcast markets such as Direct-To-Home (DTH) and Direct Broadcast Satellite (DBS) operators, Internet Service Providers (ISPs), telecom operators, network integrators and government agencies.

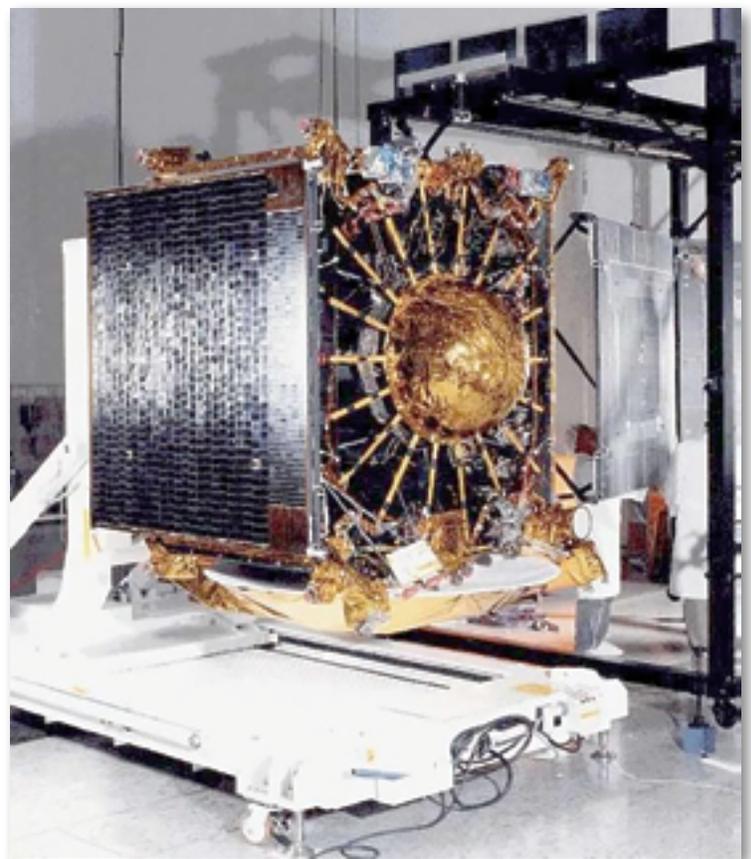
During the past year, we generated business in all areas of the spectrum: broadcast, broadband, government and corporate. Telecom operators are using the AMOS fleet for data backhaul and innovations in the area of Internet broadband, whereas our traditional broadcast business, especially in Africa, is enabling clients to move to digital from analog technologies. Spacecom is expanding the AMOS brand and continuing its emergence in new markets.

This year we also introduced and launched a Satellite-Cellular hybrid service. Our hybrid solution for Internet provisioning is based on our providing the upchannel to the cloud via a cellphone. Here, a user sends a request to the cloud via a GSM modem and all the information is accessed from the satellite with a high throughput datalink. This is a great solution for bringing affordable broadband Internet to more users who require excellent service at a cost effective price.

In 2015, AMOS-6 is scheduled for launch and the start of commercial operations. To be co-located at the 4 degrees West orbital position with AMOS-3, and replacing AMOS-2, AMOS-6 will be larger than both of those satellites combined and will incorporate new technologies such as High Throughput (HTS) Ka-band spot beams for improved broadband Internet access, covering Europe and Africa, as well as Ku-band technologies for new and existing clients. AMOS-6 will expand our European coverage with a new Pan-European beam.

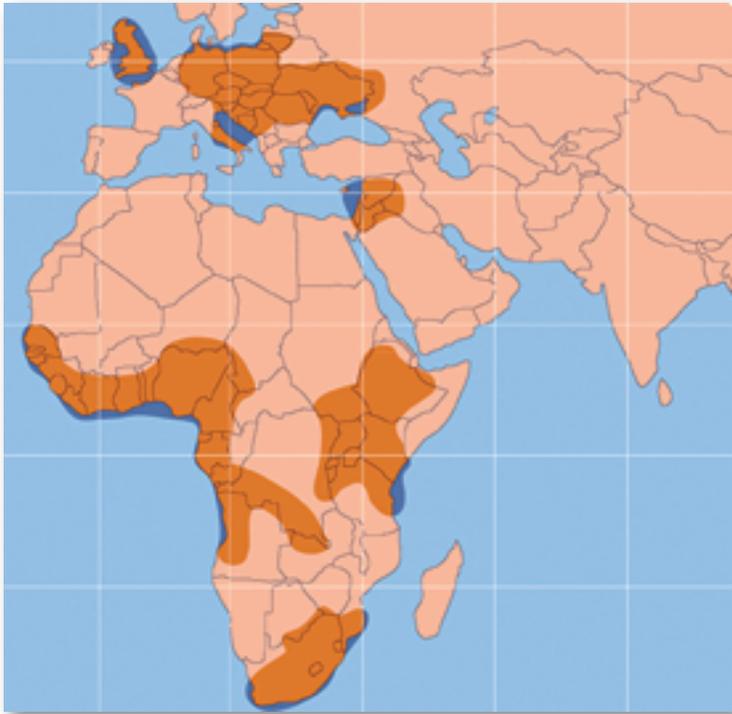
AMOS-6 will offer 39 Ku-band segments and 24 Ka-band beams to provide a wide array of services. The satellite will be fitted with numerous new technologies that include electronic propulsion capabilities to save on weight and cost. We look forward to AMOS-6 having a long service life and this satellite will assist in maintaining our leadership position in Europe. Indeed, the new satellite is important for Spacecom as it will open even more new markets that include Western Europe and AMOS-6 will also bring Ka-band spot-beams to portions of Africa.

AMOS-6's HTS capacity and attractive Mbps cost will answer the markets' emerging needs. In the next few years, we see AMOS-6 playing a role in providing dual-play with UltraHD content to specific markets; 3G and 4G backhaul to smaller sites to enhance low ARPU; IP trunking; Oil & Gas platforms; and government services, among many. The satellite's unique coverage and built-in operational flexibility are designed to concurrently provide multiple services so that our clients can engage their customers with top of the line offers to generate more business.



Spacecom's AMOS-6 satellite during the build process.

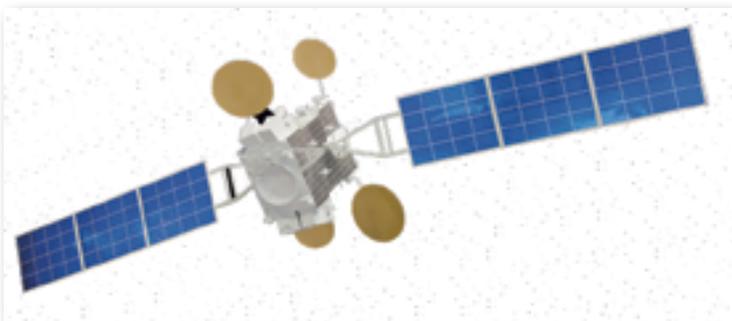
In 2014, as well as into the future, Europe is a key market for Spacecom. During our two decades of operation in this region of the world, we have developed long-term relationships and partnerships with the numerous key players and major media groups. From our 4 degrees West orbital position 'hot-spot,' the



AMOS-6 Ka-band spot beams.

AMOS constellation provides excellent, strong broadcast neighborhoods. Clients include DTH platforms such as T-Home SatTV (Magyar Telekom) in Hungary, a subsidiary of the Deutsche Telekom group; Xtra-TV in the Ukraine and Israel's Yes. These DTH operators anchor our European business. With one of the strongest satellite presences in the CEE region, AMOS also works with leaders like HBO for its European cable and IPTV distribution, Ukraine's Inter Media Group and MTV channels, among others.

Africa is also important for Spacecom. Our expansion into Africa with the AMOS-5 satellite located at the 17 degrees East prime orbital position has been exciting and the opening of this market is part of our growth strategy to focus on developing markets. AMOS-5 is an excellent platform for all types and manners of broadcast, data and telecom services. With a pan-African C-band and three Ku-band capacity, the satellite reaches all of Africa with significant signal strength and the capability to bring more bandwidth to customers. Working with governments, international corporations, local broadcasters and an array of other businesses, we are constantly moving forward over the continent.



Artistic rendition of Spacecom's AMOS-5 satellite.

In Africa, the demand for satellite services is expanding. Broadcast is being driven by increasing numbers of HD channels as well as the growth of local or regional broadcasters. Data services are being pulled by an increase in portable and digital devices while telecom services are being positively influenced by the growth of mobile platforms that are used by more and more people as their primary method of communication.

Corporate and government sectors are also growing. New contracts for digital services, including telephony and broadcast, are increasing and ushering the continent further into the digital era. As in other areas of the globe where communications services face boundaries due to geographic challenges, African countries are also investigating how to provide basic communications services for all of their population whether in urban, outlying or rural areas.

Our teams are continuously working to make the future brighter. Our strategic development team is advancing programs to generate new business opportunities around the world. The AMOS brand is respected in our markets for service, response and the ability to provide solutions that work. This will continue to be the case, as well, in the future.

Joining Spacecom in 2009, Eyal Copitt leads the African sales efforts. Mr. Copitt brings with him more than 20 years of worldwide consulting and sales experience, of which 15 were in the African IT and Communications Markets working with governments, private and national owned Telco's, the finance industry and education networks. Prior to joining Spacecom Mr. Copitt served as VP Sales Africa at Gilat Satcom and as the Africa District Manager at NetApp (NASDAQ: NTAP), where he was in charge for developing new markets in the African Markets.

SpeedCast

By Pierre-Jean Beylier, Chief Executive Officer

Since embarking on our global expansion two years ago, SpeedCast has enjoyed substantial organic growth across all of the verticals that we serve. Equally pleasing has been the company's growth in terms of product offerings, geographic reach, number of customers, revenue, and the number and the skill diversity of our employees.

2014 was undoubtedly a monumental year for the business: from opening several new offices and sustaining strong organic growth, to the acquisition of two satellite services providers and our IPO on the Australian Securities Exchange (ASX), the past 12 months have propelled SpeedCast to become a new global force within the satellite industry.

The year commenced on a strong note with the opening of our new facilities in Perth, Australia, and the launch of our new organization in Australia, integrating acquired companies, all designed to better serve the nation's natural resources sector. Launching our new office in Perth was a step forward in our strategic infrastructure investment to address the needs of our oil and gas (O&G) and mining customers, allowing us to provide services into Africa, Asia and within Australia directly from Perth.

We also opened a new facility in the important maritime and offshore hub of Singapore to focus on the delivery of services and support for the maritime market, augmenting SpeedCast's extensive presence in the South East Asian region. The Singapore office has grown rapidly since its inception, with the addition of 10 additional staff to support the growth of our business. The Singapore office demonstrates our dedication to serve the maritime industry, which has been a key growth driver for us, especially as the adoption of broadband satellite systems continues to accelerate in this market.

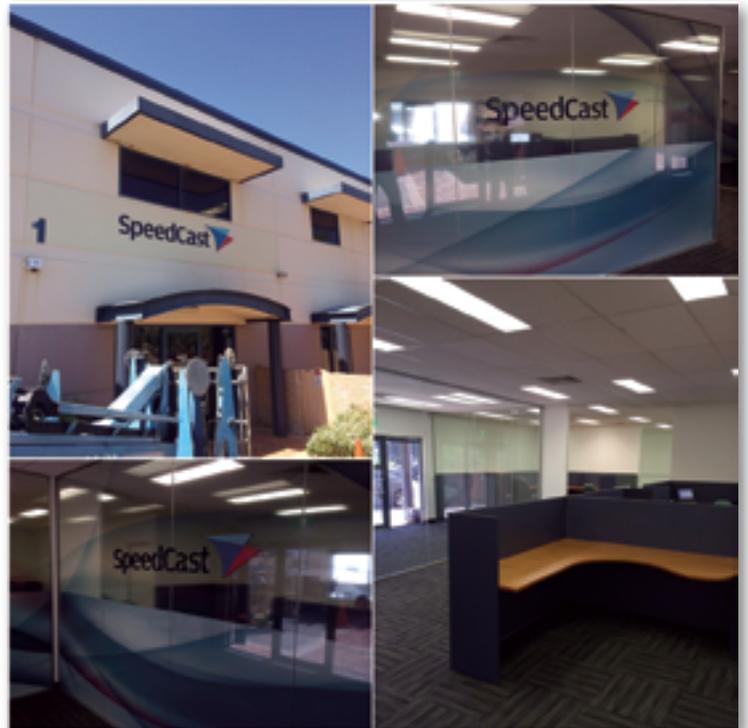
Most recently, our expansion continued with the establishment of a new Energy Division as well as the opening of an office in Houston, Texas. Headed by Keith Johnson, Senior Vice President / GM, the new division will deliver solutions to energy customers who expect high reliability and uncompromising customer service. With many of the largest global energy companies based in Houston, this location was an obvious choice for us for a new division there—this will allow us to be closer to key decision makers and provide them with a strong alternative for their communication needs.

A pinnacle of 2014 was SpeedCast's debut on the Australian Securities Exchange (ASX) in August, following strong institutional and retail response to our Initial Public Offering (IPO). The ASX listing will enable us

to continue executing our global growth plans and to focus on delivering high-quality service reliability and customer support.



Looking back to early 2014, we successfully unified the SpeedCast brand by consolidating Australian Satellite Communications, Pactel International, Elektrikom Satellite Services and SpeedCast Limited under one, new, global brand, to create a single identity which positioned us as a top five international industry player.



SpeedCast's Perth, Australia, location.

We are proud of our heritage in, and to, Asia. Through our dynamic growth process, we have developed broad global experience and capabilities and with this single identity, we reaffirmed that we are truly a world player within the SATCOM industry.





flexibility, reactivity and an unwavering focus on our customers and their communications needs.

The proliferation of data connectivity and broadband mobility represents one of the fastest growing markets for satellite services. We anticipate this trend will continue into 2015 and will continue to fuel growth opportunities for all aspects of satellite communications.

This has been a monumental year for SpeedCast in 2014. As we look ahead to 2015, delivering fast and reliable communications that exceed our customers' expectations is our top priority. We look forward to an equally exciting 2015 for SpeedCast, as we continue our growth story and enable the success of our customers.

Mr. Pierre-Jean Beylier has been Chief Executive Officer of SpeedCast Ltd. at Asia Satellite Telecommunications Holdings Ltd. since July of 2004. Mr. Beylier has led the sales and marketing activities of SpeedCast Limited since 2000 and he has more than 15 years of international sales and marketing experience. Prior to joining SpeedCast Limited, Mr. Beylier held various sales and marketing positions with Rhodia, a company listed in Paris, and gained experience in consumer marketing while working at Black and Decker France. He serves as a Director of SpeedCast Ltd. Mr. Beylier graduated from the Lyon School of Management and holds a Master's Degree in Business administration from the University of Southern California.

ReadyCONNECT™TA12 is a mobile VSAT solution that combines portability and rapid deployment equipment, providing instant access to the Internet, wireless and voice applications.

Our growth strategy combines strong organic and acquisitive growth. To strengthen our leadership position in the Australia-Pacific region and affirm our commitment to serve the energy sector in its key areas of operations, SpeedCast made two strategic acquisitions of SatComms Australia and Oceanic Broadband Solutions. Both companies have prime teleport facilities in our key markets (Perth, Australia and Port Moresby, PNG), which are expected to add tremendous value for our customers in terms of speed and reliability as well as access to a wider support network and enhanced engineering and IP capabilities. SatComms Australia also provided us with a new facility in the fast growing Queensland market.

Since embarking on a global expansion journey back in 2012, SpeedCast has continued to demonstrate organic growth, based on reliability,



SpeedCast comms solutions are aboard Allseas' flagship, the Pieter Schelte, to supply broadband connectivity between the vessel and the company's land-based operations.

SRT Group

By John "JR" Russell, Chief Operating Officer

The SRT Group wishes to present their playlist for 2014 and 2015...

Overview: "Running Down a Dream" (Tom Petty)—Looking back on the last 12 months, to see how far we have come at SRT Group is breathtaking. We launched two market-disrupting products; earned increasing attention in the marketplace; took 18 trips to pitch our products in 12 countries; and enjoyed the best form of jet lag—exhaustion from a job well done.

Founded 15 years ago to exploit the convergence of cellular, Wi-Fi, and satellite communications technologies, the SRT Group of companies delivers mission-critical hardware, software, and services to major business, government, and nongovernmental customers. We are proud to serve customers in a variety of important sectors including national security, law enforcement, commercial telecommunications, oil and gas, and maritime.

We are also proud to be entirely self-funded. All of our employees are based at our headquarters in Davie, Florida, where we perform all of our research, development, manufacturing and training programs. We have doubled in size over the last five years; reached \$25 million in annual revenues; and passed the 100 mark in our workforce, including subject matter experts in MSS L-band, 802.11 and 4G.

A Look Back: "Satellite" (Dave Matthews Band)—This has been one of the most exciting years for SRT in my seven year tenure, with deepening partnerships and technological breakthroughs fueling the promise of greater growth in years to come. A key highlight was our growing partnership with Thuraya Telecommunications Company, a leading mobile satellite services operator reaching nearly two-thirds of the globe (over 160 countries), via satellite. Thuraya has GSM roaming agreements with over 360 mobile operators around the world.



Last year, Thuraya selected SRT Wireless to provide it with a new, "all-in-one" satellite modem, essentially a software-defined radio (SDR) for advanced SATCOMs. The result of 42,000 hours of development, the VIPturbo is a compact, single-board modem that can handle all of the data and telecom services on Thuraya's satellite network and can be modified to support additional waveforms. Specifically, the product enables developers and end users to access every service available on the Thuraya network, including voice, GmPRS (for low data rates), and high-speed IP data services.

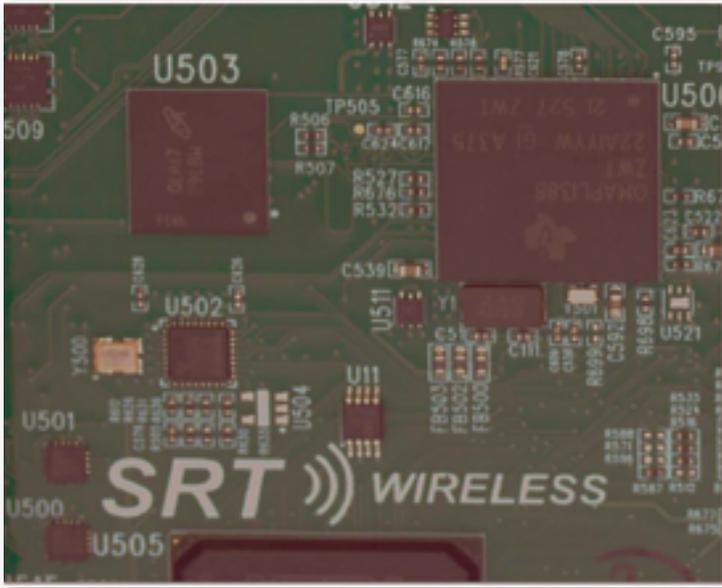
The modem offers greater functionality at more than half the price of competing products and is stimulating the development of new products and services for the network. The module also has integrated Wi-Fi, allowing end-users to connect and communicate using their own smart phones and tablets, even in the most remote locations. Reflecting a major concern in the SATCOM world, the software is "hardened" to prevent cyber hacking.

Another key feature is the flexibility we built into its design, which allows developers and users to customize the modem as well as the applications developed for its use. The module includes a separate RF Headend Board (HIB) for antenna integration and a connector interface card that facilitates terminal vendor proprietary interface design.

Then, in June, SRT Wireless and Thuraya jointly introduced the IP Commander, the first and only ruggedized satellite broadband terminal designed to meet military specifications (IP 66 and IK 10 rated enclosure). The IP Commander enables mission-critical voice and data connectivity in mobile or stationary applications in the most extreme and remote environments, making it well suited for military and governmental operations, as well as applications in land mobile, energy and mining. The package includes a rugged voice handset that offers clear and uninterrupted



Thuraya CEO Samer Halawi presents the company's 2013 Innovation Award to SRT Wireless's John Russell (COO) and Conrad Smith (CTO) at the 013 Partners Conference in Dubai.



SRT's VIPturbo board.

voice connectivity across Thuraya's satellite network, which covers many of the world's strategic conflict zones.

In November, we introduced our newest satellite modem, the Afterburner. Whereas the VIPturbo is about the size of a paperback book, the Afterburner is about the size of pack of cigarettes, with a 50 percent reduction in power requirements—easily outperforming competitive products in terms of size, weight, price and performance.

Finally, we continue to provide network technology solutions and operational support for our customers that include network simulation and Radio Access Networks (RANs). These allow the SRT Group of companies significant advantages and a unique set of end-to-end capabilities for custom solutions to better address our customers' requirements and needs. SRT Wireless's product lifecycle vision takes a 360 degree view of our clients' communications needs, extending beyond product delivery into designing and integrating custom systems. With integrated support we help our partners derive the most value from their SATCOM products and systems solutions.

The Industry in 2015: "Communication Breakdown" (Led Zeppelin)—As we look ahead to 2015, we see an urgent need to combat the growing threat of SATCOM cyber attacks. We've all heard the drumbeat of stories about corporate hacking scandals involving the theft of millions of credit card numbers. In recent months, we've seen data breaches affecting customers of such venerable brands as K-Mart, Staples, Home Depot, Dairy Queen, the U.S. Postal Service, and JPMorgan Chase. Less known, but equally concerning, is the vulnerability of U.S. and global SATCOMs, which could potentially affect a wide swath of government and commercial sectors.

Given how expensive and critical our satellite networks are, as highlighted in an April report by consultancy IOActive, and given the efforts of some nations to gain asymmetrical advantages over the United States and the

nation's allies, we see this as an issue that will continue to garner attention throughout 2015. The industry, as a whole, must act now to harden our SATCOM systems before a catastrophic breaches occur. The vulnerabilities in satellite communication systems must be prevented by implementing safeguards that would thwart cyber attacks and mitigate potential damage. Given our long record of serving U.S. military customers, SRT Group meets these demands by hardening our satellite modems in several ways prior to deployment.

Cybercrime poses enormous risks to global security and prosperity, but solutions are available. SRT Group is proud that our equipment includes some of the best protections in the world against these threats.

SRT in 2015: "I Can See for Miles" (The Who)—We look forward to building on our 2014 successes during 2015. While we cannot disclose all of the partnerships and new products we have in the pipeline, we are confident in saying that SRT Wireless will continue to lead the evolution of satellite communications, punching well above our weight class for a relatively small company.

Not interested in resting on our laurels, SRT Group of companies will continue to develop hardware solutions that are smaller, more powerful, and less costly than current alternatives. We will also continue to strengthen our partnerships with Thuraya and other industry leaders, and with U.S. national security and law enforcement agencies.

Additionally, we also look forward to increasing our participation in the broader conversations surrounding satellite communications technology and policy. For example, SRT's Chief Technology Officer, Conrad Smith, is gaining prominence as a leading voice on cyber security and satcoms. He will speak about this subject at the forthcoming Satellite 2015 conference in Washington, DC in March of next year.

All of us in the satellite communications industry should give back—not just to our employees and the communities in which we operate, but also to the industry and public at large—by providing a concrete vision on how we can ensure the safety and security of our satellite networks, even as we work to expand their capabilities and reach.

From where I sit in Broward County, Florida, I can tell you the future of the satellite communications industry is bright—and with apologies to Pete Townsend and The Who, I can see for miles and miles and miles.

John "JR" Russell serves as the CMO of SRT Group and the COO of SRT Wireless. As a pioneer in the marketing of wireless location-specific safety and security systems for consumer, commercial, and public safety applications, JR has initiated and managed successful business relationships with some of the largest global brands. At SRT Wireless, JR manages all aspects of SRT Group's commercial and law enforcement business units.

SSL (Space Systems / Loral)

By Rich Currier, Senior Vice President, Business Development

This has been a busy year for the industry and a highly successful year for SSL. At the time of this writing, SSL counted eight new contract awards for geostationary (GEO) satellites, and expanded its reach into Low Earth Orbit (LEO) Earth Observation (EO) satellites with a contract to build a constellation of innovative small satellites. The company also saw five SSL-built satellites successfully launched, with the expectation of one more launching prior to the end of 2014.

In addition to its commercial successes, in 2014 SSL continued to work with NASA, DARPA and the U.S. Air Force to deliver cost-effective solutions to U.S. government programs. SSL also completed the construction of a new spacecraft test facility, which was dedicated to the memory of its former Chief Engineer, Bob McFarland, who left behind a legacy of integrity and industry respect. The second thermal vacuum chamber, which starts operation at the close of this year, provides the company with added flexibility for managing satellite manufacturing schedules.

2014 was a year when SSL expanded its customer base with contract awards from companies in Indonesia and Bulgaria. The company also continued to build on relationships with four returning customers, reflecting the teamwork and trust that has been established over the years.



Photo of AsiaSat 8 during its build process. Photo courtesy of SSL.

Among the first-time SSL customers, Bank Rakyat Indonesia (Persero) Tbk (BRI) is the world's first bank to acquire its own communications satellite. BRISat will serve the people of Indonesia with a dedicated platform for banking services across the archipelago of islands where the bank provides service to even the most remote areas.



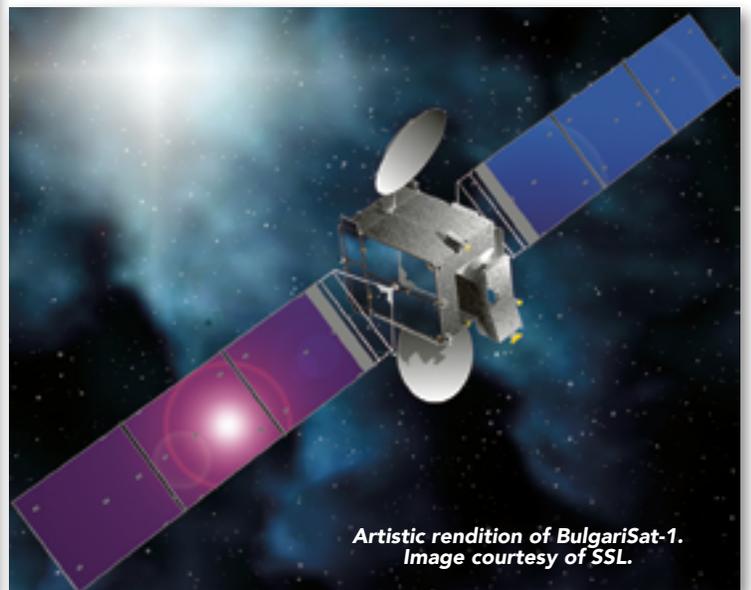
Bulgaria Sat is another first-time satellite buyer that contracted with SSL in 2014. The company is an affiliate of Bulsatcom, which is a leading telecommunications company and the largest provider of payTV services in Bulgaria. BulgariaSat-1 will provide Direct-To-Home (DTH) television service in the Balkan region.

Most recently, SSL announced its eighth GEO satellite contract award, which is with an undisclosed customer that is also new to working with SSL. Among returning customers, SKY Perfect JSAT (SJC) selected SSL to build JCSAT-15 and JCSAT-16, which will provide video distribution, data transfer communications, and back-up service capabilities to meet the growing demand for telecommunications infrastructure in the Asia Pacific region. The company also has a third satellite for SJC, JCSAT-14, in production at SSL's Palo Alto, California, manufacturing facility.

EchoStar contracted with SSL for EchoStar XXIII, which will be the 13th SSL-built satellite in the EchoStar fleet. The spacecraft, which is planned for launch in 2016, will have the capability of providing high-power, flexible Ku-band service from any of eight different orbital slots.

In August, long-term customer Intelsat awarded a contract to build Intelsat 36 to SSL. This will be the 52nd SSL-built satellite for Intelsat and will provide media and content distribution services in Africa and South Asia.

For Spanish operator, Hispasat, SSL was selected to build Hispasat 1F, a multi-mission satellite that will provide service for television, broadband,



Artistic rendition of BulgariSat-1. Image courtesy of SSL.

corporate networks, and other telecommunications applications in Europe, North Africa, North America, and South America. Hispasat 1F will replace Hispasat 1D and will be the third SSL-built satellite in the HISPASAT fleet.

In part, the company attributes its success with so many satellite operators to its focus on its customers' overall business plan and not only the mechanics of building a satellite that delivers the desired service. The company assists its customers with launches, ground stations, internship training programs, and financing, among other important factors. In 2014, SSL completed and delivered five new satellites, which were successfully launched and are now performing on orbit. With a sixth launch planned for the end of the year, there will be 78 SSL-built satellites currently on orbit.

2014 marked the company's first launch on the SpaceX Falcon 9, and a new record of two satellites for the same company launched within a month of one another from the Cape Canaveral Air Force Station in Florida. The satellites were both for Hong Kong-based AsiaSat, which provides broadcasting, telecommunications, and broadband services across the Asia-Pacific region. SSL has now provided four satellites to AsiaSat and has an additional satellite, AsiaSat 9, currently under construction in its Palo Alto manufacturing facility.

Other launches during the year included satellites for ABS, Optus, and Intelsat, all of which were launched on the Ariane 5 launch vehicle. A satellite for DIRECTV was delivered to launch base in Kourou, French Guiana at the time of this writing, and is expected to launch before the end of the year.

With its ongoing integration with parent company MDA, SSL is growing the value the company can bring to a broad range of customers in both government and new space arenas. Skybox, now a part of Google, selected SSL to build 13 small satellites for an advanced constellation for Earth imaging. This is the first contract for SSL-built LEO spacecraft since 2000. As part of the award, SSL also obtained the license to use the small satellite technology in other applications, opening up a new product line for SSL. The company's location in the heart of Silicon Valley positions the company well to help innovative startups, such as Skybox, to benefit from SSL's long heritage in space.

SSL has a history of leveraging its commercial platform to help support NASA initiatives for cost-effective solutions. The propulsion system for NASA's

highly successful Lunar Atmosphere Dust Environment Explorer (LADEE) is an example of this collaboration—SSL has continued working with NASA on hosted payload accommodation development for the Laser Communications Relay Demonstration (LCRD) in a program for NASA Goddard.

In 2014, SSL was one of the companies selected by the U.S. Air Force for a Hosted Payload Solutions (HoPS) indefinite delivery/indefinite quantity contract, which pre-qualifies SSL to bid on opportunities for hosted payloads, which can help the U.S. Government get a variety of missions to orbit by integrating them with commercial satellites. SSL was also one of the companies awarded the first task order under HoPS to assess hosting options for NASA's Earth Venture Instrument TEMPO (Tropospheric Emissions: Monitoring of Pollution).

In 2014, SSL also began providing advanced robotics capability based on MDA heritage robotics technology, and the company is currently studying system concepts and key technologies for NASA'S Asteroid Redirect Mission, which is expected to be a key part of the agency's path to sending humans to Mars. SSL is working with MDA to conduct two studies; one that examines using MDA robotic technology for asteroid capture, and one that examines adapting commercial spacecraft for the Asteroid Redirect Vehicle. In another collaboration with parent company, MDA, in 2014 SSL announced that it entered into the next phase of designing and integrating the first Payload Orbital Delivery system (PODs) accommodation on the SSL 1300 platform—which would enable affordable delivery of small free-flying spacecraft beyond LEO for future servicing, operational, science, and technology space missions. Designed for DARPA, the PODs program allows a free-flying satellite to be jettisoned by an SSL-built satellite, to then fly on its own.

In October 2014, SSL celebrated the completion of its new test facility and second thermal vacuum chamber. The facility—dedicated to SSL's former chief engineer and vice president of Mission Assurance, Bob McFarland—represents a significant capital investment and will allow SSL to improve the efficiency of satellite manufacturing and support larger volumes of satellites in the factory with shorter schedules. During the dedication ceremony, SSL president John Celli drew attention to Bob McFarland's many years of commitment to quality and reliability. The test facility is named after Bob to acknowledge that focus on quality and recognize the critical role that a thermal vacuum chamber plays in the validation of spacecraft quality and readiness.

The new front-loading chamber measures 50 feet in length and 30 feet in diameter and helps SSL accommodate 10 to 12 satellite contract awards per year without needing to outsource the thermal vacuum work to a third party and without impacting the schedule of other satellites in the factory.

Industry researchers have noted that the coming year should be another strong one for satellite manufacturers, as demand for replacement satellites and expanded services drive the commercial GEO climate. In addition to these core business opportunities, SSL continues to leverage the synergies that it shares with MDA to enter new markets and bring the benefits from its extensive expertise and competencies into a broad range of disciplines for both government and private industry.

This year's expansion into new regions and markets is likely to serve as a catalyst for future SSL growth for many years to come.



Artistic rendition of the PODs system for the company's 1300 platform.

Surrey Satellite Technology Ltd. (SSTL)

By Sir Martin Sweeting, Executive Chairman

A classic British understatement would be to say that 2014 was a busy year for the Surrey Group—2014 has, in fact, been one of our most active years ever experienced by our companies.

With a welcome expansion in the downstream market for Earth Observation (EO) data that's seen some exciting new players, such as Skybox Imaging and Urthecast who emerged into the sector, this year SSTL has been responding to innovative business models and new mission requirements from customers. More than ever before, we are enjoying the challenge of working on new ways to deliver space data.

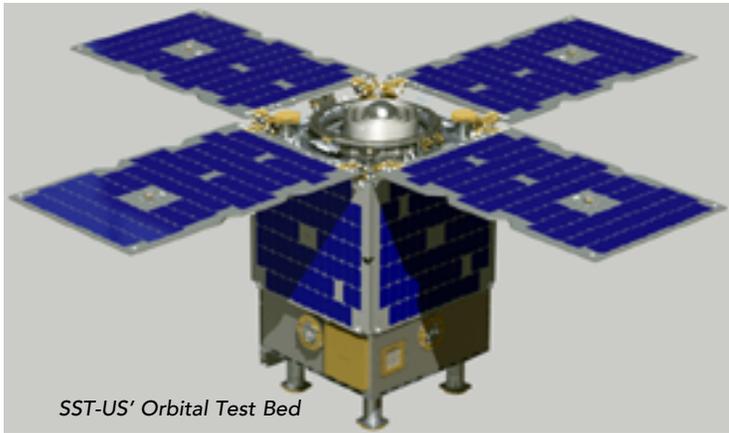
We're aiming to have our new X-series platforms space-ready in just nine months; this means we're disrupting the conventions of satellite design and manufacture, again, and that suits us just fine. The first set of new generation avionics and platform design are already in production for KazSTSAT, which will be our first X-Series satellite, built in the U.K. in collaboration with Kazakh engineers from Ghalam LLP.

On average, two SSTL satellites are launched every year, but this was a bonus year and we clocked three launches. In June, KazEOSat-2, a medium resolution EO satellite for Kazakhstan, was launched, and the following month saw the launch of TechDemoSat-1, an in-orbit testbed for U.K. technologies. Soon after launch, TechDemoSat-1 delivered a rare opportunity to obtain a view from one of our orbiting satellites with a video from a COTS-based inspection camera mounted on one of the panels. The video captured the moments after satellite separation from the rocket, with a spectacular view of Earth and then a surprise fly-by of the Fregat upper stage of the Soyuz-2 rocket. This was our own mini space adventure movie and definitely a highlight in the past year for us.

Just a month after launch, our operations team received five close approach warnings for TechDemoSat-1 and responded quickly by commissioning a new type of on-board propulsion system. The Hollow Cathode Thruster was fired up and, working seamlessly with resistojet propulsion, TechDemoSat-1 was successfully moved out of the path of an object from the U.S. Defense



*SSTL's DMC3 satellite during the build process.
Photo is courtesy of SSTL.*



SST-US' Orbital Test Bed

Meteorological Satellite Program. A week later, the new Hollow Cathode Thruster managed a second workout with yet another collision alert, this time to dodge its ride-share, UKube-1. Aside from TechDemoSat-1's collision alerts, the satellite's payloads are cause for excitement in the U.K. We are proud to have built and launched the U.K.'s technology demonstration mission, which hosts eight payloads from U.K. academia and industry, providing valuable on orbit validation for new technologies—we are looking forward to seeing their results in the coming months. The mission is also flying several SSTL developments, and we've already had early data from the Sea State Payload, which measures ocean winds and waves from space using GNSS reflectometry—a new method that paves the way cost effective improvements to weather services and climate research.

In August, the launch of the Galileo 5 and 6 FOC satellites occurred, both carrying navigational payloads supplied by the SSTL. Unfortunately, space can be a risky business, and the Galileo satellites were injected into the incorrect orbit. This was naturally disappointing for the team at SSTL who had been manufacturing the 22 navigation payloads we supplied for the constellation. However; we are heartened by the recent news that the two satellites are fully operational and they may be able to supply useful data. Meanwhile, our Galileo FOC team in the U.K. are continuing to manufacture the payloads at a rate of about one every six weeks, and we are looking forward to more launches for this flagship European program next year.

We forged a long and valued relationship with our Algerian space agency (ASAL) colleagues during the AlSat-1 mission and we are delighted to continue that relationship with the signing of the Alsat-1B contract earlier this year. Alsat-1B will be based on the SSTL-100 platform, hosting a 24m multispectral imager and a 12m panchromatic imager. Offering further opportunities for the transfer of skills and the development of local capabilities, 18 ASAL engineers will work alongside SSTL colleagues in the U.K. and study Higher Degrees at the University of Surrey, before undertaking the satellite's assembly and test phase in Algeria.

I've been pleased to see our U.S. operation thrive during the past year. From new, purpose-built facilities in Denver, Colorado, Surrey Satellite Technology US (SST-US) is working closely with the U.S. government and commercial partners to develop innovative and low risk solutions that sustain space programs within challenging budgets. SST-US' new Orbital Test Bed (OTB) business model offers aerospace organizations a low-risk way to test new technologies on an operational LEO mission while sharing the cost of

development and launch. The flight manifest for OTB-1 was finalized this year for launch by SpaceX Falcon Heavy. Based on a modular adaptation of the SSTL-150 platform pioneered for the CFESat mission, OTB-1 will fly five payloads, including the Deep Space Atomic Clock (DSAC) for NASA's Space Technology Mission Directorate, U.S. Air Force and university payloads plus a de-orbit device. OTB-2 planning is already underway.

Hosted Payloads are another route to lower cost research and development. The U.S. Air Force Space and Missile Systems Center (SMC) Contracting Directorate also awarded our U.S. office a contract under the Hosted Payload Solutions (HoPS) program, offering government customers fast, regular, cost-effective options for maintaining and developing defence and civil space architectures. In September, SST-US was also awarded a contract by NASA's Goddard Space Flight Center to conduct the Sustainable Land Imaging (SLI) Reduced Instrument Envelope Study. SST-US is investigating smaller and lighter alternatives to the sensors currently flying on Landsat 8 and investigating new technologies for sensors that may be considered for the Landsat 10 program and other missions. NASA's SLI Office has committed to researching a satellite, or constellation of satellites, that will be smaller and more economical than Landsat 8, all the while maintaining data continuity.

At the close of the year, our manufacturing pipeline remains extremely busy with our first Synthetic Aperture Radar (SAR) satellite, NovaSAR, three DMC3 constellation spacecraft, seven FORMOSAT-7 spacecraft, AlSat-1B, KazSTSat, and the modules for our U.S. operation's Orbital Test Bed—all going through our cleanrooms. Other significant projects include avionics suites for the Russian Kanopus program and the qualification of our small GEO platform structure.

Much in the news this year, I'm delighted that the U.K. space sector continues to flourish. The sector is currently worth £11.3 billion to the U.K. economy and growing at more than seven percent per year. I'm gratified that SSTL is part of this growth, sustaining an average growth of 26 percent in turnover figures, year on year. This year we achieved recognition for our success, winning "Best Aerospace & Defence company 2014" at the "Made in the U.K." awards in July.

As I look ahead into 2015, I'm heartened that small satellites are no longer confined to Low Earth Orbit (LEO) missions. SSTL has developed GMP-T, a small, geostationary satellite platform that will deliver up to 5.5kW power and up to 8GHz of Ka-band or 1GHz of Ku-band. Our GMP-T platform is designed for smaller domestic telecoms operators in emerging markets and established global commercial satellite operators looking for cost-effective and rapid deployment. We are close to being able to share some news about our first customer.

Next year looks set to be equally as productive and we hope for more challenges, milestones and successes. We already know that we can look forward to more Galileo launches, and the launch of our three DMC3 constellation spacecraft, which will be launched by ISRO from Sriharikota in India.

Everything else is fluid, and we like it that way. Our success is built on innovation in technology and in how we approach our customers' challenges. No doubt we will be helping new friends and old change the economics of space in 2015.

STN Teleport

By Mitja Lovsin, Sales Director

STN is a Global provider of broadcast over satellite solutions with the capabilities to offer multiple solutions, satellites and the platforms best-suited and tailored to individual customer requirements.

Our strong reputation has led us to be the trusted partner to more than 400 hundred TV channels to date. Looking back on 2014, one of the highlights for us was certainly the company's 10 year celebration. This event was a wonderful opportunity to be joined by our esteemed partners and associates within the industry, some of whom have been with us since the inception of our company and who have always believed in our operational strengths and potential. This occasion certainly did not pass quietly... the decade of service celebration included a gathering in a castle on an island as well as SatNews' Publisher Silvano Payne, who was one of the invited guests.

Rewind 14 years and one can see just how much the Lovsin family has to celebrate. Their careers started not in the satellite industry, rather... as documentarians. Several of their award-winning films garnered much attention after they were broadcast on a local television station. The station acquired so many of the Lovsins' films that the family eventually became co-owners of the station.



As viewership grew throughout Slovenia and beyond, the family decided to start broadcasting their content via satellite. As the lack of services in their region didn't offer such satellite broadcast services, the family quickly determined they needed to build their own uplink facility. The first step was taken when an antenna was purchased and the initial 24/7 broadcasting services were initiated, using their first distribution satellite.

Two years after their first broadcast, the Lovsins made the crucial decision to focus on becoming a full service teleport. In 2004, Satellite Telecommunications Network was born—with only two employees, four Antennas (3RX + 1TX) for uplink/downlink reception, and 50 m² (538.20 sq. ft.) of space in Slovenia's capital, Ljubljana.

During the celebration, the company's year on year changes and developments were discussed, from a small startup enterprise in 2004 to becoming a serious competitor in the industry today. I don't intend to sound boastful... but we were proud.

The facility now has a capacity for 900 channels and the planned construction of EQC2 in the coming years will provide the ability to broadcast an additional 400 to 500 TV channels. Due to the long-term focus of the management team and their drive for further company growth, with





additional land acquired, the foundation has now been set that will allow STN Teleport to bring into play capacity for more than 20 new antennas, which range in size from six to 15 meters.

This year, I think anyone working in a global industry such as ours could not help but be somehow impacted by the political and economic unrest in our world. At times, the disruptions were extremely unpredictable and disturbing. What was important for us was to remain adaptable in terms of selecting the stronger markets where business opportunities continue to grow.

The ability to react swiftly and change course whenever necessary has always been one STN's strong advantages—as one market slowly closes, we quickly re-construct and adapt our focus onto new opportunities. This capability makes STN somewhat unique.

One of the next steps in viewing technology that is becoming quite clear to us is to broadcast signals via the 4K (UHDTV) standard. Our opinion is that this technology is still at an early stage and the real commercial implication to the market will most probably require another three to five years for

market acceptance and technology stability. However, that being said, STN is already fully equipped and ready to implement service requirements should UHDTV become cemented into place faster than is expected.

I think a fair assessment for businesses in our industry would be that maintaining any company's growth at a steady pace is becoming more and more difficult, mainly due to all of the changes occurring throughout the world and new competitors arriving in the market.

STN is no exception; however, with a strong team working together and the ability to quickly alter directions when required, this ship is definitely staying on course. The future for any company is difficult to predict. However, reviewing our last five years of history, I am confident that STN will continue on its path of increasing growth and building an even bigger and stronger business in the years ahead.

I believe a realistic goal for STN is to become more of an innovator and leader in the industry and one of the most recognized global teleports in the market—we look forward to the challenges that come with success.

Teledyne Paradise Datacom

By Tony Radford, Vice President

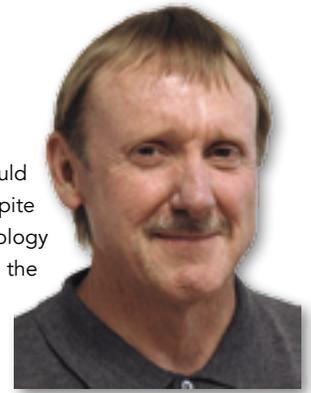
From the perspective of a 35-year SATCOM veteran, 2014 has been a challenging year for the industry—all thanks to a protracted slowdown in government spending and a generally languorous commercial market.

I know that we like to coin the industry as being 'cyclic' in nature with an ebb and flow that seems to defy logic—sort of like the stock market. However; in my experience, the demand for SATCOM goods and services has always been about as linear as a TWTA. Even the degree of vitality within each of the market segments varies greatly from year to year, be it ground stations, airborne terminals, shipboard, offshore, military comms or video broadcast. Consequently, when it comes to shaping product portfolios, both situational awareness and a cognizance of trends are as important as ever.

All things considered, it's evident that aligning product roadmaps with the sentiments of the DoD, or any other singular market for that matter, can be perilous. Just look around. Some of the best known brands in our industry are reeling from the blight of sequestration—starved from an unfulfilled dependence on U.S. tax dollars for nourishment. Some have been forced to reduce their respective signatures to a fraction of what they were a year or two ago, while others have been placed on the market by appetent Boards convinced that the shortest route to salvation is divestiture.

Having a broad and diverse portfolio can iron out the rough spots as the pendulum of prosperity swings back and forth between segments with a methodical tempo biased by the dynamic influences of economics, political stability, world events and, of course, available space segment.

At Paradise Datacom, our modem and amplifier design teams have been busy developing the products that carried us through 2014 and will continue to do so for years to come—products that have been optimized with the latest technology to best support our customers on both sides of the government/commercial divide.



Speaking of technology, I think most would agree that some trends are unstoppable, despite attempts by manufacturers of archaic technology to 'flip-the-mattress' in hopes of instilling the prolongation of yesterday's news. Knowing that putting chrome bumpers on a 'Model T' won't make it faster, our designers are constantly pushing the performance/feature envelope while maintaining a forward-looking view of the needs and wants of a bandwidth-thirsty population. In the product world, innovation requires more than the mere assimilation of technological advancements. It requires a team of empowered designers with passionate dedication to the maximization of value.

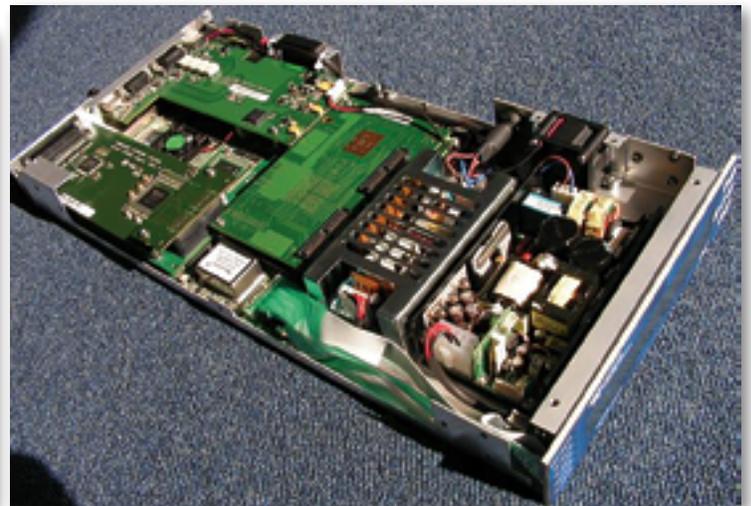
On the SSPA front, "Modular," "soft-fail" and "hot-swappable" have become standard fare in RFQs for amplifiers that operate at the high end of the RF power spectrum. Our PowerMAX Solid State Amplifiers operate in S-, C-, X- and Ku-bands, at power levels as high as 10kW and are currently supporting military communications, Troposcatter, Digital TV broadcast services, flying satellites—even supporting deep space exploration.

Our adoption of Gallium Nitride (GaN) technology has enabled us to maximize the amount of output power that can be generated within a given footprint and reach efficiencies that rival those of tube-based products, but with the high MTBF and low MTTR values that only modular solid state can deliver. Our proprietary linearization technology ensures that our GaN amplifiers perform better than their Gallium Arsenide (GaAs) counterparts they're replacing.

Since we released our Q-Flex satellite modem, orders have grown exponentially. During shootouts with our major competitors' products, we've proven time and again that the IP performance of our modem is absolutely top shelf. By using a common hardware platform, our software-



Teledyne Paradise Datacom's 100W, Ka-band, Solid State Power Amplifier



Teledyne Paradise Datacom's Q-Lite in an exposed chassis. Photo is courtesy of Teledyne Paradise Datacom.

defined modem is by far the most versatile in its class, offering virtually unlimited scalability and upgradeability.

Software updates and feature upgrades are performed easily via keypad or the USB port on the front panel. The long list of embedded features means that Q-Flex can eliminate external boxes required by some of our competitors to perform the same tasks. Plus, everyone knows that a reduced box count means lower cost, better reliability and simplified redundancy schemes.

In addition, our new Q-Multiflex multi-channel demodulator allows Q-Flex to be fitted with eight or 16 demods in point-to-multipoint and mesh network topologies for reduced equipment footprints and lower capital costs. Our half-sized Q-Lite modem consumes a quarter to a third of the power required by a standard modem, while delivering performance values similar to those of our full-sized Q-Flex. A growing list of lightweight, mobile terminal manufacturers, both land based and airborne, have adopted our Q-Lite modem for integration into their systems.



Teledyne Paradise Datacom's PowerMAX.

2014 marked our latest release—Q-NET, a comprehensive 'Bandwidth-On-Demand' network management platform that allows the dynamic assignment of individual link capacities either manually or from an internal event scheduler. Q-Net, developed in conjunction with CodeMettle, is paired with Q-Flex's embedded diagnostics and statistical measurement and graphing-tools that allow operators to optimize the efficiency of their satellite networks, both in performance and cost of operation. Q-Net provides remote monitoring and control of every element in the network, regardless of brand.



As 2014 is essentially a done deal, the real question is—what does 2015 have in store for all? Events set into motion this year will likely conclude, as corporate buyers and sellers ink deals that are certain to have an impact on the industry—good or bad, depending on where you sit in the pecuniary food chain. If it's like every other year, operators around the globe will be looking to tighten up on bandwidth, increase EIRP and get their network operations under control.

Wherever operators are located, Paradise Datacom will be there with an extensive line of modem and amplifier products designed to address their most challenging needs and missions.

Tony Radford currently serves as the VP of sales and marketing for Paradise Datacom, a Teledyne Technologies company that specializes in the design and manufacture of satellite modems and solid state power amplifiers. Radford has worked in the satellite communications industry for 35 years for a number of brands that have included Scientific Atlanta, STM Wireless, TriPoint Global Communications as well as Teledyne Paradise Datacom.

Thaicom

By Nile Suwansiri, Chief Marketing Officer

In an industry that is constantly changing, 2014 has seen the satellite market shift in new directions. New vertical business opportunities have created new prospects for operators, while UHD television (UHDTV) has continued to open up new areas of growth.

With a strong pioneering history, we were among the first to launch innovative services in these new sectors, making 2014 an incredibly exciting and prosperous year for Thaicom. Our portfolio offerings have certainly broken new ground for the company, and with new satellites, new territories and new acquisitions, we are anticipating a New Year wherein we will continue to embrace new challenges and opportunities.

Perhaps our biggest achievement of 2014 was in becoming the first satellite operator in Asia-Pacific (APAC) to launch commercial In-Flight Connectivity (IFC) using Ku-band broadband. In a highly competitive industry such as the airline sector, companies are increasingly looking for value added services to distinguish themselves from their competition. Furthermore, consumers

rightfully expect terrific service and there is an increasing demand to be connected to the digital universe everywhere and anywhere, whether in the home, office, car, at the beach or even at 35,000 feet. The expectation is that they will be able to visit social media sites, stay in touch with the latest news and contact family members, regardless of their location.

With more than three billion people currently traveling on airplanes each year, that is an average of 8.2 million people airborne each day—the expectations are that this number will double by 2032. That's a lot of potential surfing of the Internet while flying a mile high. It is also an important connection for airlines as those companies look to tap the resource of a captive, digital audience.

In June of 2014, we announced a partnership with NokAir to deliver our innovative service to the airline's planes. The high-capacity Ku-band service enables NokAir customers to send and receive data, which is transmitted to and from the aircraft via the satellite to the ground station and returned

Thaicom's CEO Suphaje Suthumpun with NokAir CEO Patee Sarasin at the launch of the new IFC service. Photo is courtesy of Thaicom.



to the plane, providing passengers with the strongest possible signal. Thaicom's Network Operation Center (NOC) monitors each plane's usage to ensure a highly reliable broadband service experience. Scalability allows airlines to custom tailor these services to their needs. This service was launched in September..

In addition to IFC, we have also focused on the maritime market, with the launch of a low-cost maritime broadband service for vessels. Tokyo-based shipping firm Ocean Trans Company is one of the first customers to use our end-to-end service, which uses the IPSTAR broadband service to provide the company's crew with reliable and cost-effective access to email and the Internet. Consequently, crew morale and productivity is boosted while at sea, enhancing operational efficiency across fleets and supporting the growing demand for cost-effective crew welfare services.

Expanding our end-to-end solutions was only the first step to better serve our customers. In January, we entered the African market with the launch of Thaicom-6/Africom-1 to provide Asia and Africa with satellite communication end-to-end services, such as video distribution, Digital TV / Digital Terrestrial TV and mobile backhaul.

Thaicom-7, our latest C-band satellite, was launched to the 120 degrees East orbital slot in September. The satellite's regional beam will provide a full range of media and data services tailored to the communication needs of the entertainment industry and telecom operators across Asia and Australasia. This satellite will help to fulfill demand for services in South Asia and Southeast Asia, as well as Australia and New Zealand, with clients also able to cross-connect to other regions.

We are already looking ahead to our next launch—Thaicom-8 in 2016. We intend to serve customers' needs for increased Ku-band capacity and also strengthen our video neighborhood at 78.5 degrees East. Thaicom-8 will have a total of 24 Ku-band transponders, covering Thailand, South Asia and Africa. Orbital Sciences Corporation will be the manufacturer and Space Exploration Technologies Corporation (SPACE X) will launch the satellite.

New partnerships have also help Thaicom growth in 2014. In particular, NBN Co selected wholly-owned subsidiary, IPSTAR Australia (IPA), for a new initiative to boost the number of broadband connections for Australians who cannot access an existing commercial broadband service. Since 2005, we have delivered satellite Internet services via the IPSTAR satellite to Australia's remote communities and IPSTAR continues to make a difference in the life of many Australian's and the country's education, farming, and health sectors.

With our new CEO, Ms. Suphaje Suthumpun, we have consistently been delivering a positive financial result each quarter since Q4 2011. Such a solid financial performance has required change and transformation in a number of areas. Thaicom rebranded to ensure the company was focused on our customers and their needs. Internally, teams were reorganized from product-based to function-based in order to better respond to the growing convergence of broadband and broadcast.

We have also achieved greater operational efficiency to ensure we have the most appropriate people with the correct skills in the right place to

best serve the customer. This has improved the process within teams and ensures we are working as efficiently as possible.

Consequently, Thaicom is reaping the benefits—announcing a consolidated net profit of 1.1 billion Baht (USD\$34 million) for the year 2013, an increase of 548 percent over the previous year. Thaicom's focus on developing and implementing strategic directions with the aim of profitable, sustainable growth was recognized at the Asia-Pacific Satellite Communications Council's (APSCC) tenth annual awards ceremony when Ms. Suphaje Suthumpun was presented with the 'Satellite Executive of the Year in the Asia-Pacific' award.



Moving into 2015, the satellite industry is currently marked by two major changes, which are likely to still be present in 2015. Ultra HD has witnessed 4K and even 8K coverage of the 2014 FIFA World Cup—by 2016, the estimated is that there will be 10 million Ultra HDTVs (UHDTV).

The other shift is in consumer behavior. They want anywhere, anytime connectivity and have the devices to facilitate such desires—mobility applications on land, at sea or in the air are widely available and data consumption is rising, while broadband and broadcast continue to converge.

To deal with these changes, satellite operators have to supply capacity as well as offering solutions to address customers' needs. At Thaicom, we have already established UHDTV as key for our strategic direction, even though this broadcast market is still a few years away from gaining traction, especially in Thailand and neighboring countries. We have also launched a 4K event with partners on Thaicom-6 and had positive feedback from our customers. We will continue to work with partners to promote 4K services.

I foresee that satellite will continue to play a significant role in complementing other technology platforms, due to the increasing consumption of data and the proliferation of UHD as growth drivers. Thaicom is ready for, and looking forward to, a most productive 2015.

Thuraya

By Bilal El Hamoui, Vice President of Commercial

The satellite industry has struggled this year—many players have reported declining or flat revenues, brought about by budgetary cuts, troop withdrawals with the associated reduction in requested communication services, and other factors that have led to oversupply of capacity in certain markets.

However, it's not all doom and gloom in the industry. Budget cuts and limitations have not deterred many users from seeking new satellite technologies and innovative communication capabilities. Whether funding is scarce or plentiful, users still want to adopt the latest SATCOM systems for their organizational needs.

In spite of a tough market, Thuraya has bucked this trend to report strong results across all of our verticals and product groups. In 2014, we made steady progress, reporting three years of consecutive growth. This continued success was achieved organically and without any material dependency on one-off events, price increases or margin grabs.

Our success was not achieved overnight, but came on the back of a transformation program that has seen a reinvigoration of the company on several fronts. Our approach is simple, yet effective. We deliver what users truly need; products and services that are customizable for their demands, at flexible prices and we innovate the way we work to break into new markets.

Our product innovation strategy led us to being the first in the satellite industry to address BYOD (Bring Your Own Device) with the introduction of

the Thuraya SatSleeve for smartphones. We broke new ground in deepening our mobile satellite broadband portfolio with the launch for four new terminals. We strengthened our maritime offerings with two new IP terminals and price plans that offer the flexibility that ship owners and crew need.



The Atlas IP is a feature-rich broadband satellite terminal with voice, data plus additional functionality while the Orion IP, a easy-to-use broadband satellite terminal that supports crew welfare needs.



Thuraya's SatSleeve for smartphones.



To cater to the needs of government, relief and energy users, we launched two vehicular terminals; IP Commander, our first ruggedized satellite broadband terminal designed using MIL-SPEC components, and IP Voyager, the only satellite broadband terminal capable of delivering streaming IP rates of up to 384Kbps as well as asymmetric streaming capabilities.



Partnerships and collaborations are key in driving the industry forward and we have made great strides by enhancing our product innovation strategy, business models and distribution channels. Our partnerships with Airtel Africa, Satcom Direct, Talia, TrustComm, ViaSat and Western Union enabled Thuraya to extend our reach into new markets and create new business opportunities across Europe, the Middle East, Asia, Australia and Africa.

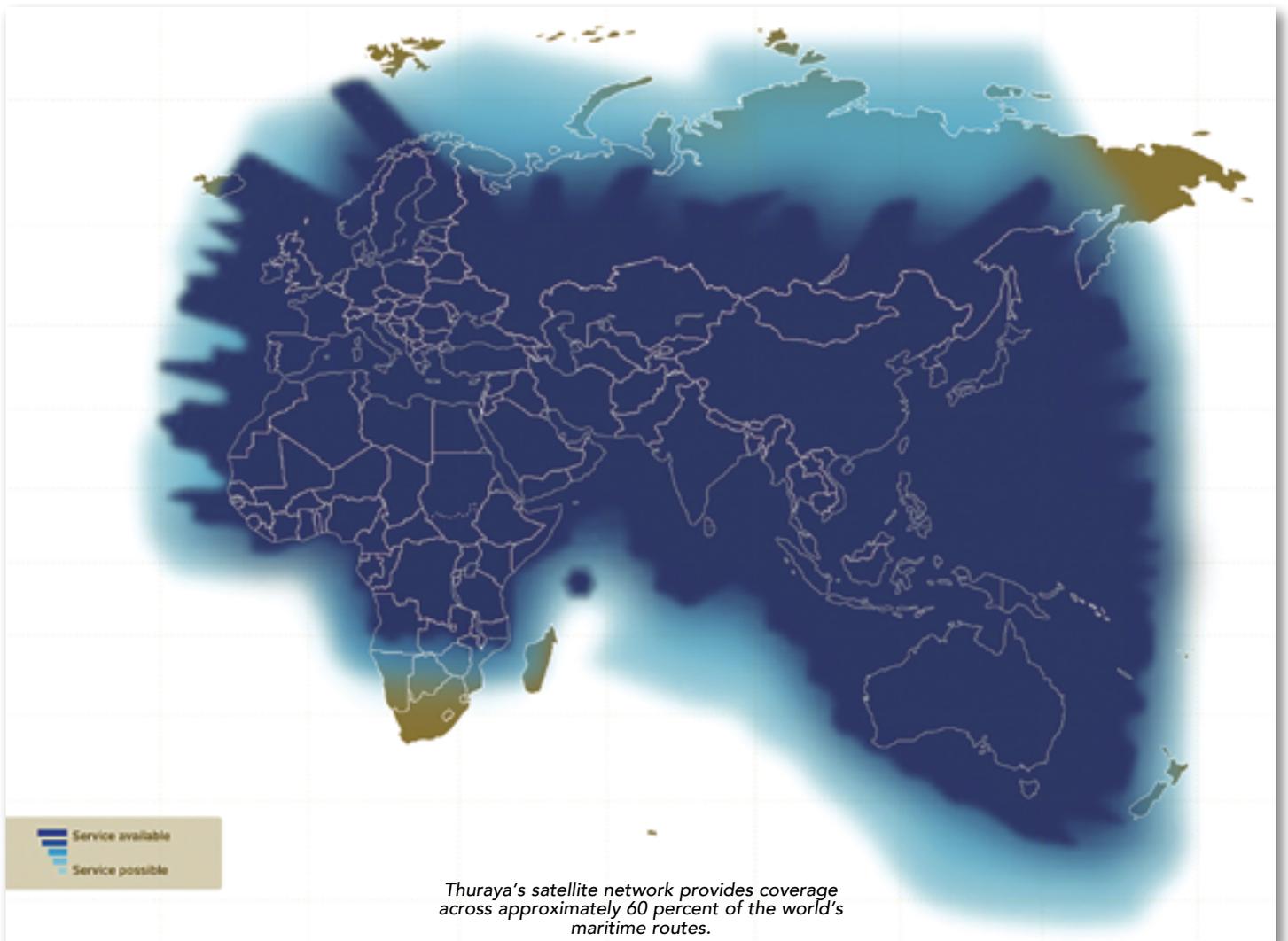
Our partnership with Airtel Africa addresses the growing demand for communications technology in Africa. Airtel Africa is the first and only African mobile network operator to offer 100 percent coverage through terrestrial and mobile satellite connectivity as part of its portfolio of services.

Our collaboration with Western Union marks yet another world's first for a satellite telecoms operator, which allows us to offer top-up services for Thuraya prepaid SIMs for voice and data services using the Western Union® Quick PaySM service. This service is available at participating Western Union agent locations across more than 200 countries worldwide at no extra charge.

The extension of our partnership with TrustComm through the gateway in Cyprus demonstrates Thuraya's commitment and ambitions to expand and diversify our customer base in the United States. The new gateway will further enhance our network's resiliency and provide an end-to-end, managed Thuraya service for government and commercial users.

These are exciting times as we aim to break new barriers in the MSS industry and beyond. Planning is currently underway for our next generation constellation and we are exploring several interesting opportunities. In 2015, we will be unveiling several initiatives that will enable us to push the innovation boundaries in satellite and terrestrial convergence, bringing greater choice and flexibility for users.

As we embark on 2015, we are optimistic and excited about what's to come for Thuraya as we look to break barriers across new markets and new segments.



Virgin Technologies, Inc.

By Robert Smibert, Founder and President

This has been a year of exciting growth and market positioning for Virgin Technologies Inc. Last year, the company merged with a leading satellite manufacturer, which now allows us greater control over products and benefits customers as we can offer world class products, supported by a 24/7 network operations team.

As a result, we've seen tremendous growth, mainly because we've managed to move our business model from a regional manufacturer and services provider to a national and global supplier of auto-aiming satellite antennas.

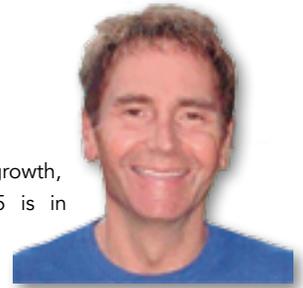
Broadening our reach globally, we also developed and launched Virgin Technologies Inc.'s 1U DVB Antenna Controller, which is ideal for the broadcast and satellite news gathering (SNG) marketplace. This universal controller is compatible with any modem and teleport platform.



These developments were the result of listening to our customers and end-users and then developing a strategy that is customizable for individual client needs.

Our history has been predominately servicing the oil and gas markets in Western Canada—everything from drilling rig, camps, mobile data vans and pipeline. Working directly in this sector teaches a great many lessons, namely that product and service have to be extremely reliable and priced correctly all the time.

In order to be successful from a business standpoint, companies need to have highly valued products and services. What we intend to accomplish this coming year is to take all of our learned experiences and the products we have developed and build an innovative reseller ecosystem to share our expertise and products with like-minded companies across the globe.



Even though we're experiencing tremendous growth, our biggest challenge and focus for 2015 is in building customer awareness of our products and services.

The auto-aiming satellite antenna market is a healthy one with many choices for customers. While we believe we have the best auto-aiming satellite antennas in the industry, with so many voices and messages in the marketplace gaining customer attention, we must demonstrate how we are different—a project this certainly a challenge.

To build product and company awareness, as stated earlier, we are implementing a value-added reseller network strategy. This will allow us to share our expertise and products to companies that need to provide their customers with mission critical, auto-aiming, satellite solutions.



We're also looking at staffing and how we can build our brand more effectively. Through our recent merger, we gained a wealth of industry know-how and talented staff as well as our current Vice President, a true innovator and exceptional talent, Brad Adams.

We also recently hired a business development manager, Ted Naylor, who has extensive experience in private and public sector relations. His role will be to listen to the reseller market and work to build a marketing campaign to better communicate our message to the marketplace.

The goal for the company is that, by this time next year, we'll have an even stronger brand awareness, sales will grow 20 percent, and we'll have a more global clientele. In addition, we're also in the planning stages of launching an annual Reseller Network Summit, which will allow us to join our resellers, share new experiences and expertise, listen and learn about market challenges, and introduce new and innovative products designed to help our resellers succeed in their local markets.



Overall, from an industry perspective, the auto-aiming satellite antenna business offers customers an almost endless array of solutions, options and price points. We all know the market is healthy and growing rapidly and that advances come quickly—capabilities and technologies seem to change faster than ever experienced previously.

What we need to continue to remind ourselves is that the most elegant solutions for customers are the ones that make complexity simple. Global communication is becoming a standard requirement for companies as boundaries fall and markets expand—highly portable and universal antennas will need to be developed with the ability to work, no matter what the geographic region or satellite spectrum.

Virgin Technologies Inc. is confident we will be able to continue to meet that demand and move with the marketplace as solutions go global and products prove themselves to be just what the customer wanted.

Robert Smibert, with more than 25 years of experience in telecommunications and technology, founded Virgin Technologies in 2001 after serving as Director & Chief Technology Officer for Safalink Corporation (NASDAQ:SFLK). Rob lead a team of more than 40 software engineers and R&D personnel and transformed the Company's technology vision, exposing many new opportunities for the Company's biometric products.

Prior to Safalink, Rob was co-founder and Chief Technology Officer of Jotter Technologies, where he developed the Internet's first "e-Wallet" application, which PC World Magazine dubbed as better than Microsoft's Passport and Novelle's Digital Me products. Rob was instrumental in the sale of Jotter Technologies to Safalink Corporation and remained as Managing Director of Jotter Technologies, managing investor's interests and debt reconciliation.

Rob's extensive experience also includes technology innovation and management roles with RedCell, a Canadian battery startup, and Acu-Trol Canada, an aquatic automation equipment company Smibert founded in 1994.

By Ali Zarkesh, Product Development Director

The last 12 months have been a busy time for the broadcast sector, as well as for Vislink. A wave of consolidation has swept through the industry, with new partnerships and acquisition activity stealing countless headlines across 2014.

Vislink, for one, acquired Pebble Beach Systems, adding a new dimension to the company's growing product portfolio. A number of other high-profile deals this year demonstrated how hardware and software sides of the broadcast industry are gradually merging together; however, this hasn't been the only prevailing theme—4K has also become a growing trend.

Even though it's widely accepted that 4K delivery to the home is still some way off, mounting competition from Over-The-Top (OTT) players means it has become essential to get the hardware in place that will make 4K transmission a reality. In recent years, and the last 12 months in particular, broadcasters have become increasingly reliant on wireless equipment. The ability to transmit footage from anywhere, be that a 200 m.p.h. race car or up close and personal at a major news event, has become the attention-grabber broadcasters seek. The move to 4K, however, presents a series of challenges.

By using new encoding technologies such as HVEC (H.265), it is possible to have up to double the data rate, while still using the same amount of bandwidth to transmit the same video quality. For broadcasters using portable satellite newsgathering equipment (SNG) for first-on-scene reporting, 4K has the added benefit of reducing expensive satellite data usage costs by up to half.



Compared to H.264, H.265 uses half the bandwidth to transmit the same amount of data at the same quality, or the same amount of bandwidth to transmit at far higher quality, making the technology ideal for 4K transmission. However, getting ready for 4K is just the latest in a long line of hurdles for broadcasters to vault over—in addition to pressure from OTT content providers, today's viewers also present their own unique challenge. They expect to feel like they're part of the action when it comes to live broadcast, which relies entirely on the correct shot being captured. Efficiency is important, granted, as there's no room for distortion and delay is not acceptable. Ultimately, broadcast success comes down to using the correct equipment to capture the most suitable imagery at the right time, then reliably transmitting that imagery.

To meet this demand, Vislink has developed a range of modular solutions in recent months that are adaptable and flexible. Smaller and lighter than previous models, Vislink's modern wireless equipment is highly customizable, and the modular design makes the equipment future-proof. This new approach to broadcast equipment is even capable of being upgraded on the fly to support new software and features, or modified to meet individual needs as the challenges faced by broadcasters change over time.

Vislink's L1700 wireless video transmitter, for example, provides the multiple inputs and mounting options necessary to be used with any camera—from prosumer to full broadcast level—capable of sending HD footage from any live event without compromise. The L1700 is currently one of the smallest, lightest camera-back transmitters (with low power consumption) on the market and was widely used at this year's FIFA World Cup, cementing Vislink's strong reputation in providing broadcast communications equipment for high-profile sporting events.





Vislink's momentum around providing more advanced broadcast equipment carried over into this year's IBC, as well, where Vislink showcased the new NewSwift 2.4m, motorized, vehicle-mounted system. Designed as a customizable and lightweight antenna, and available as either a single or three piece carbon fiber reflector, this latest NewSwift version builds on Vislink's goal of helping broadcasters achieve more with less and providing them with more flexible equipment. Auto-acquisition, auto-tracking and excellent wind loading capabilities are included and allow for satellite acquisition in less than five minutes from a stowed position, even in demanding environments.

Vislink's partnership with ND SatCom has also gone from strength to strength this year. The agreement led to joint development of the Vislink ADM5100, a new half rack satellite modem supporting mesh technology. The partnership may lead to further joint development later on and Vislink's technology may be integrated into ND SatCom's hardware in the future. For now, ND SatCom's 5G modem is available for use across Vislink's full range of ultra-lightweight MSAT data terminals, giving customers even greater flexibility.

This year's IBC also coincided with the first Formula E race, which Vislink was heavily involved in—gigawave on-board cameras and live video transmission systems were used to capture real-time, close up action from

the race track, pit lanes and cars themselves, making Vislink instrumental to the success of the event. Formula E is the latest example of how sport broadcast continues to be a growing market for Vislink, as demand for lightweight and versatile wireless broadcast equipment grows.

Of course, once an event has been captured and transmitted, the footage then needs to be run through a video playout platform to incorporate broadcasters' pre-program clips, including ads, adding channel logos, or adjusting audio levels. With the acquisition of Pebble Beach Systems, Vislink is now in a position to offer the full package—from video to playout, from side line to TV set, or as we like to call it, from scene to screen.

A seasoned professional of the space and satellite communication industry, Ali Zarkesh joined Vislink in 2010 and is Product Development Director. With more than 21 years of experience, 10 of which were program management, Ali has worked at leading space and IT companies throughout his career such as Inmarsat, Astrium, Eumetsat, Vega and ComDev – as well as his current position at global provider of satellite communications technologies, Vislink.

Ali's role at Vislink involves directing and overseeing the product development of the Sat-com product range and defining the strategic direction and road map for future products, as well as developing new business contacts and markets for the Vislink range of satellite communications products.



